Calpine Corporation

Bechtel Enterprises Holdings, Inc.

May 22, 2001

Mr. Steve Larson
Executive Director
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

Dear Mr. Larson:

In accordance with the provisions of Title 20, California Code of Regulations, Calpine Corporation (Calpine) and Bechtel Enterprises Holdings, Inc. (Bechtel), hereby submit this Application for Certification (AFC) seeking authority to construct and operate the Russell City Energy Center, a 600-megawatt, natural gas-fired, combined-cycle power plant to be located in the City of Hayward, California. Calpine/Bechtel respectfully request that the Russell City Energy Center AFC be reviewed under the expedited six-month licensing process as set forth in Public Resources Code 25550.

Approximately 10 acres of the 14.7-acre proposed site for the Russell City Energy Center is currently occupied by the transmitter facilities of Radio Station KFAX, AM 1100. The owner of KFAX has applied to the City of Hayward for permission to construct and operate new transmitter facilities on a closed City of Hayward landfill located approximately 1.25 miles from the existing transmitter facility. The City of Hayward is currently preparing an environmental document, in compliance with the provisions of the California Energy Quality Act (CEQA) that addresses the demolition of the existing KFAX transmitter facility and construction of the new transmitter facility. Calpine/Bechtel has been advised that completion of the City of Hayward's CEQA review is anticipated by mid summer 2001. A copy of the City's environmental clearance document will be submitted to the California Energy Commission Docket Office when it becomes available.

As officers of the respective Companies, we hereby attest, under penalty of perjury, that the contents of this application are truthful and accurate to the best of our knowledge.

Dated this 22nd day of May, 2001

Sincerely,

Curt Hildebrand
Vice-President-Calpine Corporation
General Manager-Calpine/Bechtel Joint Development

Robert Duncan
Vice President and Manager
Bechtel Enterprises Holdings, Inc.

Attachments

CALPINE/BECHTEL JOINT DEVELOPMENT
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PLEASANTON, CALIFORNIA 94566
925-600-2000 925-600-8926 (fax)

APPLICATION FOR CERTIFICATION

FOR THE

RUSSELL CITY ENERGY CENTER

HAYWARD, CALIFORNIA

VOLUME I: SECTIONS 1 THROUGH 10

Submitted to:

California Energy Commission
Sacramento, California

Submitted by:

Calpine/Bechtel Joint Development
Pleasanton, California

May 2001

CONTENTS

Russell City Energy Center AFC

May 2001

LIST OF TABLES

LIST OF FIGURES

Russell City Energy Center AFC

May 2001

ACRONYMS AND ABBREVIATIONS

AA	Administering Agency
ABAG	Association of Bay Area Governments
AC	Alternating current
ACTA	Alameda County Transportation Authority
ACWD	Alameda County Water District
AFC	Application for Certification
AGC	Automatic generation control
ANSI	American National Standards Institute
APE	Area of Potential Effect
ASME	American Society of Mechanical Engineers
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
AWT	Advanced Wastewater Treatment
BA	Biological assessment
BART	Bay Area Rapid Transit District
BCDC	Bay Conservation and Development Commission
BFI	Browning Ferris, Inc.
BO	Biological opinion
BOD	Biochemical oxygen demand
CAA	Clean Air Act
CalARP	California's Accidental Release Prevention Program
CAPCOA	California Air Pollution Control Officer's Association
CARB	California Air Resources Board
CATEF	California Air Toxics Emission Factor
CBC	California Building Code
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDMG	California Division of Mines and Geology
CDOE	California Department of Education
CEC	California Energy Commission
CEDD	California Employment Development Department
CEM	Continuous emissions monitoring
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHRIS	California Historical Resources Information System
CIP	Clean-In-Place
CNDDB	California Natural Diversity Data Base
CNEL	Community noise equivalent level
CNPS	California Native Plant Society
COB	Chief Building Official
CRT	Cathode ray tube
CRWQCB	California Regional Water Quality Control Board
CSC	California species of concern
CTGs	Combustion turbine-generators
CUPA	Certified Unified Program Agency
CURE	California Unions for Reliable Energy
CWA	Clean Water Act

DC	Direct current
DCIS	Distributed control and information system
EBDA	East Bay Dischargers Authority
EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Parks District
EPCRA	Emergency Planning and Community Right-to-know Act
ERCs	Emission reduction credits
ESA	Endangered Species Acts
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
HARD	Hayward Area Recreation District
HCP	Habitat Conservation Plan
HMBP	Hazardous materials business plan
HP	High-pressure
HRSG	Heat recovery steam generator
HUSD	Hayward Unified School District
HWCL	Hazardous Waste Control Law
I/O	Input/output
IP	Intermediate-pressure
ISO	International Standards Organization
LORS	Laws, ordinances, regulations, and standards
LP	Low-pressure
MCCs	Motor control centers
MEI	Maximally exposed individual
MF	Micro-filtration
MF/RO	Membrane filtration reverse osmosis
MRF	Material recovery facility
MSDS	Material Safety Data Sheets
MSL	Mean seal level
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NEIH	National Institute of Environmental Health Sciences
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
O&M	Operation and Maintenance
OHP	Office of Historic Preservation
PCBs	Polychlorinated biphenyls
PCN	Preconstruction Notification
PRC	Public resource code
PSD	Prevention of significant deterioration
PSIDM	Predicted Seismic intensity of distribution maps
RCEC	Russell City Energy Center
RCRA	Resource Conservation and Recovery Act
RELs	Reference Expose Levels
RMP	Risk management plan
RO	Reverse osmosis
ROCs	Reactive organic compounds

ROW	Right-of-way
RWQCB	Regional Water Quality Control Board
SC	Species of concern
SCR	Selective catalytic reduction
SEBP	South East Bay Plain
SHPO	State Historic Preservation Officer
SOP	Standard operating procedures
SPCC	Spill prevention control and countermeasure
STG	Steam turbine-generator
SVP	Society of Vertebrate Paleontology
SWPPP	Storm Water Pollution Prevention Plant
SWRCB	State Water Resources Control Board
TDS	Total dissolved solids
TQ	Threshold quantity
TSD	Treatment, Storage, and Disposal
UCMP	University of California Museum of Paleontology
UPCF	Unified Program Consolidated Form
UPRR	Union Pacific Railroad Company
USACE	United States Army Corps of Engineers
USD	Union Sanitary District
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Services
USGS	United States Geological Survey
VOCs	Volatile organic compounds
WPCF	Water Pollution Control Facility

Russell City Energy Center AFC

May 2001

1.0 EXECUTIVE SUMMARY

1.1 PROJECT OVERVIEW

Calpine Corporation (Calpine) and Bechtel Enterprises Holdings, Inc. (Bechtel), known as the Calpine/Bechtel Joint Development, propose to construct, own, and operate a merchant energy generating facility in the Industrial Corridor of the City of Hayward, Alameda County, California, to be known as the Russell City Energy Center (RCEC). The RCEC will be a natural gas-fired, combined-cycle electric generating facility rated at a nominal gross generating capacity of 600 megawatts (MW). The proposed 14.7-acre project site is located at the southwest corner of the intersection of Enterprise Avenue and Whitesell Street, directly south of the City of Hayward's Water Pollution Control Facility (WPCF).

The project also includes the construction and operation of an advanced wastewater treatment plant (AWT plant) adjacent to the energy center that will treat secondary effluent that is currently discharged to San Francisco Bay to produce high-quality water for use in the energy center's cooling and process water systems. Secondary effluent will be supplied to the AWT plant by the Hayward WPCF. Secondary effluent from the East Bay Dischargers Authority (EBDA) pipeline from the Union Sanitary District (USD) wastewater treatment plant will serve as a backup supply to the AWT plant.

Approximately 11 acres of the 14.7-acre proposed site for the RCEC is currently occupied by the transmitter facilities of Radio Station KFAX, AM 1100. The owner of KFAX has applied to the City of Hayward for permission to construct and operate new transmitter facilities on a closed City of Hayward landfill located approximately 1.25 miles from the existing transmitter facility. The City of Hayward is currently preparing an environmental document, in compliance with the provisions of the California Energy Quality Act (CEQA), that addresses the removal of the existing KFAX transmitter facility and construction of the new transmitter facility. Calpine/Bechtel has been advised that completion of the City of Hayward's CEQA review is anticipated by mid summer 2001. A copy of the City's environmental clearance document will be submitted to the California Energy Commission (CEC) Docket Office when it becomes available. A legal description of the RCEC site is attached as Appendix 1-A. A list of property owners adjacent to the RCEC site and linear corridors is attached as Appendix 1-B.

1.1.1 The Russell City Energy Center

Figure 1-1 is a rendering that shows the project in its surroundings. Figure 1-2 shows the location of the project features. The proposed energy center will consist of the following:

- A 600-megawatt (MW) nominal, natural gas-fired, combined cycle generating facility consisting of two "F-Class" combustion turbine–generators (CTGs), two multi-pressure, supplementary-fired heat recovery steam generators (HSRGs), a single 3-pressure, reheat, condensing steam turbine–generator (STG), and a hybrid, wet/dry plume-abated mechanical draft cooling tower
- A 230-kilovolt (kV) on-site switchyard
- A 1.1-mile 230-kV, double-circuit overhead transmission line connecting the RCEC switchyard to the existing Pacific Gas and Electric (PG&E) Eastshore Substation via PG&E's existing Eastshore to Grant 115-kV transmission corridor which is located approximately 600 feet from the northeast corner of the project site

- Approximately 0.9 miles of 16-inch diameter underground natural gas pipeline from PG&E's gas distribution Line 153 to the RCEC site
- Approximately 100 feet of new 12-inch diameter domestic water/firewater pipeline from the existing City water main in Whitesell Street
- Approximately 2,000 feet of new industrial wastewater discharge pipeline to the headworks of the Hayward WPCF

1.1.2 Advanced Wastewater Treatment (AWT) Plant

The proposed new AWT plant will produce high-quality water for plant cooling and process makeup needs from treated secondary effluent that is currently discharged to San Francisco Bay via EBDA. The AWT plant will consist of the following:

- Micro-Filtration (MF) and Reverse Osmosis (RO) treatment trains to remove suspended solids and dissolved solids from the incoming treated secondary effluent
- Chlorine contact basins to eliminate any residual biological contamination from the treated water in accordance with Title 22 (California Code of Regulations, Title 22, Section 60301.230)
- Product water storage tanks sufficient to provide for 24 hours of energy center operation at average consumption during interruptions of AWT plant operation
- Precipitation and clarification processes to remove metals and other potentially harmful dissolved solids from the RO reject water stream
- Solids processing and handling systems to convert the sludge from the metals separation process to a benign solid form that can be transported by truck for disposal off-site
- Approximately 150 feet of new pipelines beneath Enterprise Avenue to convey secondary effluent to the AWT plant and to convey AWT wastewater streams to the WPCF
- Approximately 700 feet of new pipeline to convey backup secondary effluent from the existing EBDA pipeline to a connection in the supply line from the WPCF to the AWT plant

1.1.3 RCEC and AWT Plant Arrangement

The site arrangement shown in Figure 2.2-1 and typical elevation views shown in Figures 2.2-2a and 2.2-2b illustrate the location and size of the proposed energy facility and the adjacent AWT Plant. The parcel will be fenced to accommodate the generation facilities, including the storage tank areas, parking area, control/administration building, water treatment building, emission control equipment, generation equipment, and the on-site switchyard. The AWT plant will be separately fenced at the northwest corner of the property to provide security for that operation.

Access to the RCEC site will be via a driveway off Enterprise Avenue through a security gate. Most of the RCEC site will be paved to provide internal access to all facilities and onsite buildings. Access to the AWT plant will be via a separate driveway off Enterprise Avenue through a separate security gate.

1.2 PROJECT SCHEDULE

Calpine/Bechtel has requested that this Application for Certification (AFC) for the RCEC be processed under the CEC's expedited six-month licensing process. Assuming the project receives a license by January 2002, construction of the RCEC and the AWT plant will begin in the summer of 2002. Pre-operational testing of the energy center and AWT plant will begin in the spring of 2004, and full-scale commercial operation is expected to commence in the summer of 2004.

Figure 1-1
Architectural Rendering

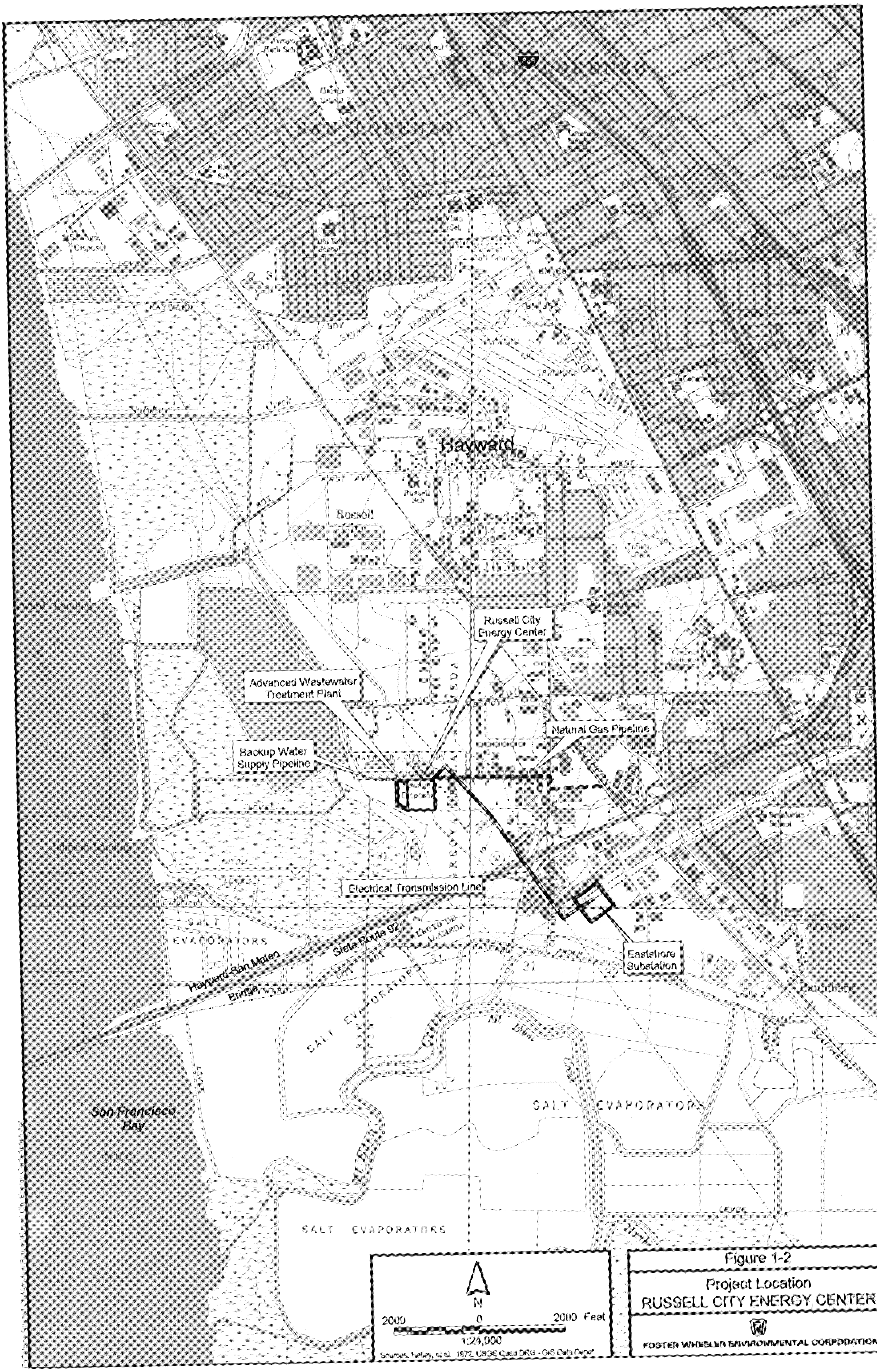


Figure 1-2

Project Location
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

1.3 PROJECT OWNERSHIP

The RCEC will be jointly owned by Calpine and Bechtel. The two companies established a joint development program in late 1998 for the express purpose of developing, owning, and operating a number of natural gas-fired merchant power plants in the San Francisco Bay Area. The Delta Energy Center, which is under construction in Pittsburg, was the first Calpine/Bechtel project approved by the CEC. The Metcalf Energy Center, which is in the final stages of CEC review, will be the second. The Russell City Energy Center would be the third.

The AWT plant will be designed and constructed by Calpine/Bechtel and owned and operated by the City of Hayward.

1.3.1 Calpine Corporation

Calpine is an independent power developer, owner, and operator. Its headquarters are located in San Jose, California. Calpine is a publicly traded company with the NYSE stock symbol CPN.

Calpine owns an interest in 50 power generation facilities and geothermal steamfields having an aggregate capacity of 7,000 MW. Calpine's Sutter Power Plant near Yuba City in Sutter County is nearing completion and is expected be begin commercial operation this summer. Calpine also has two merchant power plants under construction in Pittsburg, Contra Costa County: the Los Medanos Energy Center and the Delta Energy Center. They are expected to be online by summer 2001 and summer 2002, respectively. Both the Sutter and Delta projects are being constructed by Bechtel Power Corporation. In addition, Calpine owns and operates natural gas-fired cogeneration facilities in Gilroy, King City, Watsonville, San Jose, and the Greenleaf 1 and 2 plants adjacent to the Sutter Power Plant near Yuba City. Across North America, Calpine currently has 27 plants under construction and 28 plants in announced development for a total of an additional 32,660 MW.

1.3.2 Bechtel Enterprises Holdings, Inc.

Bechtel Enterprises Holdings, Inc. is the development, finance and ownership entity within the Bechtel Group of Companies. Bechtel is based in San Francisco, California, with offices worldwide.

A privately held firm, Bechtel is one of the world's largest engineering and construction companies. Bechtel has extensive experience in the development and construction of power, petrochemical, and large infrastructure projects both in the U.S. and internationally. Until 1997, Bechtel was a partner with PG&E in both the U.S. Generating Company (now PG&E Generating Company), and the International Generating Company (now InterGen). Bechtel is now partnered with Shell in ownership of InterGen, which now operates worldwide. InterGen has recently secured CEC approval for three peaking generating facilities in southern California, and is actively developing other projects in California, elsewhere in the US, and overseas. Bechtel/InterGen currently has ownership interests in more than 17,000 MW of power generating capacity in operation, construction, or advanced development worldwide. Bechtel Power Corporation, another member of the Bechtel Group of Companies, will be the engineer/constructor for the RCEC, the AWT plant, and the associated linear facilities.

1.3.3 CURE Labor Agreement

Calpine has entered into an agreement with the California Unions for Reliable Energy (CURE) to establish a proactive and strong working relationship between the project sponsors and labor for the construction of the RCEC. In addition, Bechtel constructs projects using Union labor under a National Presidents' Agreement with the National Building Trades Council.

1.3.4 Other Agreements

Calpine/Bechtel will contract with PG&E for ownership and operation of the new electrical interconnection facilities required to transmit power from the RCEC switchyard into the Bay Area electrical grid. Calpine/Bechtel will also contract with PG&E for the ownership and operation of the new natural gas supply pipeline for the RCEC. Calpine/Bechtel will contract with PG&E and/or other natural gas suppliers to supply natural gas to the RCEC. The legal relationship between Calpine and Bechtel, as owner of the RCEC, and PG&E and other suppliers will be contractual only (one of supplier/user or seller/buyer of services or products).

1.4 PROJECT ALTERNATIVES

A "No Project" Alternative was considered and rejected. The "no project" alternative fails to meet the basic project objectives of the RCEC project as described in this Application. For example, the "no project" alternative is inconsistent with one of the primary business objectives of Calpine/Bechtel's program to develop merchant power generation facilities, which is to generate and sell electric power in the deregulated power market. In addition, the "No Project" Alternative could result in greater fuel consumption and air pollution in the state, because older, less efficient plants with higher air emissions would continue to generate power instead of being replaced with cleaner, more highly efficient plants, such as the RCEC. The "No Project" Alternative is also inconsistent with the energy policies and directives issued by Governor Gray Davis in recent months to bring additional electrical generating capacity on line as quickly as possible to help resolve California's current energy crisis.

Five possible alternative sites in the general vicinity of the proposed site were reviewed and rejected as infeasible because they fail to meet most of the RCEC project's basic objectives, fail to avoid or minimize potentially significant environmental effects (in part because no such effects are identified for the project), and/or include the potential for the alternatives themselves to result in one or more significant environmental impacts. A complete discussion of project alternatives is presented in Section 9. Similarly, alternative routes for the natural gas line, electric transmission line, and water lines were also reviewed and found to be infeasible, failed to avoid or minimize any potential significant environmental effects, or had the potential to cause significant environmental effects avoided or minimized by the proposed project. Natural gas pipeline alternatives, electric transmission connection alternatives, and water line alternatives are also presented in Section 9.

Several alternative generating technologies were reviewed in a process that led to the selection of a modern, yet conventional, natural gas-fired combustion turbine combined-cycle arrangement for the RCEC. The alternative technologies included conventional oil and natural gas-fired plants, simple-cycle combustion turbines, biomass-fired plants, waste-to-energy plants, solar plants, wind generation plants, and others. None of these technologies was considered better than or equal to the combined-cycle technology selected for the RCEC.

1.5 ENVIRONMENTAL CONSIDERATIONS

Pursuant to the requirements set forth in existing law and the CEC's regulations, sixteen areas of possible environmental impact from the proposed project were investigated. Detailed descriptions and analyses of these areas are presented in Sections 8.1 through 8.16 of the AFC. As discussed in detail herein, with the implementation of the proposed mitigation measures and the anticipated Conditions of Certification, there will be no significant unmitigated environmental impacts associated with the construction and operation of the RCEC project. All sixteen subject areas are discussed in detail in Section 8 of this Application. This Executive Summary highlights findings related to five subject areas that are typically of the most interest in a CEC proceeding: air quality, water resources, visual resources, biological resources, and noise.

1.5.1 Air Quality

The site is located in the State of California ambient air quality standards nonattainment area for both ozone and particulate matter with a diameter less than 10 microns (PM_{10}). An assessment of the impact to air quality was performed using detailed air dispersion modeling. The air impacts from the RCEC will be mitigated by the proposed combustion turbine emission control technology and cooling tower drift control technology. Additionally, emission reduction credits (ERCs) will be obtained to offset the project's emissions of volatile organic compounds (VOCs) and NO_x, both of which are precursors of ozone, and PM_{10}. These mitigation measures will result in the project having no significant adverse impact on air quality or public health. The AWT plant will not produce any emissions of concern. See Section 8.1 for a detailed analysis of air quality.

1.5.2 Water Resources

The water to be used in the RCEC cooling tower and as process makeup for the power cycle systems will be high-purity tertiary treated water produced from secondary effluent from either the City of Hayward's WPCF or from the USD/EBDA backup supply. No potable or otherwise fresh water will be used for these purposes. The peak and average net consumptions of water by the RCEC are approximately 5.27 and 3.33 million gallons per day (mgd), respectively. Section 8.15 includes a detailed analysis of water resources.

1.5.3 Visual Resources

The most prominent visual features of the RCEC will be two HRSGs and their associated exhaust stacks and the cooling tower. The HRSG exhaust stacks will be 145 feet high. The HRSG casings will be approximately 90 feet high. The cooling tower will be approximately 64 feet tall to the tops of the fan exhaust cones.

An architectural screening treatment will be provided around the combustion turbines, HRSGs, and the HRSG exhaust stacks. Additional architectural screening will be provided around the cooling tower and to the south of the steam turbine-generator systems. Rather than attempting to disguise the energy center as something else, this architectural treatment will make the facility an architectural landmark visible to travelers crossing the Hayward-San Mateo bridge at the western gateway to the City. Section 8.13 presents a detailed description and depictions of the proposed architectural treatment and discussion of the resulting visual effects of the RCEC. A letter from the City of Hayward endorsing the RCEC architectural design concept is attached as Appendix 1-C.

The RCEC will employ a hybrid wet/dry, plume-abated cooling tower design that will prevent the formation of visible plumes above the cooling tower under all but the most extreme cold weather conditions. Various control features will be incorporated in the design of the balance of the energy center to prevent the formation of visible plumes from other sources.

1.5.4 Biological Resources

The project would cause no significant impacts to endangered or threatened species. The project site contains 1.68 acres of seasonal wetlands. Calpine/Bechtel will obtain a permit under the Clean Water Act from the U.S. Army Corps of Engineers to fill these wetlands at the plant site. The permit application will include a plan to mitigate this potential impact to below significance level. The mitigation plan may involve replacement of the seasonal wetlands with wetlands of equivalent value or contribution to ongoing wetland restoration projects in the Hayward Shoreline area. See Section 8.2 for a detailed discussion of biological resources.

1.5.5 Noise

Ambient noise measurements were taken to determine the L_{90} (the noise level that is exceeded during 90 percent of the measurement period) nighttime noise level at the nearest residence (i.e., sensitive receptor). Noise modeling was used to determine the RCEC's contribution to the nighttime ambient noise levels at the nearest residence. The RCEC's contribution to cumulative noise will not cause the background level to be increased by more than 5 dBA (barely noticeable increase) at the nearest receptor. Since the cumulative increase in noise level at the nearest receptor will be barely noticeable during the quietest nighttime hours at the nearest receptor, no adverse impact is expected as a result of the normal operation of the facility. Noise modeling was also used to determine the L_{DN} noise levels at the project's property lines. The project will comply with the City of Hayward's property line noise limit of 75 dBA, L_{DN}. The AWT plant will not generate any significant operational noise. See Section 8.7 for a detailed analysis of potential noise impacts.

1.6 KEY BENEFITS

1.6.1 Environmental

The RCEC will employ advanced, high efficiency combustion turbine technology and SCR to minimize emissions from the facility. NO_x emissions (a precursor to smog) produced by the RCEC, will be approximately 90 percent less than those produced by existing power plants in the Bay Area. In addition to the significant reduction of emissions, the RCEC's operating efficiency will be such that the plant will consume 40 percent less fuel than existing plants of similar size. The RCEC will also purchase and permanently retire Emission Reduction Credits, or "offsets", to more than compensate for its minimal emissions. Because its superior efficiency will make the RCEC one of the new Bay Area energy centers that will be called upon to run when older, highly-polluting generating units cannot compete economically, the RCEC will hasten the retirement or the modernization of the older generating units, thereby contributing to a net air quality improvement for the region.

The use of tertiary treated water as cooling and process water makeup for the RCEC will benefit San Francisco Bay. The mass emission of heavy metals and solids discharged by EBDA will be reduced by conversion of dissolved and particulate metals into benign solids through the AWT processes. Most significantly, the RCEC/AWT plant project will reduce copper discharge to the Bay by 12 kg/month, which represents an 8 percent reduction in the total discharge from the EBDA system.

1.6.2 Employment

The project will provide for a peak of approximately 485 construction jobs over a 2-year period and approximately 25 skilled, family-wage positions in the energy center throughout the life of the plant. The AWT plant will provide an additional 6 skilled family-wage operator positions throughout the life of the plant. In addition to the direct employment benefit, the RCEC and the AWT plant will require and use the services of local firms for major maintenance and overhauls, plant supplies, and other support services throughout the life of the facility.

1.6.3 Tax Base

The RCEC will be a significant tax contributor, generating $3 to $5 million per year in property taxes that will support the services and programs of Alameda County, Hayward, and other nearby communities. The California State Board of Equalization is currently debating whether a power generation facility should be assessed at the county or the state level. If the facility were assessed by the state, property tax revenues would be allocated countywide; if the facility were assessed at the county level, the allocation would be dispersed to the local tax jurisdiction within which the facility is sited.

1.6.4 Energy Efficiency

The RCEC will be an efficient, environmentally responsible source of economic and reliable energy to serve the growing energy demands of the Bay Area.

1.7 PERSONS WHO PREPARED THE AFC

Persons with primary responsibility for the preparation of each section of this AFC are listed in Appendix 1-D.

Russell City Energy Center AFC

May 2001

2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION

The Russell City Energy Center (RCEC) will be a 600 megawatt (nominal gross output) natural gas-fired combined-cycle electrical generating facility, with a 230-kilovolt switchyard. The RCEC will be located on 14.7 acres at the west end of Enterprise Avenue in the City of Hayward, in Alameda County directly south of the Hayward Water Pollution Control Facility (WPCF). A new 230-kV double-circuit transmission line will exit the RCEC switchyard eastward toward Pacific Gas and Electric Company's (PG&E) existing Eastshore-Grant 115-kV transmission corridor, and then follow the existing corridor to PG&E's Eastshore Substation. The total length of this new transmission line will be 1.1 miles.

A new Advanced Wastewater Treatment (AWT) Plant will be constructed immediately west of the energy center to supply tertiary treated water for makeup to the facility's cooling and process makeup water systems. A number of water and wastewater pipelines under Enterprise Avenue will connect the energy center and the AWT plant with the City of Hayward's WPCF. The City will also supply potable water to the RCEC site for domestic use and for fire fighting.

The RCEC and the AWT plant are discussed separately below.

2.2 RCEC PROJECT DESCRIPTION, DESIGN, AND OPERATION

This section describes the design and operational characteristics of the proposed RCEC plant.

2.2.1 Site Plan and Access

The site arrangement shown in Figure 2.2-1 and the typical elevation views shown in Figures 2.2-2a and 2.2-2b illustrate the location and size of the RCEC. Approximately 12.55 fenced acres will be required to accommodate the generation facilities, control/administration building, switchyard, emission control equipment, storage tanks, parking area, and storm water detention basins.

The RCEC will be visually compatible with existing and planned industrial and commercial development in the adjacent properties to the west and north of the site. An architectural screening treatment will be applied to the outside of the major project structures, including the heat recovery steam generators (HRSGs) and cooling tower, to make the facility an architectural landmark that will welcome commuters and visitors to the Hayward community as they travel eastbound across the Hayward-San Mateo Bridge.

Access to the RCEC will be from a new entrance driveway on Enterprise Avenue. Most of the surface within the fenced area will be paved to provide internal access to all project facilities and on-site buildings.

The existing Union Pacific Railroad Company (UPRR) industrial rail spur located immediately south of the site will be used for delivery of heavy equipment components during construction.

2.2.2 Process Description

The energy center's power train will consist of two Siemens Westinghouse 501 FD Phase 2 combustion turbine generators (CTGs) equipped with dry, low oxides of nitrogen (NO_x) combustors and steam injection power augmentation capability; two heat recovery steam generators (HRSGs) with duct burners; a single condensing steam turbine generator (STG); a deaerating surface condenser; a mechanical draft (wet/dry) plume-abated cooling tower; and associated support equipment.

Each CTG will generate a maximum of approximately 200 MW. The CTG exhaust gases will be used to generate steam in the HRSGs. The HRSGs will employ reheat design with duct firing. Steam from the HRSGs will be admitted to a condensing STG. A maximum of 235 MW will be produced by the steam turbine. The project is expected to have an overall annual availability in the general range of 92 to 98 percent.

The heat balance for power plant baseload operation is shown in Figures 2.2-3a and 2.2-3b. The predicted net electrical output of this facility under these conditions is 553 MW. This balance is based on an ambient temperature of 59°F with water fog cooling of the combustion air, no augmentation steam injection, and no duct firing.

Associated equipment will include emission control systems necessary to meet the proposed emission limits. NO_x emissions will be controlled to a maximum of 2.5 (3-hour average, annual average of 2.0) parts per million by volume, dry basis (ppmvd), corrected to 15 percent oxygen, by a combination of dry, low NO_x combustors in the CTGs and selective catalytic reduction (SCR) systems in the HRSGs. Carbon monoxide (CO) will be controlled to 6 ppmvd at 15 percent oxygen under all operating conditions.

2.2.3 Power Plant Cycle

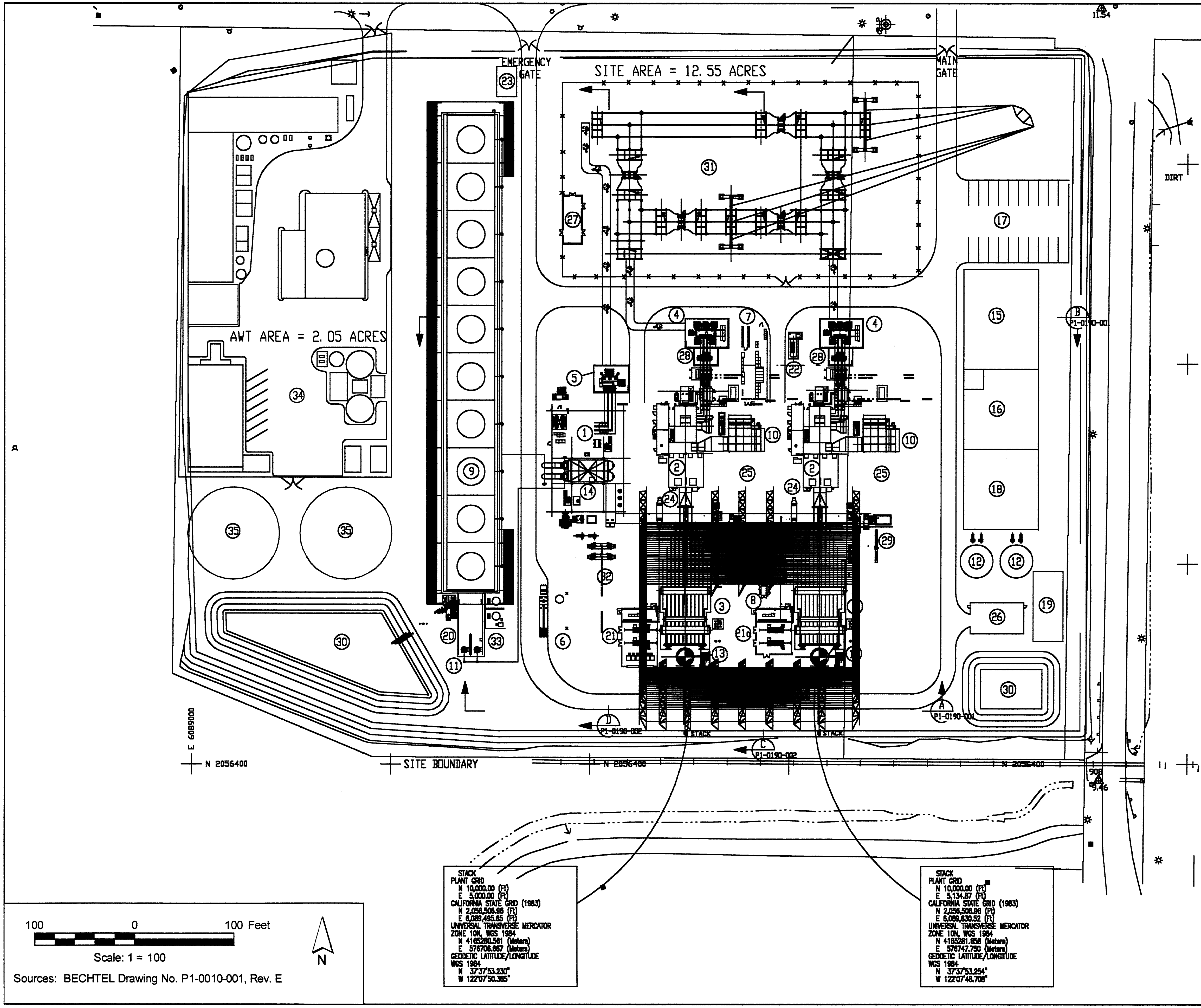
CTG combustion air will flow through the inlet air filters and water foggers and associated air inlet ductwork, be compressed, and then enter the combustion sections. Natural gas fuel will be injected into the compressed air in the combustion sections and ignited. The hot combustion gases will expand through the turbine sections of the CTGs, causing them to rotate and drive both the electric generators and CTGs compressors. The hot combustion gases will exit the turbine sections and enter the HRSGs, where they will heat water (feedwater) that will be pumped into the HRSGs. The feedwater will be converted to superheated steam and delivered to the steam turbine at three pressures: high-pressure (HP), intermediate-pressure (IP), and low-pressure (LP). The use of multiple steam delivery pressures will permit an increase in cycle efficiency and flexibility. High-pressure steam, delivered to the HP section of the steam turbine, will exit the HP section as "cold reheat" steam and be combined with IP steam before passing through the reheater sections of the HRSGs. This mixed, reheated steam (called "hot reheat") will then be delivered to the IP steam turbine section. Steam exiting the IP section of the steam turbine will be mixed with LP steam and expanded in the LP steam turbine section. Steam leaving the LP section of the steam turbine will enter the surface condenser and transfer heat to circulating cooling water, which will cause it to condense to water. The condensed water, or condensate, will be delivered to the HRSG feedwater system. The condenser cooling water will circulate through a wet, mechanical draft cooling tower where the heat absorbed in the condenser will be rejected to the atmosphere via evaporation of cooling water.

2.2.4 Combustion Turbine-Generators, Heat Recovery Steam Generators, Steam Turbine-Generator, and Condenser

Power will be produced by the two CTGs and the STG. The following paragraphs describe the major components of the generating facility.

2.2.4.1 Combustion Turbine Generators

Thermal energy will be produced in the CTGs through the combustion of natural gas, which will be converted into the mechanical energy required to drive the combustion turbine compressors and electric generators. Each CTG system will consist of a CTG with supporting systems and associated auxiliary equipment. The CTGs will have power augmentation capability by the use of steam injection upstream of the turbine section.



Sources: BECHTEL Drawing No. P1-0010-001, Rev. E

1	STEAM TURBINE (S.T.)
2	COMBUSTION TURBINE (C.T.)
3	H.R.S.G.
4	C.T. MAIN TRANSFORMER
5	S.T. MAIN TRANSFORMER
6	AMMONIA UNLOADING/STORAGE AREA
7	SWITCHGEAR BUILDING W/ BATTERY ROOM
8	AIR COMPRESSOR SKID
9	COOLING TOWER
10	C.T. AIR INLET FILTER
11	CIRCULATING WATER PUMP AREA
12	DEMINERALIZED WATER STORAGE TANK
13	STACK
14	SURFACE CONDENSER
15	WAREHOUSE / MAINTENANCE SHOP
16	ADMINISTRATION BUILDING W/CONTROL ROOM
17	PARKING
18	WATER TREATMENT BUILDING/LABORATORY
19	GAS METERING AREA
20	COOLING TOWER BASIN/PUMPHOUSE BUILDING
21	BOILER FEEDWATER PUMP/CHEMICAL FEED BLDG
21a	BOILER FEEDWATER PUMP BLDG
22	EMERGENCY GENERATOR
23	FIRE WATER PUMP BUILDING
24	ROTOR AIR COOLER
25	MOBILE CRANE ACCESS AREA
26	GAS COMPRESSOR BUILDING
27	SWITCHYARD CONTROL ROOM
28	UNIT AUX. XFMR
29	GAS SCRUBBER/HEATER STATION
30	STORMWATER RETENTION BASIN
31	SWITCHYARD
32	CCW HEAT EXCHANGERS/CCW PUMPS
33	CHLORINATION SKID
34	ADVANCED WASTEWATER TREATMENT PLANT
35	FINAL PRODUCT WATER STORAGE TANK

Figure 2.2-1

SITE ARRANGEMENT

RUSSELL CITY ENERGY CENTER

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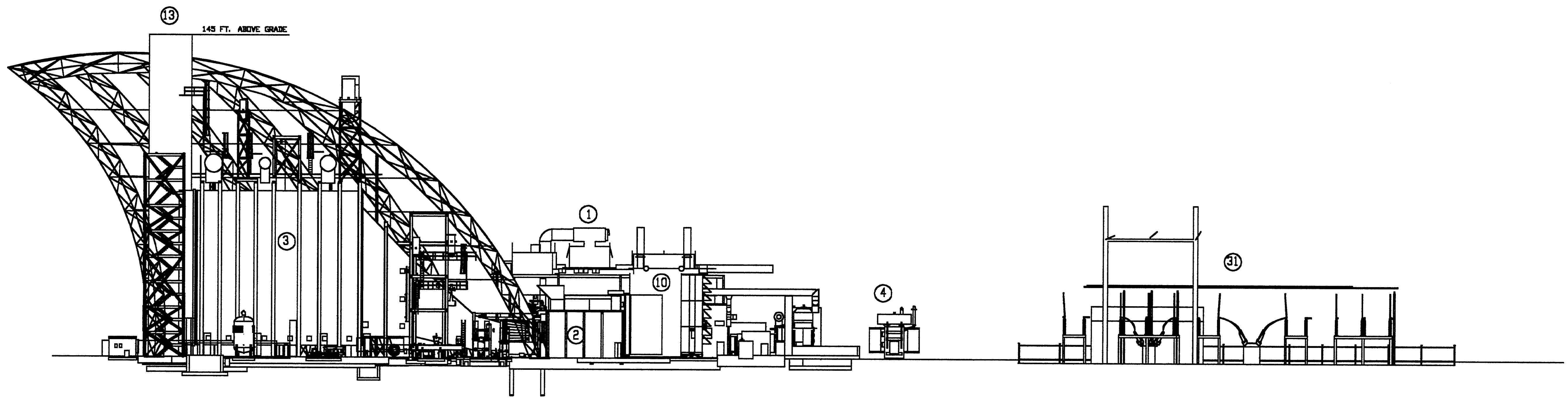
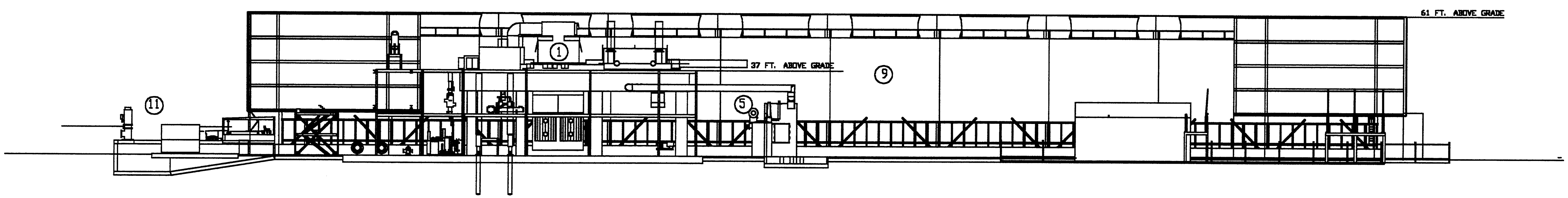


SECTION C
P1-0010-001



SECTION D
P1-0010-001

50 0 50 Feet

Scale: 1 = 50

Sources: BECHTEL Drawing No. p1-0190-002, Rev. D

Figure 2.2-2a

Site Elevation

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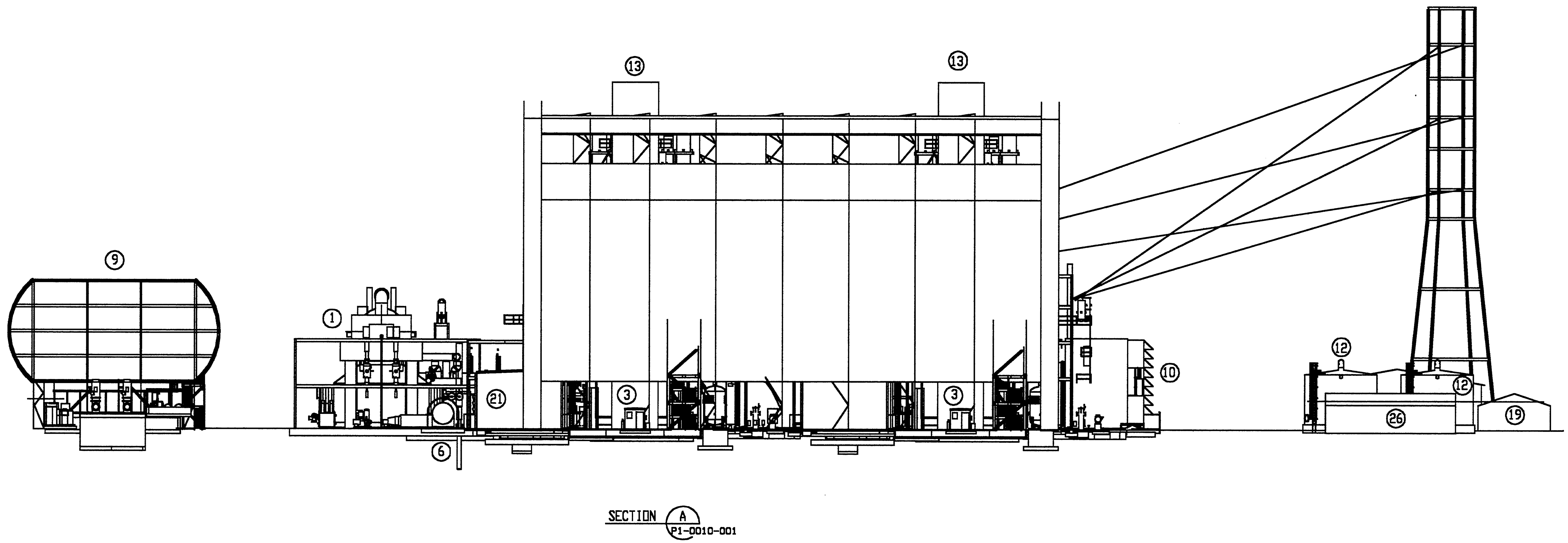

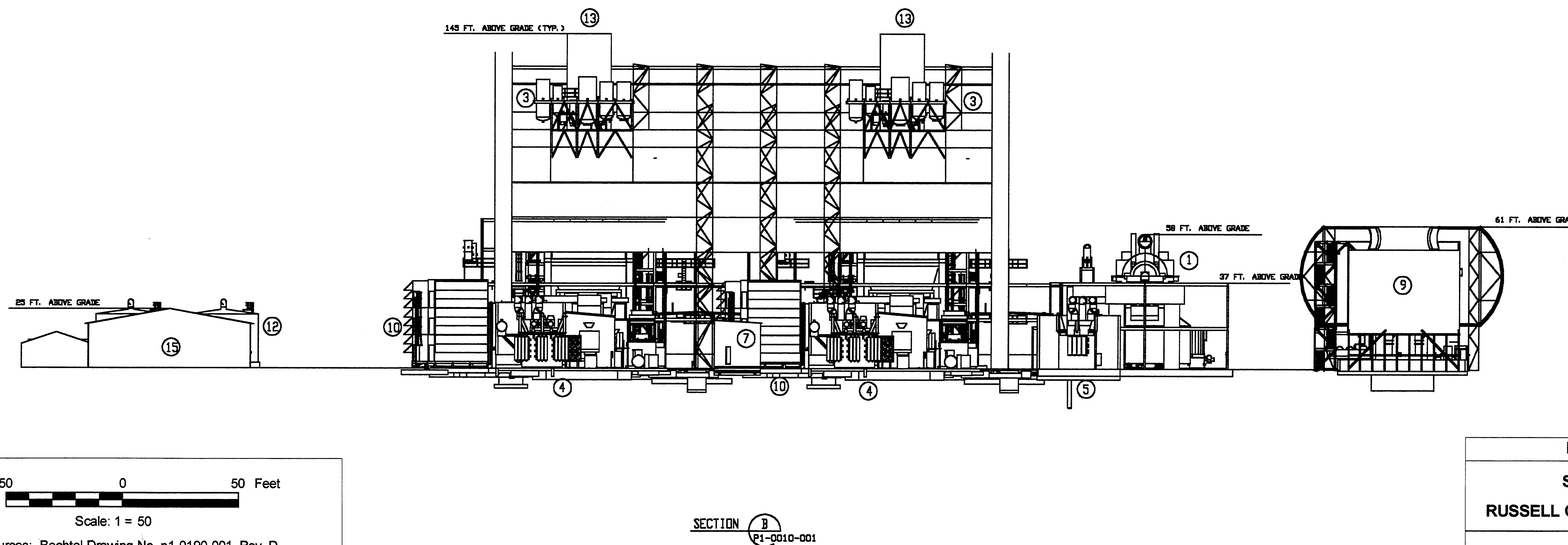

50 0 50 Feet

Scale: 1 = 50

Sources: Bechtel Drawing No. p1-0190-001, Rev. D

Figure 2.2-2b

Site Elevation

RUSSELL CITY ENERGY CENTER

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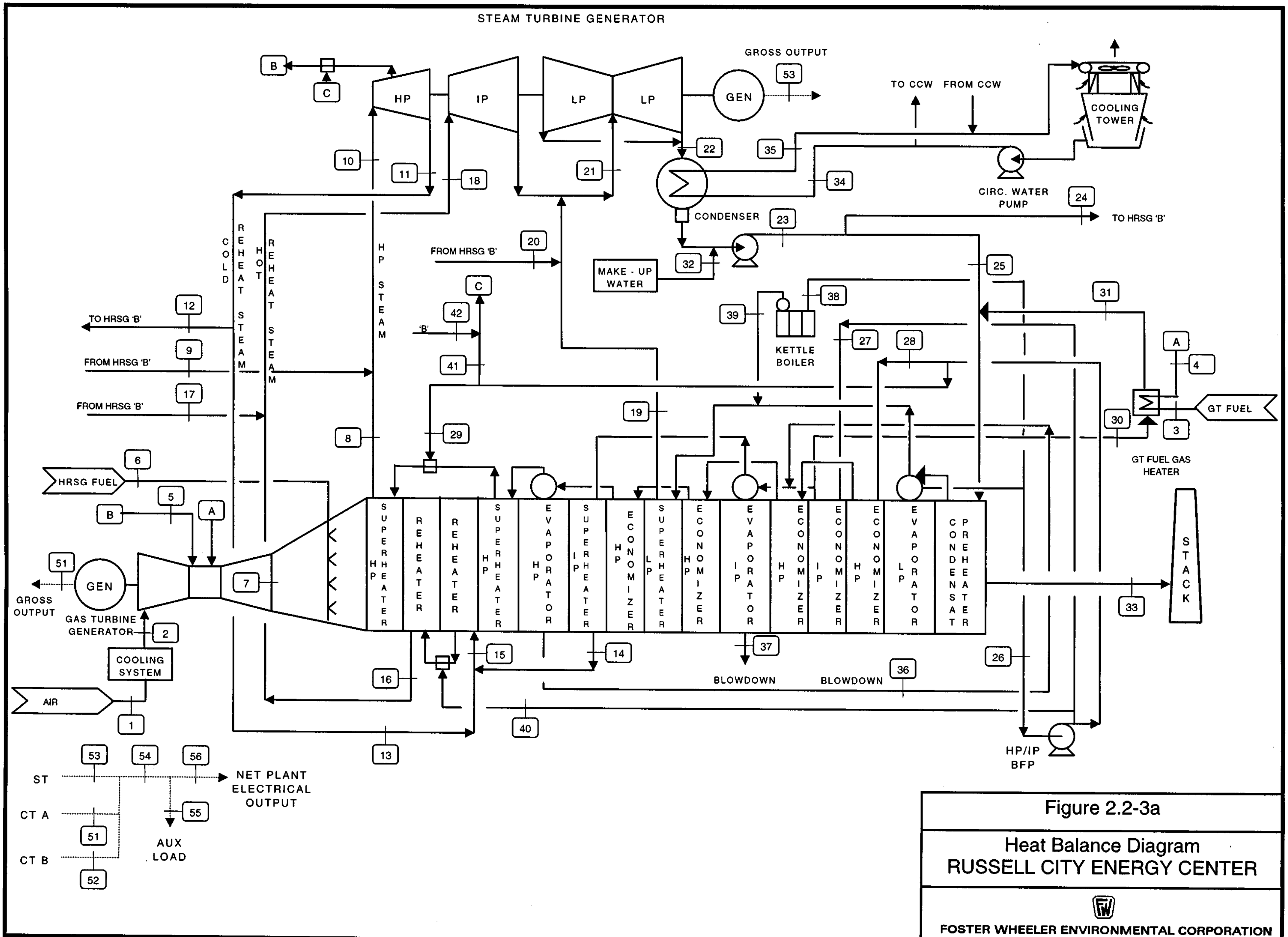

Figure 2.2-3a

Heat Balance Diagram
RUSSELL CITY ENERGY CENTER

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59 °F / 68% RH / 14.691 PSIA
GAS FIRED ANNUAL AVERAGE - 100% LOAD

STREAM NO.	UNITS	1	2	3	4	5	6	7	8
Mass Flow	lb/hr	3,662,780	3,666,110	81,340	81,340	0	0	3,747,450	439,540
Temperature	°F	59	55	60	280	n/a	n/a	1,107	1,047
Pressure	psia	14.691	14.554	410	400	n/a	n/a	15.240	1,808

STREAM NO.	UNITS	9	10	11	12	13	14	15	16
Mass Flow	lb/hr	439,540	879,090	863,870	431,930	431,930	69,730	501,670	501,670
Temperature	°F	1,047	1,042	706	704	704	576	685	1,048
Pressure	psia	1,808	1,748	497	481	481	481	481	453

STREAM NO.	UNITS	17	18	19	20	21	22	23	24
Mass Flow	lb/hr	501,670	1,003,330	85,080	85,080	1,185,710	1,185,710	1,188,710	594,360
Temperature	°F	1,048	1,045	525	525	575	96	97	95
Pressure	psia	453	437	75	75	70	0.847	119	108

STREAM NO.	UNITS	25	26	27	28	29	30	31	32
Mass Flow	lb/hr	594,360	537,860	98,320	439,540	0	28,590	28,590	3,000
Temperature	°F	95	311	313	316	n/a	451	107	60
Pressure	psia	108	80	531	1,960	n/a	496	486	25

STREAM NO.	UNITS	33	34	35	36	37	38	39	40
Mass Flow	lb/hr	3,747,450	65,803,360	65,803,360	0	0	20,350	20,350	0
Temperature	°F	191	70	87	n/a	n/a	311	312	n/a
Pressure	psia	14.691	35	25	n/a	n/a	80	80	n/a

STREAM NO.	UNITS	41	42	43	44	45	46	47	48
Mass Flow	lb/hr	0	0	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Temperature	°F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pressure	psia	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

STREAM NO.	UNITS	51	52	53	54	55	56
Output	kW	184,260	184,260	198,360	566,880	14,330	552,550

	UNITS	
Net Heat Rate	BTU/kWh LHV	6,177

Figure 2.2-3b

Mass Balance Diagram
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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

- Inlet air fogging system
- Inlet air filters
- Metal acoustical enclosure
- Single lube oil cooler
- Dry, low NO_x combustion system
- Compressor wash system-both online and offline
- Fire detection and protection system (utilizing FM200)
- Fuel gas system, including flow meter, strainer, duplex filter, and fuel gas heater.
- Starter System
- Turbine controls
- Direct-air-cooled synchronous generators
- Generator controls, protection, excitation, Power System Stabilizer, and Automatic Generation Control (AGC)

The CTGs and accessory equipment will be contained in a metal acoustical enclosure.

2.2.4.2 Heat Recovery Steam Generators

The HRSGs will provide for the transfer of heat from the exhaust gases of the CTGs to the feedwater, which will become steam. The HRSGs will be three-pressure, natural circulation units equipped with inlet and outlet ductwork, duct burners, insulation, lagging, and separate exhaust stacks.

Major heat transfer components of each HRSG will include an LP economizer, LP drum, LP evaporator, LP superheater, IP economizer, IP evaporator, IP drum, IP superheater, HP economizer, HP evaporator, HP drum, and HP superheaters. The LP economizer will receive condensate from the condenser hot well via the condensate pumps. The LP economizer will be the final heat transfer section to receive heat from the combustion gases before they are exhausted to the atmosphere.

Condensate will be directed through the LP drums and then to the boiler feed pumps. The boiler feed pumps will provide additional pressure to serve the separate IP and HP sections of the HRSG. Similarly, as described above, the IP and HP steam will be produced for supply to the steam turbine.

Feedwater from the LP drum will be sent to the HP section of the HRSG. High-pressure feedwater will flow through the HP economizers to the HP steam drum, where a saturated liquid state will be maintained. Next, the saturated water will flow from the steam drum through downcomers to the inlet headers of the HP evaporator. The saturated water will flow upward through the HP evaporator tubes by natural circulation. Saturated steam will form in the tubes while energy from the combustion turbine exhaust gas is absorbed. The HP-saturated liquid/vapor mixture will then return to the steam drum, where the two phases will be separated by the steam separators in the drum. The saturated water will return to the HP evaporator while the vapor passes to the HP superheater inlet. The saturated steam (vapor) will pass through the HP superheater to the HP steam turbine entrance.

Feedwater from the LP drum will also be sent to the IP section of the HRSG by an interstage bleed from the boiler feed pumps. This IP feedwater will flow through an IP economizer to the IP steam drum where a saturated liquid state will be maintained. Next, the saturated water will flow from the steam drum through downcomers to the inlet headers of the IP evaporator. The saturated water will flow upward through the IP evaporator tubes by natural circulation. Saturated steam will form in the tubes as energy from the combustion turbine exhaust gas is absorbed. The IP-saturated liquid/vapor mixture will then return to the steam drum where the two phases will be separated. The saturated water will return to the IP evaporator, while the vapor passes to the IP superheater inlet. The saturated steam (vapor) will pass through the IP superheater to the IP steam turbine entrance.

Duct burners will be installed in the HRSGs. These burners will provide the capability to increase steam generation, increase operating flexibility, and improved steam temperature control. The duct burners will burn natural gas. The duct burner for each HRSG will be sized to release up to 200 million British thermal units (MMBtu higher heating value or HHV basis) per hour per HRSG.

The HRSGs will be equipped with an SCR emission control system that will use ammonia vapor in the presence of a catalyst to reduce the NO_x concentration in the exhaust gases. The catalyst module will be located in the HRSG casing. Diluted ammonia vapor (NH_3) will be injected into the exhaust gas stream through a grid of nozzles located upstream of the catalyst module. The subsequent chemical reaction will reduce NO_x to nitrogen and water, resulting in a NO_x concentration of no more than 2.0 (annual average basis) ppmvd at 15 percent oxygen (O_2) in the HRSG exhaust gas.

2.2.4.3 Steam Turbine System

The steam turbine system will consist of a reheat steam turbine, gland steam system, lubricating oil system, hydraulic control system, and steam admission/induction valving. The steam turbine will drive a a hydrogen-cooled synchronous generator.

Steam from the HRSG HP, IP, and LP superheaters will enter the associated steam turbine sections through the inlet steam system. The steam will expand through the turbine blading, driving the generator. On exiting the turbine, the remaining steam will flow into the condenser.

2.2.5 Major Electrical Equipment and Systems

The electric power produced by the facility will be transmitted to the PG&E grid. Some power will be used onsite to power auxiliaries such as pumps and fans, control systems, and general facility loads, including lighting, heating, and air conditioning. Some will also be converted from alternating current (AC) to direct current (DC) for use as backup power for control systems and for other uses. Transmission and auxiliary uses are discussed in the following subsections.

2.2.5.1 AC Power—Transmission

Power will be generated by the two CTGs at 15 kV, and one STG at 18 kV. An overall single-line diagram of the facility's electrical system is shown in Figure 6.2-1. The generator outputs will be connected by isolated phase bus to individual oil-filled generator step-up transformers, which will increase the voltage to 230-kV. Surge arresters will be provided at the high-voltage bushings to protect the transformers from surges on the 230-kV system caused by lightning strikes or other system disturbances. The transformers will be set on concrete pads within containments, which will contain the transformer oil in the event of a leak or spill. Fire protection systems will be provided. The high voltage side of each step-up transformer will be connected to the plant's on-site 230-kV switchyard. From the switchyard, power will be transmitted through new overhead transmission lines to PG&E's existing Eastshore Substation.

2.2.5.2 AC Power—Distribution to Auxiliaries

Auxiliary power to the combustion turbine and steam turbine power block will be supplied at 4,160 volts AC by a 4,160-volt switchgear lineup. Primary power to the switchgear will be supplied by one of two redundant oil-filled 15- to 4.16-kV station Auxiliary Transformers. The high voltage sides (15-kV) of the auxiliary transformers will be connected to each of the CTGs. These connections will allow the switchgear to be powered from either of the Auxiliary Transformers by power generated by the connected CTG or by backfeeding power from the 230-kV switchyard via the connected CTG's stepup transformer. A natural gas-fired emergency generator will be provided to supply power to emergency loads when power is not available through the 230-kV interconnection to the PG&E grid.

The 4,160-volt switchgear lineup will supply power to the various 4,160-volt motors, to the combustion turbine starting system, and to the load center (LC) transformers rated 4,160 to 480 Volts for 480-volt power distribution. The switchgear will have vacuum breakers for the main incoming feeds and fused contactors for power distribution.

The LC transformers will be of the dry type if located inside and will be of the oil-filled type if located outside. Each transformer will supply 480-volt, 3-phase power to LC switchgear. The LC switchgear will provide power through feeder breakers to the various 480-volt motor control centers (MCCs). The MCCs will distribute power to 460-volt motors, to 480-volt power panels, and to other intermediate 480-volt loads. The MCCs will distribute power to 480-480/277-volt isolation transformers when 277-volt, single-phase lighting loads are to be served. The 480-volt power panels will distribute power to small 480-volt loads.

Power for the AC power supply (120-volt/208-volt) system will be provided by the 480-volt MCCs and 480-volt power panels. Transformation of 480-volt power to 120/208-volt power will be provided by 480-120/208-volt dry-type transformers.

2.2.5.3 DC Power Supply

One common DC power supply system consisting of one 125-volt DC battery, two 100 percent 125-volt DC full-capacity battery chargers, metering, ground detectors, and distribution panels will be supplied for balance-of-plant and steam turbine equipment.

Under normal operating conditions, the battery chargers will supply DC power to the DC loads. The battery chargers will receive 480-volt, three-phase AC power from the AC power supply (480-volt) system and continuously charge the battery. The ground detection scheme will detect grounds on the DC power supply system.

Under abnormal or emergency conditions, when power from the AC power supply (480-volt) system is unavailable, the battery itself, rather than the charger, will provide DC power for the DC system loads. Recharging of a discharged battery will occur whenever 480-volt power becomes available from the AC power supply (480-volt) system. The rate of charge will depend on the characteristics of the battery, battery charger, and connected DC load during charging. The anticipated maximum recharge time will be 24 hours.

The 125-volt DC system will also be used to provide control power to the 4,160-volt switchgear, to the 480-volt LCs, to critical control circuits, and to the emergency DC motors.

2.2.5.4 Essential Service AC Uninterruptible Power Supply (UPS)

The combustion turbines and steam turbine power block will also have an essential service 120-volt AC, single-phase, 60-Hz power source. This source will supply AC power to essential instrumentation, to critical equipment loads, and to unit protection and safety systems that require uninterruptible AC power. The essential service AC system and DC power supply system will be designed to ensure that critical safety and unit protection control circuits have power and can take the correct action on a unit trip or loss of plant AC power.

The essential service AC system will consist of one full-capacity inverter, a solid-state transfer switch, a manual bypass switch, an alternate source transformer and-voltage regulator, and an AC panelboard.

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

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

2.2.6 Fuel System

The CTGs will be designed to burn natural gas. Maximum natural gas requirements during base load operation are approximately 99,000 MMBtu/day, HHV basis.

The pressure of natural gas delivered to the site via a 0.9 mile pipeline (see Section 5) is expected be approximately 250 pounds per square inch gauge (psig). The natural gas will flow through a revenue meter and then be pressurized by onsite compressors, as needed, and then gas scrubber/filtering equipment, a gas pressure control station, a fuel gas heater, and unit flow metering stations before entering the combustion turbines. LP gas for the HRSG duct burner systems, emergency generator, and building heating systems will be provided by a central pressure reduction station and an LP gas distribution system.

2.2.7 Water Supply and Use

This section describes the quantity of water required, the primary and back-up water supply sources, water quality and water treatment requirements, and planned discharges for the RCEC. Process flow schematics for the energy facility are shown in Figure 7-1 in Section 7. Design specifics for the AWT are discussed in Section 2.3. Peak and average water requirements and flow rates throughout the system are shown. Details of the water requirements, water supply, water treatment, and water discharges are summarized below and provided in Section 7.

2.2.7.1 Water Requirements

A water balance diagram for project operation, showing the various water requirements and estimated flow rates for the facility, is presented in Figure 2.2-4. Operation of the RCEC will require 3.33 million gallons per day (mgd) (2,313 gallons per minute), or 43,730 acre-ft/year during average water supply demand conditions (assumed at 60°F ambient temperature with no fog injection and power augmentation) and 5.27 mgd (3,660 gpm), or 5,904 acre-ft/year during peak water supply demand conditions (assumed at 90°F ambient temperature with no fog injection and power augmentation). These flow rates account for losses in the water treatment process, to produce the final product demand for the plant of 2.41 mgd during average conditions and 3.8 mgd at peak conditions. In evaluating water supply requirements and

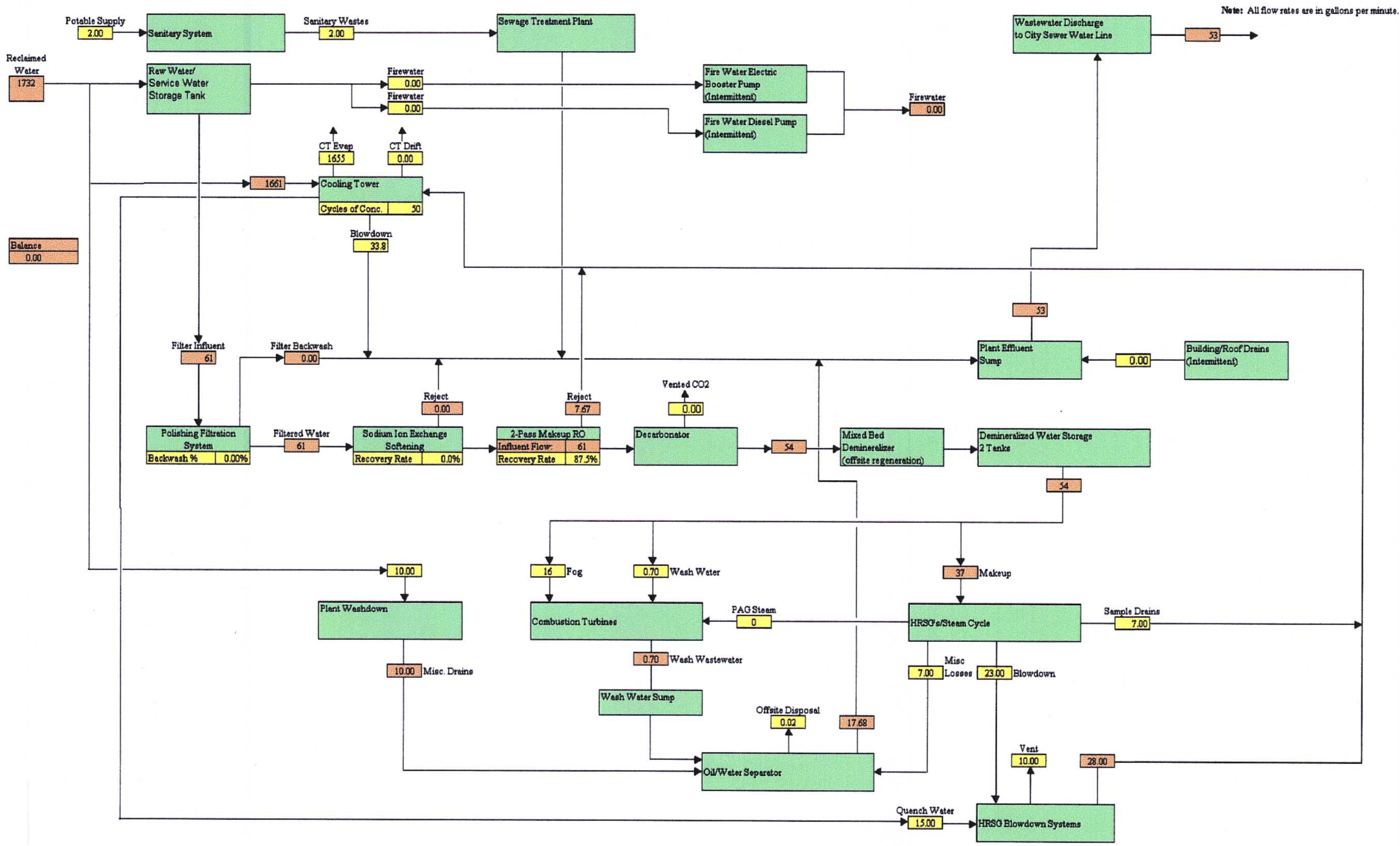

Figure 2.2-4

Water Balance Diagram

RUSSELL CITY ENERGY CENTER

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impacts, the data for 60°F were used most often because this is essentially the average temperature at the project site (Section 8.15.1.1). Worst-case water impact scenarios are based on the data for 90°F, with inlet air fogging, power augmentation, and duct firing.

2.2.7.2 Water Supply

The City of Hayward will provide the industrial process water supply for the RCEC. The City will own and operate the AWT plant, and will supply tertiary treated water produced by the AWT plant to meet cooling and process makeup requirements. A "will-serve" letter describing the City's water supply agreements is included in Appendix 7-A.

Water required for domestic uses and fire fighting will also be provided by the City of Hayward. A new connection would be made to the existing 12-inch potable water line that runs along Enterprise Avenue, shown on Figure 2.3-2. The City of Hayward's water supply comes from the City of San Francisco's Hetch Hetchy Aqueduct.

2.2.7.3 Water Quality

An analysis of the water sources is provided in Section 7, Water Supply.

2.2.7.4 Water Treatment

Secondary effluent is not suitable for use as process water or cooling water without filtration and disinfection to meet California Code of Regulations Title 22 standards for turbidity and coliform content. The AWT will be constructed adjacent to the RCEC to treat secondary effluent from the WPCF to the level of quality required for both the cooling water and process makeup water for the HRSGs.

2.2.8 Plant Cooling Systems

The steam turbine cycle heat rejection system will consist of a deaerating steam surface condenser, cooling tower, and cooling water (circulating water) system. The heat rejection system will receive exhaust steam from the low-pressure steam turbine and condense it to water for reuse. A surface condenser is a shell and tube heat exchanger; the steam condenses on the shell side, and the cooling water flows in one or more passes inside the tubes. The condenser will be designed to operate at a pressure of approximately 2.5 inches of mercury, absolute (in. HgA) at an ambient temperature of 90°F. It will transfer approximately 1,330 MMBtu/hr from condensing steam to cooling water. Approximately 133,000 gallons per minute (gpm) of circulating cooling water is required to condense the turbine exhaust steam at maximum plant load at 90 °F.

The cooling water will circulate through a counter-flow mechanical draft cooling tower that uses electric motor-driven fans to move the air in a direction opposite to the flow of the cooling water. The heat removed in the condenser will be discharged to the atmosphere by heating the air and evaporating some of the cooling water. Maximum drift (the fine mist of water droplets entrained in the warm air leaving the cooling tower) will be limited to 0.0005 percent of the circulating water flow.

2.2.9 Waste Management

Waste management is the process whereby all wastes produced at the RCEC plant will be properly collected, treated if necessary, and disposed. Wastes will include wastewater, solid nonhazardous waste, and hazardous waste (liquid and solid). Waste management is discussed in more detail in Section 8.14.

2.2.9.1 Wastewater Collection, Treatment, and Disposal

Expected wastewater streams (excluding sanitary wastewater) and flow rates for the RCEC are shown on the process flow schematic, Figure 7-1. The average flow rates shown are based on 60° F ambient temperature (with no inlet air fogging or power augmentation) and the peak flow rates assume 90° F ambient temperature (with inlet air fogging and power augmentation).

Wastewater discharges from the plant include the following:

- Cooling Tower Blowdown (peak 46 gpm, average 33 gpm)
- Sanitary Wastewater (2 gpm)
- RCEC Plant Drainage (peak 66 gpm, average 53 gpm)

Pipelines for each of these discharges are shown on Figure 2.3-2. Details of each of these waste streams are included in Section 7.

2.2.9.2 Solid Waste

The RCEC Plant will produce maintenance and plant wastes typical of power generation operations. Generation plant wastes include oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other miscellaneous solid wastes, including the typical refuse generated by workers. These materials will be collected by a waste collection company, such as Browning Ferris, Inc. (BFI), and transported to a material recovery facility (MRF), such as one owned by BFI located at the Newby Island Landfill in Milpitas. Recyclables will be removed, and the remaining residue will be deposited in a landfill such as the Newby Island Landfill (see Section 8.14). Waste collection and disposal will be in accordance with applicable regulatory requirements to minimize health and safety effects.

2.2.9.3 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by the RCEC Plant. Waste lubricating oil will be recovered and recycled by a waste oil recycling contractor. Spent lubrication oil filters will be disposed of in a Class I landfill. Spent SCR catalyst will be recycled by the supplier or disposed of in a Class I landfill. Workers will be trained to handle any hazardous waste generated at the site.

Chemical cleaning wastes will consist of alkaline and acid cleaning solutions used during pre-operational chemical cleaning of the HRSGs, acid cleaning solutions used for chemical cleaning of the HRSGs after the units are put into service, and turbine wash and HRSG fireside wash waters. These wastes, which are subject to high metal concentrations, will be stored temporarily onsite in portable tanks. They will be disposed of offsite by a licensed chemical cleaning contractor in accordance with applicable regulatory requirements.

2.2.10 Management of Hazardous Materials

Various chemicals will be stored and used during the construction and operation of the RCEC Plant. All chemicals will be stored, handled, and used in accordance with applicable laws, ordinances, regulations, and standards (LORS). Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks and spills. Berm and drain piping design will allow a full-tank capacity spill without overflowing the berms. For multiple tanks located within the same bermed area, the capacity of the largest single tank will determine the volume of the bermed area and drain piping. Drains from the chemical storage and feed areas will be directed to a neutralization area for neutralization, if necessary. Drain piping for volatile chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors. After neutralization, water collected from the chemical storage areas will be directed to the facility's industrial wastewater collection system.

Aqueous ammonia will be stored in a horizontal tank mounted within a covered secondary containment. Ammonia vapor detection equipment will be installed to detect escaping ammonia and activate alarms and the automatic vapor suppression features.

Safety showers and eyewashes will be provided adjacent to, or in the area of, all chemical storage and use areas. Hose connections will be provided near the chemical storage and feed areas to flush spills and leaks to the neutralization facility. State-approved personal protective equipment will be used by plant personnel during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and instructed in the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material will be stored onsite for spill cleanup. Electric equipment insulating materials will be specified to be free of polychlorinated biphenyls (PCBs).

A list of the chemicals anticipated for use at the power plant is provided in Section 8.5, Hazardous Materials Handling. This table identifies each chemical by type and intended use and estimates the quantity to be stored onsite. Section 8.14, Waste Management, includes additional information on hazardous materials handling. Section 8.12, Traffic and Transportation, contains information on the transport of hazardous materials.

2.2.11 Emission Control and Monitoring

Air emissions from the combustion of natural gas in the CTGs and duct burners will be controlled using state-of-the-art systems. Emissions that will be controlled include NO_x, reactive organic compounds (ROCs), CO, and particulate matter. Continuous emissions monitoring (CEM) will be employed in accordance with regulatory requirements. Section 8.1, Air Quality, includes additional information on emission control and monitoring.

2.2.11.1 NOx Emission Control

SCR will be used to control NO_x concentrations in the exhaust gas emitted to the atmosphere to an annual average of 2.0 ppmvd at 15 percent oxygen from the gas turbines (2.5 ppmvd at 15% oxygen, 3 hour average basis). The SCR process will use aqueous ammonia as the source of the ammonia vapor that will react with NO_x, in the exhaust gas to produce harmless N_2 and water. Ammonia slip, the unreacted ammonia in the exiting exhaust gas, will be limited to a concentration of 5 ppmvd at 15 percent oxygen. The SCR equipment will include a reactor chamber, catalyst modules, ammonia storage system, ammonia vaporization and injection system, and monitoring equipment and sensors.

2.2.11.2 CO and ROC Emission Control

The formation of CO and ROC will be controlled at the CTG combustor and HRSG duct burners by state-of-the-art combustion technology.

2.2.11.3 Particulate Emission Control

Particulate emissions will be controlled using combustion air filtration and natural gas, which is low in particulates, as the sole fuel for the CTGs and duct burners. Cooling tower mist elimination will control the emission of particulate matter from the cooling tower.

2.2.11.4 Continuous Emission Monitoring

CEM systems will sample, analyze, and record fuel gas flow rate, turbine and stack NO_x and stack CO concentration levels, and percentage of O_2 in the exhaust gas from each of the two HRSG stacks. This system will generate reports of emissions data in accordance with permit requirements and will send alarm signals to the plant distributed control and information system (DCIS) in the plant control room when the level of emissions approaches or exceeds pre-selected limits. Ammonia slip will be calculated in the CEMs Data Acquisition System from ammonia injected into the SCR, and turbine exhaust and stack NO_x CEM measurements.

2.2.12 Fire Protection

The fire protection system will be designed to protect personnel and limit property loss in the event of a fire. Water for fire fighting will be supplied from the City of Hayward's existing fire mains. An electric jockey pump and electric motor-driven main fire pump will be provided to increase the water pressure in the plant fire mains to the level required to serve all fire fighting systems. In addition, a diesel engine-driven fire pump will be provided to pressurize the fire loop if the power supply to the main fire pump fails. A fire pump controller will be provided for the back-up fire pump. Both the main fire pump and the emergency fire pump will draw water from the City's fire mains.

Both pumps will discharge to a dedicated underground fire loop piping system. All fire hydrants and the fixed suppression systems will be supplied from the plant fire water loop. Fixed fire suppression systems will be installed at determined fire risk areas, such as the transformers, turbine lubrication oil equipment, and cooling tower. The plant fire mains will also supply a vapor suppression system at the aqueous ammonia storage tank area. Sprinkler systems will also be installed in the Control/Administration Building and Fire Pump Building, as required by NFPA and local code requirements. The CTG units will be protected by an FM200 fire protection system. Hand-held fire extinguishers of the appropriate size and rating will be located in accordance with NFPA 10 throughout the facility.

Section 8.5, Hazardous Materials Handling, includes additional information on fire and explosion risk, and Section 8.10, Socioeconomics, provides information on city and county fire protection capability.

2.2.13 Plant Auxiliaries

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

2.2.13.1 Lighting

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

2.2.13.2 Grounding

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

The station grounding grid will be designed for a capacity adequate to dissipate heat from ground current under the most severe conditions in areas of high ground fault current concentration. The grid spacing will be adequate to maintain safe voltage gradients. Bare conductors will be installed below grade in a grid pattern. Each junction of the grid will be bonded by an exothermal welding process or mechanical clamps.

Ground resistivity as determined as part of the final geotechnical study will be used to determine the necessary number of ground rods and grid spacings to ensure safe step and touch potentials under severe fault conditions. Grounding stingers ("pigtails") will be brought from the ground grid to connect to building steel and non-energized metallic parts of electrical equipment.

2.2.13.3 Distributed Control and Information System

The Distributed Control and Information System (DCIS) will provide modulating control, digital control, monitoring, and indicating functions for the plant power block systems. The following functions will be provided:

- Controlling the STG, CTGs, HRSGs, and other systems in a coordinated manner
- Controlling the balance-of-plant systems in response to plant demands
- Monitoring controlled plant equipment and process parameters and delivering this information to plant operators
- Providing control displays (printed logs, cathode ray tube [CRT]) for signals generated within the system or received from input/output (I/O)
- Providing consolidated plant process status information through displays presented in a timely and meaningful way
- Providing alarms for out-of-limit parameters or parameter trends, displaying on alarm CRT(s), and recording on an alarm log printer
- Storing and retrieving historical data

The DCIS will be a redundant microprocessor-based system consisting of the following major components:

- CRT-based operator consoles
- Engineer work station
- Distributed processing units
- I/O cabinets
- Historical data unit
- Printers
- Data links to the combustion turbine and steam turbine control systems

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

The DCIS will interface with the control systems furnished by the combustion turbine and steam turbine suppliers to provide remote control capabilities, as well as data acquisition, annunciation, and historical storage of turbine and generator operating information. The system will be designed with sufficient redundancy to preclude a single device failure from significantly affecting overall plant control and operation. This also will allow critical control and safety systems to have redundancy of controls and an uninterruptible power source.

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

2.2.13.4 Cathodic Protection

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

2.2.13.5 Freeze Protection

The freeze protection system will provide heat to protect various outdoor pipes, gauges, pressure switches, and other devices from freezing temperatures. Power to the freeze protection circuits will be controlled by an ambient thermostat.

2.2.13.6 Service Air

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

2.2.13.7 Instrument Air

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

2.2.14 Interconnect to Electrical Grid

The two CTGs and one STG will each be connected to a dedicated 3-phase step-up transformer (a total of three) that will be connected to the plant's new 230-kV switchyard. The switchyard will consist of a ring bus arrangement with airbreak disconnect switches and SF_6 circuit breakers. From the switchyard, the generated power will be transmitted into the PG&E Eastshore Substation via a 1.1-mile 230-kV transmission line. Chapter 6 for additional information on the switchyard and transmission line.

2.2.15 Project Construction

Construction of the RCEC and AWT plant is planned to begin the summer of 2002, and require a total duration of 18 to 21 months. Major milestones are listed in Table 2-1.

Table 2-1. Project schedule major milestones.

Activity	Date
Begin Construction	Summer 2002
Startup and Test	Spring 2004
Commercial Operation	Summer 2004

The RCEC will be accessed for construction from Enterprise Avenue. During construction, this property will be used for temporary offices, parking, and outdoor material storage (Figure 2.2-1).

The average and peak workforce on the project during construction will be approximately 277 and 485, respectively, including construction craft personnel, and supervisory, support, and construction management personnel (see Section 8.10, Socioeconomics).

Construction will be scheduled between the hours of 6 a.m. and 6 p.m., Monday through Saturday. Additional hours may be necessary to complete critical construction activities. During the startup phase of the project, some activities will continue 24 hours per day, 7 days per week. Materials and equipment will be delivered by both truck and rail.

At the site, the peak construction workforce is expected to last from month 11 through month 16 of the construction period, with month 15 being the peak month.

2.2.16 Power Plant Operation

The RCEC plant will be operated by 2 operators per 12-hour rotating shift, with 2 relief operators; there will also be 5 maintenance technicians and 5 administrative personnel during the standard 8-hour workday. The facility will be operated 7 days per week, 24 hours per day.

The RCEC plant is expected to have an annual availability in the general range of 92 to 98 percent. It will be possible for plant availability to exceed 98 percent for a given 12-month period.

- **Base Load**—The facility would be operated at maximum continuous output for as many hours per year as scheduled by load dispatch. During high ambient temperature periods, when gas turbine output would otherwise decrease, duct firing and/or power augmentation by steam injection into the combustion turbines may be employed to keep plant output at the desired load.
- **Load Following**—The facility would be operated to meet contractual load, but the sum would be less than maximum continuous output at all times of the day. The output of the unit would therefore be adjusted periodically to the desired load.
- **Partial Shutdown**—At certain times of any given day and any given year, it may be necessary to shut down one CTG/HRSG. This mode of operation could generally be expected during late evening and early morning hours, when system demand may be low.
- **Full Shutdown**—This would occur if forced by equipment malfunction, fuel supply interruption, or transmission line disconnect.

In the unlikely event of a situation that causes a longer-term cessation of operations, security of the facilities will be maintained on a 24-hour basis, and the CEC will be notified. Depending on the length of shutdown, a contingency plan for the temporary cessation of operations may be implemented. Such a contingency plan will be in conformance with all applicable LORS and the protection of public health, safety, and the environment. Depending on the expected duration of the shutdown, the plan may include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes will be disposed of according to applicable LORS. If the cessation of operations becomes permanent, decommissioning will be undertaken (see Section 4, Facility Closure).

2.2.17 Facility Safety Design

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

2.2.17.1 Natural Hazards

The principal natural hazards associated with the RCEC Plant site are earthquakes and floods. The site is located in Seismic Risk Zone 4. Structures will be designed to meet the seismic requirements of CCR Title 24 and the 1998 California Building Code (CBC). Section 8.4, Geologic Hazards and Resources, discusses the geological hazards of the area and site. This section includes a review of potential geologic hazards, seismic ground motions, and the potential for soil liquefaction due to ground shaking. Appendix 10 includes the structural seismic design criteria for the buildings and equipment.

The RCEC site is essentially flat, with an average elevation of approximately 14 feet above mean sea level (MSL). The ground floor of plant facilities will be at 14 feet MSL. According to the Federal Emergency Management Agency (FEMA), the site is not within either the 100- or 500-year floodplain. Section 8.15, Water Resources, includes additional information on the potential for flooding.

2.2.17.2 Emergency Systems and Safety Precautions

This section discusses the fire protection systems, emergency medical services, and safety precautions to be used by project personnel. Section 8.10, Socioeconomics, includes additional information on area medical services, and Section 8.16, Worker Health and Safety, includes additional information on safety for workers. Appendix 10 contains the design practices and codes applicable to safety design for the project. Compliance with these requirements will minimize project effects on public and employee safety.

Fire Protection Systems

The project will rely on both onsite fire protection systems and local fire protection services.

Onsite Fire Protection Systems

The fire protection systems will be designed to protect personnel and limit property loss and plant downtime from fire or explosion. The project will have the following fire protection systems.

FM 200 Fire Protection System

This system will protect the turbine, generator, and accessory equipment compartments from fire. The system will have fire detection sensors in all compartments. Actuating one sensor will provide a high temperature alarm on the combustion turbine control panel. Actuating a second sensor will trip the combustion turbine, turn off ventilation, close ventilation openings, and automatically release the FM 200. The FM 200 will be discharged at a design concentration adequate to extinguish the fire.

Transformer Deluge Spray System

This system will provide fire suppression for the generator transformers and auxiliary power transformers in the event of a fire. The deluge systems will be fed by the plant underground fire water system.

Steam Turbine Bearing Pre-action Water Spray System

This system will provide suppression for the steam turbine bearing in the event of fire. The pre-action system will be fed by the plant underground fire water system.

Steam Turbine Lubrication Oil Areas Water Spray System

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

Cooling Tower Dry Pipe System

This system will provide protection for the cooling tower cells. Water will be supplied from the plant underground fire water system.

Fire Hydrants/Hose Stations

This system will supplement the plant fire protection system. Water will be supplied from the plant underground fire water system.

Fire Extinguisher

The plant administrative building and other buildings will be equipped with portable fire extinguishers as required by the local fire department.

Local Fire Protection Services

In the event of a major fire, plant personnel will be able to call upon the City of Hayward Fire Department for assistance. The closest Hayward fire station is approximately 2 miles away at 1401 W. Winton Avenue. The Hazardous Materials Risk Management Plan (see Section 8.5, Hazardous Materials Handling) for the plant will include all information necessary to permit all firefighting and other emergency response agencies to plan and implement safe responses to fires, spills, and other emergencies.

Personnel Safety Program

The RCEC Plant will operate in compliance with federal and state occupational safety and health program requirements. Compliance with these programs will minimize project effects on employee safety. These programs are described in Section 8.16, Worker Health and Safety.

2.2.18 Facility Reliability

This section discusses the expected plant availability, equipment redundancy, fuel availability, water availability, and project quality control measures associated with the RCEC.

2.2.18.1 Plant Availability

Due to the RCEC's high predicted efficiency, it is anticipated that the facility will normally be called upon to operate at high average annual capacity factors. The facility will be designed to operate between 30 and 100 percent of baseload to support dispatch service in response to customers' demands for electricity.

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

The percentage of time that the combined cycle power block (and the HRSG duct burners) is projected to be operated is defined as the "service factor." The service factor includes the amount of time that a unit is operating and generating power at full or partial load. The projected service factor for the combined cycle power block, which includes the projected percentage of time of operation, differs from the equivalent availability factor (EAF), which includes the projected percentage of energy production capacity achievable.

The EAF may be defined as a weighted average of the percentage of full energy production capacity achievable. The projected EAF for the RCEC is estimated to be approximately 92 to 98 percent. The EAF differs from the "availability of a unit," which is the percentage of time that a unit is available for operation, whether at full load, partial load, or on standby.

2.2.18.2 Redundancy of Critical Components

The following subsections identify equipment redundancy as it applies to project availability. Specifically, redundancy in the combined cycle power block and in the balance-of-plant systems that serve it are described. The combined cycle power block will be served by the following balance-of-plant systems: fuel supply system, DCIS, boiler feedwater system, condensate system, demineralized water system, power cycle makeup and storage, circulating water system, closed cycle cooling water system, and compressed air system. Major equipment redundancy is summarized in Table 2-2; redundancy following final design may differ.

Combined Cycle Power Block

Two separate combustion turbine/HRSG power generation trains will operate in parallel within the combined cycle power block. Each train will be powered by a combustion turbine. Each combustion turbine will provide approximately 30 to 35 percent of the total combined cycle power block output. The heat input from the exhaust gas from each combustion turbine will be used in the steam generation system to produce steam. Heat input to each HRSG can be supplemented by firing the HRSG duct burners, which will increase steam flow from the HRSG. Thermal energy in the steam from the steam generation system will be converted to mechanical energy and then to electrical energy in the STG subsystem. The expanded steam from the steam turbine will be condensed and recycled to the feedwater system. Power from the STG subsystem will contribute approximately 30 to 35 percent of the total combined cycle power block output. The combined cycle power block comprises the major components described below.

CTG Subsystems

The combustion turbine subsystems will include the combustion turbine, inlet air filtration and water fogging system, generator and excitation systems, and turbine control and instrumentation. The combustion turbine will produce thermal energy through the combustion of natural gas; the thermal energy will be converted into mechanical energy through rotation of the combustion turbine, which drives the compressor and generator. Power output can be increased through steam injection upstream of the turbine section of the CTG. Exhaust gas from the combustion turbine will be used to produce steam in the associated HRSG. The CTG generators will be totally enclosed, water/air cooled. The generator excitation system will be a solid-state static system. Combustion turbine control and instrumentation (interfaced with the DCIS) will cover the turbine governing system, the protective system, and sequence logic.

HRSG Subsystems

The steam generation system will consist of the HRSG and blowdown systems. The HRSG system will provide for the transfer of heat from the exhaust gas of a combustion turbine and from the supplemental combustion of natural gas in the HRSG duct burner for the production of steam. This heat transfer will produce steam at the pressures and temperatures required by the steam turbine. Each HRSG system will consist of ductwork, heat transfer sections, an SCR system, and space for a CO catalyst module. The HRSG system will include safety and auto relief valves and processing of continuous blowdown drains.

STG Subsystems

The steam turbine will convert the thermal energy to mechanical energy to drive the STG. The basic subsystems will include the steam turbine and auxiliary systems, turbine lubrication oil system, and generator/exciter system. The steam turbine's generator will hydrogen-cooled.

Table 2-2. Major equipment redundancy.

Description	Number	Note
Combined cycle CTGs and HRSGs	Two trains	Steam turbine bypass system allows both CTG/HRSG trains to operate at base load with the steam turbine out-of-service.
STG	One	See note above pertaining to CTGs and HRSGs.
HRSG feedwater pumps	One – 100 percent per HRSG	One complete HRSG feedwater pump will be maintained in the plant warehouse.
Condensate pumps	Three – 50 percent capacity	
Condenser	One	Condenser must be in operation for combined cycle operation or operation of CTGs in steam turbine bypass mode.
Circulating water pumps	Two – 60 percent capacity	
Cooling tower	One	Cooling tower is multi-cell mechanical draft design.
Closed cycle cooling water pumps	Two – 100 percent capacity	
Closed cycle cooling water heat exchangers	Two – 100 percent capacity	
Demineralizer—RO System	Three – 50 percent trains	Redundant installed pumps will be provided.
Natural Gas Compressors	Two - 100 percent	

Distributed Control and Information System

The DCIS will be a redundant microprocessor-based system. It will provide the following control, monitoring, and alarm functions for plant systems and equipment:

- Control the HRSGs, STG, CTG, and other systems in response to unit load demands (coordinated control)
- Provide control room operator interface
- Monitor plant equipment and process parameters and provide this information to the plant operators in a meaningful format
- Provide visual and audible alarms for abnormal events based on field signals or software generated signals from plant systems, processes, or equipment

The DCIS will have a functionally distributed architecture comprising a group of similar redundant processing units; these units will be linked to a group of operator consoles and an engineer work station by redundant data highways. Each processor will be programmed to perform specific dedicated tasks for control information, data acquisition, annunciation, and historical purposes. Since they will be redundant, no single processor failure can cause or prevent a unit trip.

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

The system will be designed with sufficient redundancy to preclude a single device failure from significantly affecting overall plant control and operation. Consideration will be given to the action performed by the control and safety devices in the event of control circuit failure. Controls and controlled devices will move to the safest operating condition upon failure.

Plant operation will be controlled from the operator panel in the control room. The operator panel will consist of two individual CRT/keyboard consoles and one engineering workstation. Each CRT/keyboard console will be an independent electronic package so that failure of a single package does not disable more than one CRT/keyboard. The engineering workstation will allow the control system operator interface to be revised by authorized personnel.

Boiler Feedwater System

The boiler feedwater system will transfer feedwater from the LP drum to the HP and IP sections of the HRSGs. The system will consist of one pump with 100 percent capacity for supplying each HRSG. Each pump will be multistage, horizontal, and motor-driven with intermediate bleed-off and will include regulating control valves, minimum flow recirculation control, and other associated pipes and valves.

Condensate System

The condensate system will provide a flow path from the condenser hotwell to the HRSG LP drums. The condensate system will include three 50 percent capacity multistage, vertical, motor-driven condensate pumps.

Demineralized Water System

Makeup to the demineralized water system will be from the Product Water Storage Tanks at the AWT plant described in Section 2.3. The demineralized water system will consist of three 50 percent RO trains and portable, mixed bed, demineralizer tanks. Demineralized water will be stored in two 153,000-gallon demineralized water storage tanks.

Power Cycle Makeup and Storage

The power cycle makeup and storage subsystem provides demineralized water storage and pumping capabilities to supply high purity water for system cycle makeup, combustion air fogging, and chemical cleaning operations. The major components of the system are the demineralized water storage tanks (two), which provide an approximate 24-hour supply of demineralized water; (including 16 hours per day of power augmentation operation) and 2 full-capacity, horizontal, centrifugal, cycle makeup water pumps per tank.

Circulating Water System

The circulating water system provides cooling water to the condenser for condensing steam turbine exhaust and steam turbine bypass steam. In addition, the system supplies cooling water to the closed cycle cooling water heat exchangers. Major components of this subsystem are two 60 percent, motor-driven, vertical pumps and associated pipes and valves, as required.

Closed Cooling Water System

The closed cooling water system transfers heat from various plant equipment heat exchangers to the circulating water system through the cooling water heat exchangers. Major components of this subsystem are two 100 percent, motor-driven, centrifugal pumps and two 100 percent cooling water heat exchangers.

Compressed Air System

The compressed air system will be designed to supply service and instrument air for the facility. Dry, oil-free instrument air will be provided for pneumatic operators and devices throughout the plant. Compressed service air will be provided to appropriate areas of the plant as utility stations consisting of a ball valve and quick disconnect fittings.

The instrument air system will be given demand priority over the service air system. A pressure control valve will be set at approximately 85 psi to cut off the air supply to the service air header once the system pressure falls below 85 psi.

Bleed air from the combustion turbine compressors is used to supply compressed air demand. The air supply system will include a header between both combustion turbines, double block valves on the exhaust bleeds from the CTG compressors, a finned tube, air cooled heat exchanger to reduce the air temperature to 95° F, and an air pressure regulator.

One 100 percent capacity oil free rotary screw package air compressor, water cooled, will supply compressed air to the service and instrument air systems during outages and startups, and will provide backup when the combustion turbines are operating.

2.2.18.3 Fuel Availability

Fuel will be delivered by PG&E from Line 153, located approximately 0.9 miles east of the RCEC, along the Union Pacific Railroad right-of-way. PG&E has confirmed that its system has sufficient capacity to supply the RCEC from this location.

2.2.18.4 Water Availability

Cooling water and non-cooling process makeup water will be tertiary treated water from the AWT plant. The availability of water to meet the needs of the RCEC is discussed in more detail in Section 7.0, Water Supply, and Section 8.15, Water Resources (see Appendix 5-A).

2.2.18.5 Project Quality Control

The objective of the RCEC Quality Control Program will be to ensure that all systems and components have the appropriate quality measures applied during design, procurement, fabrication, construction, and operation. The goal of the Quality Control Program is to achieve the desired levels of safety, reliability, availability, operability, constructibility, and maintainability for the generation of electricity.

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

Project Stages

For quality assurance planning purposes, project activities have been divided into the following nine stages:

Conceptual Design Criteria

Activities such as the definition of requirements and engineering analyses.

Detail Design

Activities such as the preparation of calculations, drawings, and lists needed to describe, illustrate, or define systems, structures, or components.

Procurement Specification Preparation

Activities necessary to compile and document the contractual, technical, and quality provisions for procurement specifications for plant systems, components, or services.

Manufacturer Control and Surveillance

Activities necessary to ensure that the manufacturers conform to the provisions of the procurement specifications.

Manufacturer Data Review

Activities required to review manufacturers' drawings, data, instructions, procedures, plans, and other documents to ensure coordination of plant systems and components and conformance to procurement specifications.

Receipt Inspection

Inspection and review of products upon delivery to the construction site.

Construction/Installation

Inspection and review of storage, installation, and cleaning and initial testing of systems or components at the plant site.

System/Component Testing

Actual controlled operation of power plant components in a system to ensure that the performance of systems and components conforms to specified requirements.

Plant Operation

Actual operation of the power plant system.

As the project progresses, the design, procurement, fabrication, erection, and checkout of each power plant system will progress through the nine stages defined above.

Quality Control Records

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

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

For procured component purchase orders, a list of qualified suppliers and subcontractors will be developed. Before contracts are awarded, the subcontractors' capabilities will be evaluated. The evaluation will include consideration of suppliers' and subcontractors' personnel, production capability, past performance, and quality assurance program.

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

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

A plant O&M program typical for a project of this size will be implemented to control O&M quality. A specific program for this project will be defined and implemented during initial plant startup.

2.2.19 Construction Laydown and Worker Parking Areas

Three candidate areas for construction laydown and off-site worker parking have been identified. These are: 1) a 10-acre parcel currently used for tractor-trailer storage at 3548/3600 Depot Road, 2) a 5-acre parcel across Whitesell Street from the RCEC site at 3600 Enterprise Avenue (Mag Trucking), and 3) the open and unused land surrounding PG&E's Eastshore Substation (approximately 10 acres) (Figure 2.2-5).

2.3 ADVANCED WASTEWATER TREATMENT PLANT

The AWT will be constructed adjacent to the RCEC for treatment of secondary effluent from the WPCF, for both the cooling water and process makeup water for the HRSG's, in compliance with Title 22. The AWT Plant will be designed and constructed by Calpine/Bechtel and owned and operated by the City of Hayward.

The water supply and discharge, treatment process design, and operation of the AWT plant is described below.

2.3.1 Awt Plant Description, Design, and Operation

This section describes the facility's conceptual design and proposed operation.

2.3.1.1 Site Plan and Access

The AWT plant will occupy 2 acres adjacent to the RCEC plant as shown on Figure 2.2-1. The AWT plant will be visually compatible with existing and planned industrial and commercial development in the adjacent properties to the west and north of the site. Architectural screening treatment will be applied to the outside of the major project structures, particularly along Enterprise Avenue to resemble the façade of an office or light industrial building.

Access to the AWT plant area will be from a newly constructed entrance driveway on Enterprise Avenue, separate from the entrance to the RCEC power plant (Figure 2.3-1). Most of the site will be paved to provide internal access to all project facilities and on site buildings. The AWT plant will be surrounded by a fence which will separate it from the RCEC facilities.

2.3.1.2 Water Supply and Use

The water supply for the AWT, including Hayward Water Pollution Control Facility (WPCF) secondary effluent, EBDA/USD secondary effluent, and potable water, will be provided by the City of Hayward. A "will-serve" letter describing the City's water supply agreements is included in Appendix 7-A.

Water Requirements

The RCEC would require 3.33 million gallons per day (mgd) (2,313 gallons per minute), or 3,730 acre-ft/year of secondary effluent during average water supply demand conditions (assumed at 60°F ambient temperature, with no inlet air fogging or power augmentation) and 5.27 mgd (3660 gpm), or 5,904 acre-ft/year, during peak water supply demand conditions (assumed at 90°F ambient temperature, with inlet air fogging and power augmentation). These flow rates account for losses in the water treatment process, to produce the final product water demand for the plant of 2.41 mgd during average conditions and 3.8 mgd at peak conditions. Approximately 95 percent of the final product water would be used as makeup for evaporation losses of the cooling tower. The remaining 5 percent would be used for process makeup water to produce steam and for plant general service water. An additional 2 gpm of city potable water will be required to meet the limited domestic demands for the project.

Water Supply

A major benefit of the proposed location of the RCEC is its use of secondary effluent from the adjacent Hayward WPCF as a primary water supply, rather than potable water. Secondary effluent from the City of Hayward's WPCF will be the primary source of water for both cooling water and process water for the RCEC following treatment in the AWT. Secondary effluent from the WPCF would be delivered to the AWT via a gravity pipeline beneath Enterprise Avenue. Figure 2.3-2 shows the proposed location of that pipeline.

In the event of an interruption of supply of secondary effluent from the Hayward WPCF to the AWT Plant, secondary effluent from the Union Sanitary District's Alvarado Waste Water Treatment Plant (USD) would be provided. Long-term interruptions are not expected; however, short-term upsets in water quality due to unpredictable discharges to the WPCF could occur resulting in the need for a back-up supply. USD secondary effluent is discharged into East Bay Dischargers Authority's (EBDA) effluent transport pipeline, which runs north-south, just to the west of the Hayward WPCF. A connecting pipeline from the EBDA line will be constructed so that during upsets of the WPCF, water from the EBDA pipeline would be delivered to the AWT Plant via the same pipeline crossing Enterprise Avenue that normally conveys secondary effluent from Hayward's WPCF. A pipeline will be constructed from the EBDA 60-inch force main east, within the Hayward WPCF property, to the primary water supply pipeline as shown on Figure 2.3-2. A valve box will be located at the intersection of these two pipelines so that either the primary supply or the back-up supply could be directed into the single secondary effluent supply pipeline across Enterprise Avenue to the AWT Plant. A pump station may be required adjacent to the existing EBDA pipeline because of the hydraulics of the EBDA pipeline. If a pump station is not

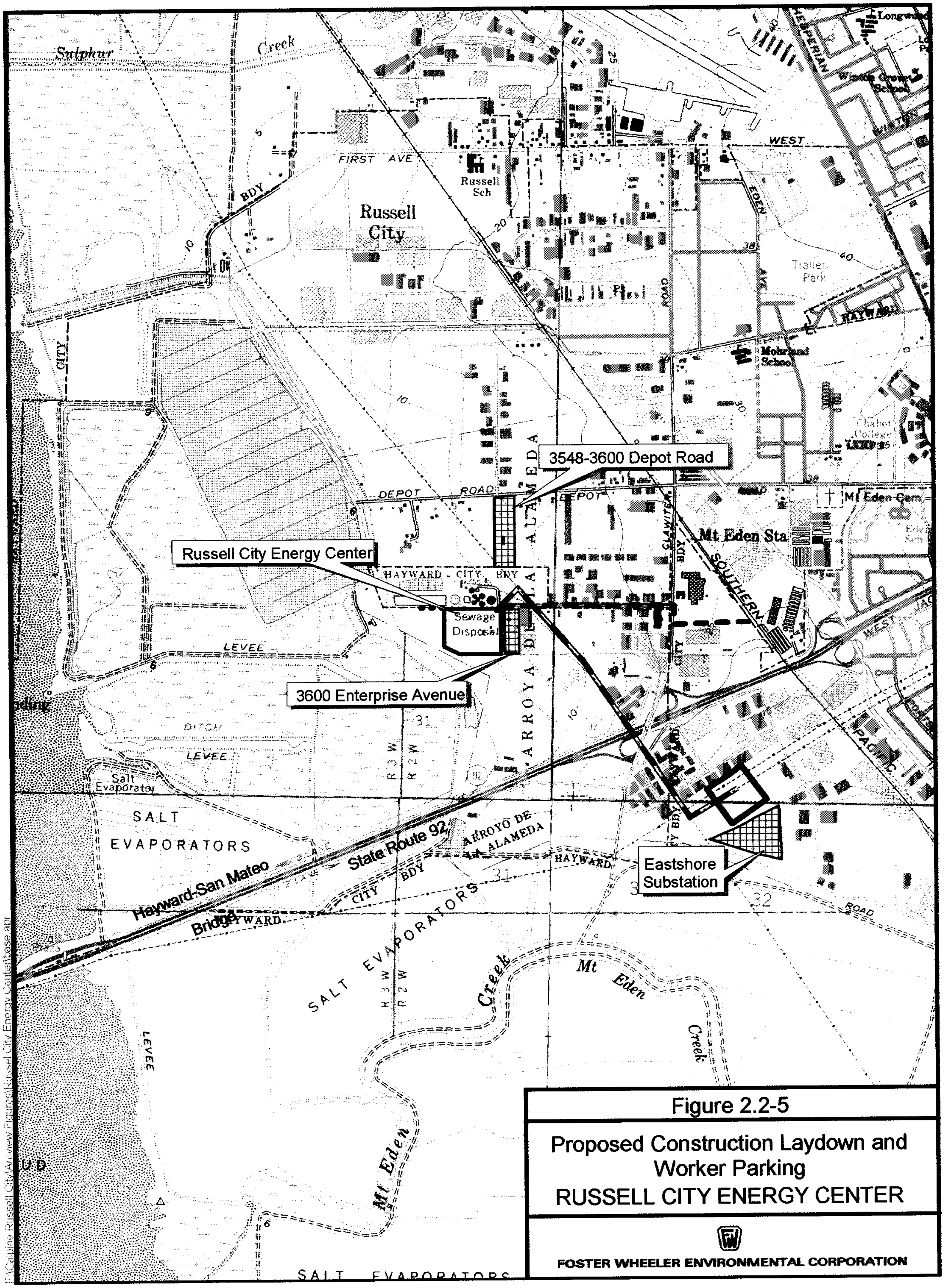


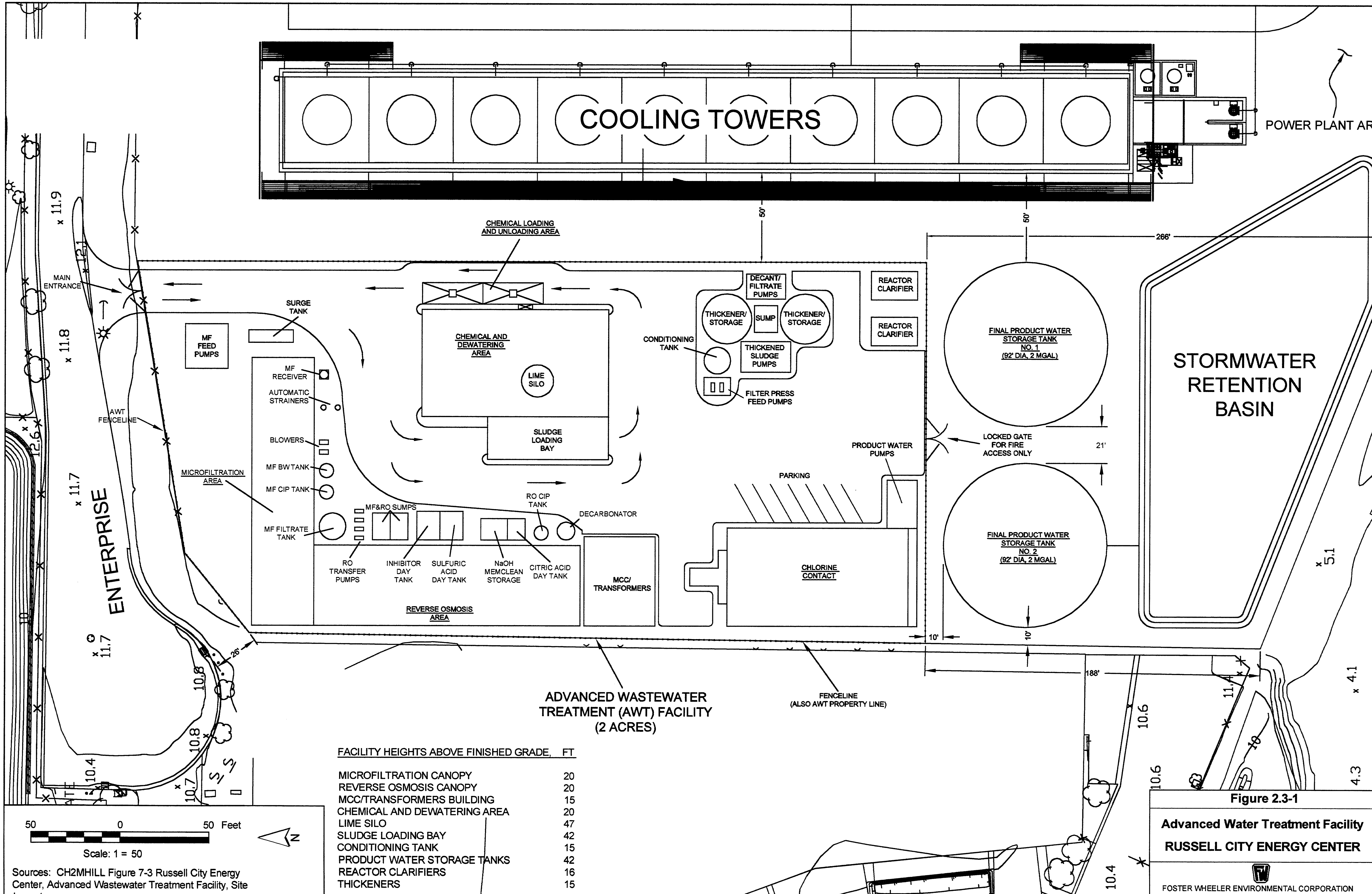
Figure 2.2-5

Proposed Construction Laydown and Worker Parking
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Russell City Energy Center AFC

May 2001



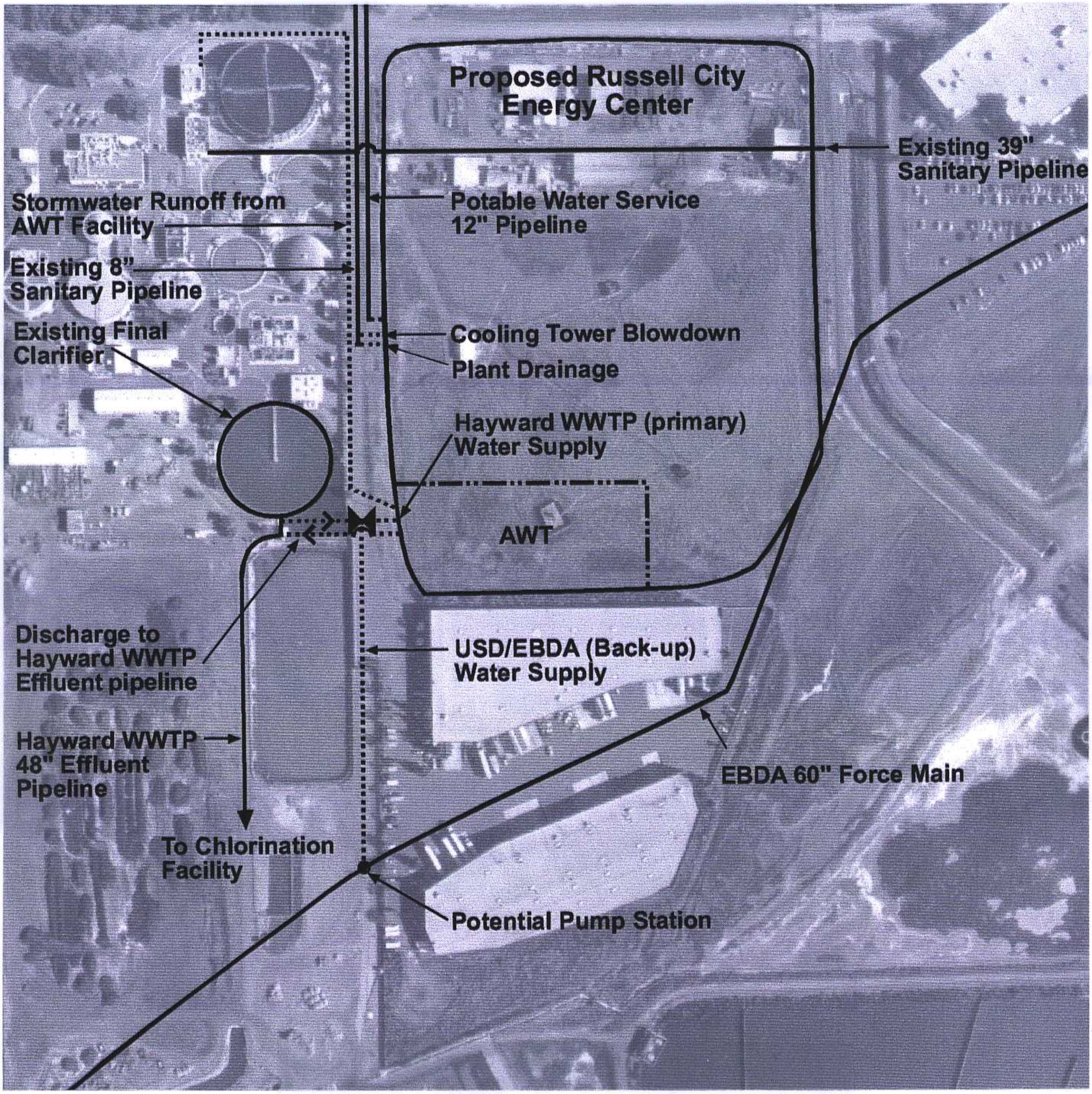
FACILITY HEIGHTS ABOVE FINISHED GRADE,	FT
MICROFILTRATION CANOPY	20
REVERSE OSMOSIS CANOPY	20
MCC/TRANSFORMERS BUILDING	15
CHEMICAL AND DEWATERING AREA	20
LIME SILO	47
SLUDGE LOADING BAY	42
CONDITIONING TANK	15
PRODUCT WATER STORAGE TANKS	42
REACTOR CLARIFIERS	16
THICKENERS	15

Sources: CH2MHILL Figure 7-3 Russell City Energy Center, Advanced Wastewater Treatment Facility, Site Layout

Figure 2.3-1

Advanced Water Treatment Facility

RUSSELL CITY ENERGY CENTER



Source: CH2M Hill

Figure 2.3-2

Water Pipeline Routes
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

needed, a valve station will be installed at the site of the connection to the EBDA line with a valve operator and a telemetry station on a 10-foot by 10-foot fenced site. The pump station, if needed, would be built on a structure surrounded by a fence, approximately 30 feet square, adjacent to the EBDA pipeline. The depth of excavation for the connection to the EBDA force main will be approximately 15 feet below grade to connect to the bottom of the EBDA pipeline. A wet well or dry well with in-line pumps will be used to pump water from the EBDA pipeline, through an isolation valve that will isolate flow to the AWT Plant. Three pumps will be included, such that two of the pumps will be able to deliver the peak flow to the AWT plant (5.27 mgd) if one of the three pumps is temporarily removed from service. The pumps are expected to be low head (pressure) pumps due to the relatively short distance and elevation change to the AWT plant. The site will be prepared with a limited amount of grading. All site work and excavation during construction of the pump station will be performed with extreme caution so as to provide appropriate protection of the EBDA pipeline. A hot tap will be installed into the EBDA pipeline, so that the line will not need to be removed from service during construction of the pump station. All electrical power will be provided to the pump station by the City of Hayward WPCF, via a buried trench with a concrete-encased conduit.

The pump station would be constructed in conjunction with the construction of the AWT plant.

As mentioned above, water required for domestic and fire fighting uses would also be provided by the City of Hayward. Connection would be to the 12-inch potable water line that runs along Enterprise Avenue, shown on Figure 2.3-2. The City of Hayward's water supply comes from the City of San Francisco's Hetch Hetchy Aqueduct.

Water Quality

An analysis of the water sources is provided in Section 7, Water Supply.

2.3.1.3 Process Description

To achieve the desired water quality and minimize impacts associated with discharge from the facility, a membrane filtration and reverse osmosis (MF/RO) AWT Plant will be constructed. Figure 2.3-1 shows the preliminary layout for the AWT Plant, including the MF/RO facility. The MF/RO process is described in detail below. Additionally, copper treatment and solids clarification processes will be used to improve the quality of the reverse osmosis concentrate and microfilter backwash before they are discharged to the EBDA system, and ultimately the San Francisco Bay via the EBDA outfall. Treatment of these waste streams is summarized below and described in detail in Section 7.

MF/RO Technology Process Description

Under the AWT plant process, secondary effluent from the City of Hayward will undergo tertiary microfiltration (MF) and reverse osmosis (RO) treatment processes. The major treatment processes, major process stream flows, operating pressures, chemical applications, and waste discharges are indicated in the MF/RO process flow diagram see Section 7, (Figure 7-2). Secondary effluent will flow by gravity to the MF feed pump station. Transfer pumps will provide sufficient pressure to down-stream treatment processes. Automatic strainers and pressure control facilities will condition the feed supply. Microfiltration will be used as pretreatment prior to the RO system. Microfiltration filtrate will flow to a storage tank from which it will be pumped to the RO system. Waste backwash from the MF system and automatic strainers will be conveyed to the post treatment facilities (solids clarification) for metals and solids removal prior to discharge to the City of Hayward's effluent. Flow equalization is provided to prevent upsetting the post-treatment facility. Permeate from the RO system will undergo decarbonation to remove residual carbon dioxide. Product transfer pumps will transfer water from the product clearwell to the product water storage tanks. RO concentrate will flow to the on-site concentrate (post) treatment facilities for metals and solids removal prior to discharge to the City of Hayward's WPCF. Chemical feed facilities will be included for sodium hypochlorite, sulfuric acid, threshold inhibitor, and chemicals associated with the MF and RO cleaning systems (see Section 8.5 for more details) regarding the chemicals used.

AWT Water Quality

The AWT plant will produce water suitable for use as cooling tower makeup and other process water uses. Anticipated process water quality data for key parameters is summarized in Table 7-2.

MF/RO Plant Hydraulic Capacities

The plant hydraulic capacities are based on a final product demand of 2,873 gpm (4.14 mgd), which is the projected water need for the power plant operating at 90°F ambient temperature, including a slight safety factor. A Process Stream Flow Summary is included on the MF/RO Process Flow Diagram (Figure 7-2), indicating instantaneous and average flow values for major streams in the treatment process, including MF feed, filtrate, and backwash, as well as RO feed, permeate, and concentrate streams. The average flow values shown on Figure 7-2 are indicative of the power plant operating at peak conditions. The maximum flow values shown on Figure 7-2 are instantaneous rates that would occur for brief periods during the backwashing of the microfilters. RO and combined MF/strainer recoveries are each 85 percent, for an overall treatment process recovery of 72 percent. Therefore, the input to the MF/RO process is 5.27 mgd at peak conditions, to account for the losses in the unit processes, and produce the final product demand for the plant.

Feed Pump Station

The MF Feed pumps will deliver secondary effluent to the MF strainers with sufficient head to provide approximately 35 psi feed pressure at the MF system, downstream of the strainers. The MF system operates at a constant, fixed pressure over a wide range of flow. Variations in flow primarily result from the MF unit backwash sequences. The feed delivery system, therefore, must be designed for continuous duty, fast response, and heavy cycling, when faced with frequent, near instantaneous changes in flow. Based on analyses conducted as part of past projects, it is anticipated that a hydropneumatic surge tank will be required.

Automatic Strainers

To protect downstream membrane treatment systems from large particles, secondary effluent from the WPCF will undergo 500-micron straining. The strainers will be the motor-operated, automatic backwash, stationary basket, rotating arm type. Backwashing will be accomplished by venting feedwater to waste through a backwash valve. Initiation of backwash will be by differential pressure, fixed time, or remote initiation from the supervisory control system. Backwash will be conveyed to post treatment facilities for metal and solids removal.

Microfiltration (MF) Treatment System

The purpose of the MF system is to provide pretreatment (particulate removal) ahead of the reverse osmosis system. The MF treatment process is uniquely capable of consistently producing a high quality filtrate from a secondary effluent feed supply, exceeding standard prerequisites for reverse osmosis feed (in terms of turbidity and silt density index) with a significant economy of space when compared to other conventional treatment alternatives. The system relies on pressure-driven membrane filtration systems incorporating hollow fiber membranes in an "outside-in" flow configuration. This preliminary design is based on use of a positive pressure-driven MF membrane configured in above-grade, skid-mounted units.

The MF system operating capacity will be set to provide 3,380 gpm (the requisite flow to the RO, including a safety factor). Components of each system are discussed in additional detail below.

The MF system will include the following components:

- Skid mounted continuous microfiltration (CMF) units
- A compressed air system
- A membrane clean-in-place system
- A waste backwash collection system
- An instrumentation and control system

Preliminary design criteria for the system are included in Table 2.3-1.

Table 2.3-1. MF/RO design criteria.

Unit Model No.	90M10C
System Rated Capacity, mgd	4.87 (on a 24-hour basis)
No. of CMF Units	9
No. of Membrane Modules per CMF Unit	90
Module Production at Rated Capacity, gpm/mod.	4.43 (on 24-hour basis)
Backwash Cycle Interval, minutes	15
Backwash Cycle Time, minutes	2.5
Operating Flux at Rated Capacity, gpm/m^2	0.340 (instantaneous)
Minimum Recovery, percent	87

MF Units

Each CMF unit incorporates the tubular MF membrane modules, piping, valves, instruments, electrical panel, and pneumatic panel, all mounted on a structural steel frame. Individual units will be manifolded on common feed, filtrate, cleaning (feed and return), backwash waste, filtrate exhaust, process air, and control air headers to achieve the desired rate of system production. As discussed above, system operation is pressure driven. Feed to each unit is distributed to the MF membrane modules mounted vertically on the frame. Each module contains a bundle of hollow fine membrane fibers and operates in dead-end filtration mode, with all of the feed water passing from outside of the fibers to the interior lumens and exiting as filtrate. A filtrate control valve on each unit modulates to achieve a setpoint flow, thereby regulating flow through each on-line unit. Aside from filtration, the other main operational mode of on-line unit is backwash. To remove accumulated debris from the membrane surface, each unit periodically undergoes a backwash sequence consisting of the following main steps:

1) Remove the unit from filtrate production
2) Drain unit piping and the shell side of the fibers to waste
3) Exhaust the lumen side of the fibers to waste
4) Introduce high pressure (90 psig) process air to the lumen side of the fibers
5) Introduce a high feedwater sweep flow to the shell side of the fibers with exhaust to waste

6) Refill the unit piping and manifolds, rewet the membranes, and return the unit to filtration mode

The above sequence takes roughly 2.5 minutes from the time the unit is taken off-line until it is back on-line producing filtrate. Proper operation of both the filtration and backwash modes requires a constant feed manifold pressure between 30 and 35 psig.

In wastewater applications, the primary backwash initiation trigger is elapsed time of filtration (typically either 15 or 20 minutes). Since the units within a row share common backwash and filtrate exhaust headers, only a single unit within a given row can backwash at one time. This effectively limits the allowable number of units within a row to the elapsed-time-of-filtration setpoint (backwash cycle interval) divided by the backwash sequence time. Operating experience from CMF units operated on secondary effluent indicate that an appropriate backwash frequency is 15 minutes at unit operating capacities listed in Table 2.3-1.

Compressed Air System

Compressed air is used in the MF system as process air during the unit backwash sequences and as control air for pneumatic valve actuators employed on the units and in the clean-in-place system.

Clean-in-Place (CIP) System

The MF CIP system will allow in-situ cleaning of the MF membrane modules. Clean membranes will operate at a differential (trans-membrane) pressure of roughly 4 to 6 psid (pounds per square inch differential). In spite of periodic backwash sequences, residual foulant will begin accumulating on the membrane surface, gradually increasing trans-membrane pressure (TMP). Once a threshold TMP is reached, somewhere between 15 and 20 psid, the modules must be cleaned. Cleaning solutions will be made up with RO permeate and either citric acid or caustic, and a detergent. Cleanings will be initiated manually but conducted automatically by the MF control system. The operating CMF unit to be cleaned will be taken off-line, isolated, and replaced in service by the standby unit. Prepared cleaning solutions will be recirculated through the unit via the cleaning feed and return manifolds. Following cleaning, the unit will be brought back on-line temporarily with filtrate diverted to waste to remove residual cleaning solution from the modules. Following this, the unit will be put back on-line or into standby mode, depending on operational requirements. While the unit is off-line for the CIP procedure, the overall filtrate flow setpoint is maintained by the remaining units as a result of excess capacity and operation at increased unit filtrate flow. Estimated cleaning frequency is once a month. CIP cleaning wastes will be conveyed to post-treatment facilities.

Backwash Collection System

During backwash, filtrate exhaust and feedwater sweep sequences discharge large volumes of an expanding mixture of compressed air and water out the filtrate exhaust and backwash waste manifolds, respectively. These manifolds will be routed to a large tank vented to atmosphere to allow energy dissipation and release of entrained air. An arrester will be provided on the tank vent to eliminate misting.

MF Filtrate Tank

The MF filtrate tank will provide intermediate storage between the MF and RO systems. Storage is required for two primary reasons. First, it helps de-couple operation of the MF and RO systems to a certain degree, limiting the impact of short-term flow transients and mismatches between MF system production and RO demand. Second, it provides necessary flow equalization for variable rates of MF filtrate production during periods of unit backwash and regeneration.

The design basis is for ten minutes of residence time at the required reverse osmosis system feed flow at a permeate flow of 4.9 mgd. This results in a tank volume of 35,000 gallons.

RO Transfer Pump Station

The RO transfer pumps will take suction from the MF filtrate storage tank and provide a continuous, stable flow through the cartridge filters and in-line RO membrane feed pumps. In addition to providing the required head for cartridge filtration, the transfer pumps allow for flushing the RO trains with low pressure feedwater during startup and following cleaning. The pumps will be constant speed and will accommodate variations in flow during startup and shutdown flush sequences by operating along their curve. An operating head of 100 feet (43 psi) allows up to 15 psig of pressure drop across the cartridge filters and provides at least 20 psig of residual head at the membrane feed pump suction.

Reverse Osmosis (RO) Treatment System

The purpose of the RO system is to remove dissolved solids and other priority constituents from the plant feedwater, conditioning it for use as a cooling water and process water supply. The RO system will include the following components:

- Sulfuric acid and threshold inhibitor chemical feed systems
- Cartridge filtration
- RO membrane feed pumps
- RO trains (pressure vessel racks, pressure vessels, membrane elements, pipe manifolds, valves, instrumentation)
- RO clean-in-place (CIP) system
- Membrane flush system
- Decarbonators
- Interconnecting piping and valves
- Instrumentation and controls

Primary components of the system are discussed below.

Cartridge Filtration

The cartridge filter will consist of a stainless steel pressure vessel housing a bank of cylindrical wound depth polypropylene filter elements. It is not intended for heavy-duty filtration service but will be used to protect the membrane feed pumps and RO membrane elements from unforeseen upsets in the pretreatment system. Estimated replacement rate for filter elements is once every nine months. Filter changes will be coordinated with normal facility maintenance periods. Filters will be disposed of in a non-hazardous waste landfill.

RO Membrane Feed Pump

Each RO train will be equipped with a single, non-redundant membrane feed pump. The pump will be sized to deliver the required feed flow at a recovery of 85 percent. Anticipated operating pressures range from a low of 150 psig with new membrane up to a maximum of 300 psig. Each pump will be equipped with a variable frequency drive to allow maintenance of train permeate flow as required operating pressures increase. Maximum pump motor speed will be limited to 1800 rpm to minimize pump noise and extend operating life.

RO Train

Four 33 percent capacity RO trains will be provided. The trains will be designed to operate continuously at 1.4 mgd each, without substantial variations in flow during normal operation. Product water recovery for the train will be held constant at 85 percent.

The RO trains will use seven 8-inch diameter, 40-inch long, spiral-wound membrane elements per pressure vessel, at nominal operating flux of roughly 12 gallons per square foot per day (gfd). Pressure vessels will be arranged on racks supporting 12 vessels, limiting vessel row height to 6 vessels maximum. This will allow access to any vessel in the train from the operating floor.

Clean-in-Place (CIP) System

A permanently piped CIP system will be provided to allow cleaning of the RO membranes in-situ. The CIP system will consist of a tank, pump, interconnecting piping, valves, instrumentation, and controls. The tank will be fitted with a flanged immersion heater, access platform, and bag loader. The bag loaders will allow batching of dry-fed cleaning chemicals directly to each tank. The cleaning pump will be used to recirculate the tank contents for mixing and feed to/from the vessels in the train being cleaned. Estimated cleaning frequency for the train is twice per year. CIP cleaning wastes will be conveyed to post-treatment facilities.

Membrane Flush System

A membrane flush system will be provided to allow flushing of each train on system shutdown. If an individual train has been off-line for a period in excess of 30 minutes without being restarted, a permeate flush cycle will be initiated. A train flush will be accomplished by pumping permeate through the flush feed valve on the suction side of the RO membrane feed pump of the train being flushed for roughly 20 minutes. A flush waste valve will be opened off the train concentrate line ahead of the control valve, routing the flush water to post-treatment facilities. If more than one train requires a flush, the system will be configured to flush each train in sequence. The flush system will consist of a pump, interconnecting piping, valves, instrumentation and controls. The flush pump will take suction from the final product wet well.

Decarbonation System

Permeate from the RO train will be routed to the top of the decarbonator where it will be distributed over plastic packing material and flow down the packing. The packing will provide a large surface area to facilitate mass transfer so that carbon dioxide in the water can be transferred to the countercurrent airflow being supplied by the integral forced air blower at the base of the tower. The base of each tower will include a catch basin to allow equalization and provide head for gravity flow to the final product wet well.

Product Transfer Pump Station

The product transfer pumps will take suction from the final product wet well. The pumps will be furnished with adjustable frequency drives.

Chemical Feed Systems

Chemicals used at the AWT plant will include the following:

- Sodium Hypochlorite
- Sulfuric Acid
- Threshold Inhibitor
- MF Cleaning Chemicals

- RO Cleaning Chemicals

Sodium Hypochlorite Feed System

Sodium hypochlorite will be used ahead of the MF and RO systems for biofouling control. Dosing to the MF feed is used to improve operation of the MF membranes, which have exhibited increased cleaning intervals when treating waters with a 1 to 3 mg/L residual of combined chlorine (chloramine). Dosing to the MF filtrate will allow periodic chlorination (presence of ammonia in the RO feed will result in formation of chloramines) of the feedwater to the RO system if required for system maintenance (biofouling control). The selected MF and RO membranes have demonstrated long-term tolerance of these concentrations of chloramine in secondary effluent applications.

Sulfuric Acid Feed System

Sulfuric acid will be used in the RO system to reduce the pH of the RO feedwater. The target feedwater pH will be set to maintain a Langelier Saturation Index (LSI) in the concentrate stream of +2.0.

Threshold Inhibitor Feed System

A threshold inhibitor compound will be added to the RO feedwater to prevent the precipitation of sparingly soluble salts in the concentrate stream. Inhibitor will be fed full strength (undiluted) from storage totes located adjacent to the injection point. To minimize the potential for adverse interactions between the inhibitor and high concentrations of acid, the inhibitor injection point will be located downstream of the point of acid addition to insure the acid is thoroughly mixed prior to contact with the inhibitor.

MF CIP Chemical Dosing Systems

Standard cleanings of the MF membranes will be conducted in-situ with a heated solution made up of RO permeate and cleaning chemicals. In each case, cleaning chemicals will be dosed directly to the main cleaning solution make-up tank(s) through a top nozzle. All chemicals will be batched to the tank as liquid. Sodium hypochlorite, sodium hydroxide and detergent, as required, will be stored as liquid solutions adjacent to the CIP tank(s). Citric acid solutions will be made up in a separate mix tank from dry chemical.

RO CIP Chemical Dosing Systems

Standard solutions used to clean the RO membranes in place will be made up of RO permeate and a variety of detergents. To allow maximum flexibility, all cleaning chemicals will be batched in dry form directly to the tank from the top. A bag loader with platform that can be accessed by forklift will be provided for this purpose.

Process Waste Collection and Disposal

MF Backwash and Strainer Drain

Waste created during periodic backwash cycles on the influent strainers as well as MF backwash waste will be routed to the MF waste sump and conveyed to the solids handling/post treatment facilities described in Section 7.

RO Concentrate Disposal

Concentrate from the RO train will be routed to the RO waste sump, prior to transfer to the solids concentrate post-treatment facilities described in Section 7.

2.3.1.4 Major Electrical Equipment and Systems

The electrical power for the AWT plant will be provided by PG&E. Power will be distributed to all loads via one or more double-ended load centers and motor control centers.

The estimated load for the AWT is 540 kW. The estimated energy usage is 5 million kWh/yr.

2.3.1.5 Waste Management

Waste management is the process whereby all wastes produced at the AWT plant will be properly collected, treated if necessary, and disposed of. Wastes will include wastewater, solid nonhazardous waste, and hazardous waste (liquid and solid). Waste management is discussed in more detail in Section 8.14.

Wastewater Collection, Treatment, and Disposal

Expected wastewater streams (excluding sanitary wastewater) and flow rates for the AWT Plant and associated power plant activities are shown on the process flow schematic, Figure 7-1. The average flow rates shown are based on 60° F ambient temperature (with no inlet air fogging or power augmentation) and the peak flow rates assume 90° F ambient temperature (with inlet air fogging and power augmentation).

Wastewater discharges from the AWT Plant include combined liquid streams from copper removal/treatment, solids clarification, and microfilter backwash (peak: 1.46 mgd; average: 0.92 mgd). A stormwater discharge will also occur from the AWT, which is a maximum of approximately 2.6 mgd (4 cfs) assuming a 25-year, 24-hour storm over an industrial area with 95 percent runoff coefficient. The treated discharge stream will be conveyed by a pipeline from the AWT to the existing Hayward WPCF effluent pipeline. The stormwater runoff from the AWT will be conveyed by a pipeline to the WPCF headworks. Pipelines for each of these discharges are shown on Figure 2.3-2. Details of each of these waste streams are included in Chapter 7 (Water Supply).

Solid Waste

Associated with the copper removal process described in Section 7, solids will be generated which will be handled onsite, prior to ultimate disposal in a landfill. The solids quality of the sludge is described in Section 7 to be non-hazardous, and unlikely to face any restrictions with respect to disposal from a hazardous waste standpoint.

Approximately 9 tons/day (average) to 12 tons/day of 50% solids sludge will be generated, requiring one to two truckloads per day. All lime storage, copper treatment, and solids handling facilities are shown in Figure 2.3-1.

Additionally, cartridge filters required for the MF/RO treatment process will be replaced every nine months. Used filters will be disposed of in a non-hazardous waste landfill.

Hazardous Wastes

No hazardous wastes will be discharged from the AWT plant.

2.3.1.6 Management of Hazardous Materials

Various chemicals will be stored and used during the construction and operation of he AWT plant. Locations of chemical storage facilities are shown on Figure 2.3-1 a table listing of the chemicals anticipated for use at the AWT plant is provided in Section 8.5, Hazardous Materials Handling. This table identifies each chemical by type and intended use and estimates the quantity to be stored onsite.

Section 8.14, Waste Management, includes additional information on hazardous materials handling. Section 8.12, Traffic and Transportation, contains information on the transport of hazardous materials.

All chemicals will be stored, handled, and used in accordance with applicable laws, ordinances, regulations, and standards (LORS). Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks and spills. Berm and drain piping design will allow a full-tank capacity spill without overflowing the berms. For multiple tanks located within the same bermed area, the capacity of the largest single tank will determine the volume of the bermed area and drain piping. Drains from the chemical storage and feed areas will be directed to a neutralization area for neutralization, if necessary. Drain piping for volatile chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors. After neutralization, water collected from the chemical storage areas will be directed to the facility's industrial wastewater collection system.

Safety showers and eyewashes will be provided adjacent to, or in the area of, all chemical storage and use areas. Hose connections will be provided near the chemical storage and feed areas to flush spills and leaks to the neutralization facility. State-approved personal protective equipment will be used by plant personnel during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and instructed in the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material will be stored onsite for spill cleanup. Electric equipment insulating materials will be specified to be free of polychlorinated biphenyls (PCBs).

2.3.1.7 AWT Plant Construction

Construction of the AWT plant will occur simultaneously with construction of the RCEC (see Table 2-1) The AWT plant will be accessed for construction from Enterprise Avenue. The average and peak workforce on the project during construction will be approximately 25 and 40 respectively, including construction craft personnel, and supervisory, support, and construction management personnel (see Section 8.10, Socioeconomics). Construction will be scheduled between the hours of 6 a.m. and 6 p.m., Monday through Saturday. Additional hours may be necessary to complete critical construction activities. During the startup phase of the project, some activities will continue 24 hours per day, 7 days per week. Materials and equipment for the AWT plant will be delivered by truck.

At the site, the peak construction workforce is expected to be required during months 3 and 4 (building of structures) and months 8 through 9 or 10 (equipment installation) of the construction period.

2.3.1.8 AWT Plant Operation

Operation of the AWT plant will be integrated with the operation of the City's existing WPCF. Incrementally, its operation would require a maximum of 3 operators per shift. The facility will operate 7 days per week, 24 hours per day in conjunction with power plant needs. In normal operations the facility would be operated remotely from the WPCF via distributed control system.

2.3.2 Facility Safety Design

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

2.3.2.1 Natural Hazards

The principal natural hazards associated with the AWT plant site are earthquakes and floods. The site is located in Seismic Risk Zone 4. Structures will be designed to meet the seismic requirements of CCR Title 24 and the 1998 California Building Code (CBC). Section 8.4, Geologic Hazards and Resources, discusses the geological hazards of the area and site. This section includes a review of potential geologic hazards, seismic ground motions, and the potential for soil liquefaction due to ground shaking. Appendix 10 includes the structural seismic design criteria for the buildings and equipment.

The site is essentially flat, with a post-construction average elevation of approximately 14 feet above mean sea level (MSL). The ground floor of plant facilities will be at 14 feet MSL. According to the Federal Emergency Management Agency (FEMA), the site is not within either the 100- or 500-year floodplain. Section 8.15, Water Resources, includes additional information on the potential for flooding.

2.3.2.2 Emergency Systems and Safety Precautions

This section discusses the fire protection systems, emergency medical services, and safety precautions to be used by project personnel. Section 8.10, Socioeconomics, includes additional information on area medical services, and Section 8.16, Worker Health and Safety, includes additional information on safety for workers. Appendix 10 contains the design practices and codes applicable to safety design for the project. Compliance with these requirements will minimize project effects on public and employee safety.

Fire Protection Systems

The AWT plant will rely on the City of Hayward's fire protection services.

Fire Extinguishers

The AWT plant will be equipped with portable fire extinguishers as required by the local fire department.

Local Fire Protection Services

In the event of a major fire, plant personnel will be able to call upon the City of Hayward Fire Department for assistance. The closest Hayward fire station is approximately 2 miles away at 1401 W. Winton Avenue. The Hazardous Materials Risk Management Plan (see Section 8.5, Hazardous Materials Handling) for the plant will include all information necessary to permit all firefighting and other emergency response agencies to plan and implement safe responses to fires, spills, and other emergencies.

Personnel Safety Program

The AWT plant will operate in compliance with federal and state occupational safety and health program requirements. Compliance with these programs will minimize project effects on employee safety. These programs are described in Section 8.16, Worker Health and Safety.

2.3.3 Facility Reliability

This section discusses the expected plant availability, equipment redundancy, fuel availability, water availability, and project quality control measures associated with the AWT plant.

2.3.3.1 Plant Availability

The AWT plant is designed to be available to provide water to the RCEC on demand as the RCEC generates electricity in response to consumer demand. The AWT plant will be available to the RCEC 24 hours a day, seven days a week. The AWT plant will be designed for an operating life of 30 years. Reliability and availability projections are based on this operating life. Operation and maintenance

(O&M) procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

2.3.3.2 Redundancy of Critical Components

The following subsections identify equipment redundancy in the AWT, as it applies to project availability.

Membrane Filtration

Two standby CMF units are included in the design to provide redundancy in the event of malfunction of one of the microfiltration units and during routine cleanings. A detailed description of procedures involved in the routine cleaning of each backwash unit is presented above.

Reverse Osmosis Train

Four 33 percent capacity RO trains will be provided. The trains will be designed to operate continuously at 1.4 mgd each, without substantial variations in flow during normal operation. In the event that one of the RO trains malfunctions, the flux rate of the remaining RO train could be temporarily increased to meet treated average water demand of the power plant.

Final Product Water Storage

The AWT plant includes storage tanks designed to hold the 24-hour peak water demand of approximately 4 million gallons. In the event of an interruption in the operation of any component of the AWT plant, water will be available from these storage tanks to provide 24 hours of supply.

2.3.3.3 Water Availability

Secondary effluent supply to the AWT plant and product water will be provided by the City of Hayward as agreed to in the "will-serve letter" included in Appendix 7-A. The primary water supply will be secondary effluent from the City of Hayward's WPCF and the back-up supply will be secondary effluent from the EBDA pipeline.

2.3.3.4 Project Quality Control

The Quality Control Program to be implemented for the AWT plant will be the same as that for the RCEC.

2.4 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The applicable laws, ordinances, regulations, and standards for each engineering discipline are included as part of Appendix 10.

3.0 DEMAND CONFORMANCE

The California Energy Commission is no longer required to determine whether or not a proposed project conforms with an integrated assessment of electrical demand or need. Senate Bill 110 (California Construction Articles 4, Section 8), which took effect on January 1, 2000, states:

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

Accordingly, this AFC does not include an assessment of need.

4.0 FACILITY CLOSURE

Facility closure can be temporary or permanent. Temporary closure consists of a cessation of operations for a period of time greater than the time required for normal maintenance, including overhauls or replacements of major equipment. Potential causes for temporary closure include economic conditions or repairable damage to the plant from earthquake, fire, storm, or other such events. Permanent closure consists of a cessation of operations with no intent to restart operations. Potential causes for permanent closure include age of the plant, economic conditions, or irreparable damage to the plant. Section 4.1 discusses temporary closure; Section 4.2 discusses permanent closure.

4.1 TEMPORARY CLOSURE

In the event of a temporary facility closure, where there is no release of hazardous materials, 24-hour security will be maintained at the facility, and the project owner will notify the California Energy Commission (CEC) and other responsible agencies. Actions taken will depend on whether the temporary closure involves a release of hazardous materials.

If there is no release or threatened release of hazardous materials, a contingency plan for the temporary cessation of operations will be implemented. The contingency plan will be conducted to assure public health and safety, protection of the environment, and conformance with all applicable laws, ordinances, regulations, and standards. Appropriate procedures will depend on the anticipated duration of the shutdown. Accordingly, the contingency plan may include the draining of chemicals, water, and other fluids from storage tanks and plant equipment and various other procedures to ensure worker safety and to protect plant equipment. All hazardous and non-hazardous waste materials will be collected and disposed of as described in Section 8.14, Waste Management.

If there is a release or threatened release of hazardous materials, procedures set forth in a Risk Management Plan (RMP) will be implemented. The RMP to be prepared is described in Section 8.5, Hazardous Materials Handling. Procedures include methods to control releases of hazardous materials, notification of appropriate authorities and the public, training for plant personnel, and other emergency response actions and preparation. Once the release of hazardous materials has been contained and cleaned up, temporary closure will proceed as in the case of a closure where there is no release of hazardous materials.

Under no circumstances will the facilities be left unattended at any time during a temporary closure.

4.2 PERMANENT CLOSURE

The planned operational life of the facility is 30 years. However, if the facility continues to be economically viable, it could be operated for a longer period of time. Operation beyond 30 years would defer environmental impacts resulting from the construction of replacement facilities. It is also possible that the facility could become economically non-competitive before 30 years have transpired, forcing early decommissioning. Whenever the facility is closed, the closure procedure will follow a decommissioning plan to be prepared is described below.

The decommissioning plan will be submitted to the CEC for review prior to commencement of permanent facility closure measures. Such measures may range from extensive "mothballing" to removal of all equipment and appurtenances, depending on circumstances at the time. However, future conditions that would affect decommissioning decisions are largely unknown at this time. It is therefore appropriate to present decommissioning details to the CEC, City of Hayward, and other jurisdictional agencies when more information is available and the time for permanent facility closure has drawn closer.

The decommissioning plan will:

- Describe the proposed decommissioning measures for the facility and for all appurtenances constructed as part of the facility.
- Describe the activities necessary to restore the site if the decommissioning plan calls for removal of all equipment and appurtenances.
- Discuss decommissioning alternatives other than restoration of the site.
- Present the costs associated with the proposed decommissioning measures and the source of funds to pay for the decommissioning.
- Discuss conformance with applicable laws, ordinances, regulations, and standards and with local and regional plans.

In general, the proposed decommissioning measures will attempt to maximize the recycling of all facility components. Unused chemicals will be sold back to the suppliers or other purchasers. All equipment will be shut down and drained so as assure public health and safety and protection of the environment. All hazardous and non-hazardous waste materials will be collected and disposed of as described in accordance with all applicable laws, ordinances, regulations, and standards. Until decommissioning activities have been completed, 24-hour security for the facility will be maintained.

5.0 NATURAL GAS SUPPLY

A new 16-inch diameter pipeline, approximately 0.9 miles long, will supply natural gas to the Russell City Energy Center (RCEC). This section describes the proposed gas supply line route, its selection from a group of candidate routes, and the anticipated environmental impacts from its construction and operation. An overview of the expected construction methods and the operating practices for this gas supply pipeline is also included.

During the project development phase, Pacific Gas and Electric Company (PG&E) was requested to perform a route evaluation study for this pipeline. A total of seven routes were identified and considered. The route selected and described in this section was designated Route 3 in PG&E's response to the Calpine/Bechtel (Appendix 5-A). This route was selected primarily because it would lie entirely within the City of Hayward and would require the disruption of traffic and damage to pavement on the fewest streets.

5.1 PROPOSED NATURAL GAS PIPELINE ROUTE

The new 16-inch diameter pipeline will connect with PG&E's 30-inch diameter gas distribution pipeline, Line 153, which parallels the east side of the Union Pacific Railroad Company (UPRR) right-of-way (ROW) through Hayward. From there it will cross the UPRR ROW and will extend west along the south property line of Berkeley Farms, immediately adjacent to an existing City of Hayward utility easement. After crossing Clawiter Road, the new pipeline will extend west along Enterprise Avenue, entering the southeast corner of the RCEC plant site off of Whitesell Street, approximately 500 feet south of its intersection with Enterprise Avenue (Figure 5-1).

For essentially its entire length from the tie-in with PG&E's Line 153 to the RCEC plant site, the pipeline follows either an existing utility corridor across a private property (Berkeley Farms) or is routed along primarily Enterprise Avenue.

The pipeline will cross the UPRR ROW with an uncased crossing installed by the jack-and-bore method, at a depth of more than 10 feet below the tracks. From the end of the jack-and-bore section, which will be located just north of the intersection of the ROW and the southern boundary of the Berkeley Farms property, the pipeline will be constructed by conventional trenching along an alignment approximately 18 feet north of the southern edge of the Berkeley Farms property immediately adjacent to an existing, gravel-covered utility corridor for a distance of approximately 1200 feet. This 20-foot wide corridor currently contains a City of Hayward 42-inch diameter sewer main and various Berkeley Farms yard utilities, including a firewater loop and power for outdoor lighting fixtures.

From the point that this utility corridor intersects Clawiter Road, for a distance of some 300 feet, the pipeline will be constructed by either conventional trenching or jack-and-bore diagonally across Clawiter Road to its intersection with Enterprise Avenue.

From the intersection of Enterprise Avenue and Clawiter Road, the pipeline will be installed by trenching in the Enterprise Avenue right-of-way, for a distance of approximately 2000 feet. Existing large-diameter stormwater and sewer mains are currently routed under the pavement along this portion of Enterprise Avenue. The gas pipeline will be routed parallel with these pipelines on an alignment that avoids interference with them.

At the intersection of Enterprise Avenue and Whitesell Street, the pipeline route turns south along Whitesell Street for a distance of approximately 550 feet. From this point, the pipeline route again turns west, to enter the RCEC plant site at a distance of about 180 feet north of the railroad crossing of Whitesell Street. All of these segments will also be installed by trenching.

5.2 ALTERNATIVE ROUTES

Seven alternative routes, including the preferred route described above, were investigated by PG&E (Figure 5-1). These routes connected with PG&E's Line 153 at a total of four candidate locations along the east side of the UPRR right-of-way. The combination of the three other tie-in points, all to the north of the one described in the preferred route, and various alternate routes along city streets and across various private properties, resulted in the identification of six additional routes for the gas pipeline. Each of the seven routes was judged to be technically feasible, using conventional trenching methods and city-street pipeline construction techniques (with the exception of the jack-and-bore railroad crossing). A discussion of the alternative natural gas pipeline routes is included in Section 9, Alternatives.

5.3 CONSTRUCTION PRACTICES

The natural gas pipeline will be constructed with a minimum of at least one crew ("spread") working continuously along the pipeline ROW. One additional construction crew will be required for the railroad crossing. Construction of the entire pipeline will require a peak workforce of approximately 15 people. Workers would park in the designated craft parking area and be transported to the construction area along the pipeline ROW by bus or van. Most major pieces of construction equipment (backhoes and trucks) may remain in the existing on-street parking lanes along the pipeline ROW during the course of construction. In addition to providing worker parking, the laydown area will serve as the primary location for storing the pipe and other pipeline construction materials. Any additional storage locations will be in existing paved or graveled areas along the pipeline route. Pipeline construction will take approximately 2 to 3 months and is expected to occur during the summer of 2003.

The pipeline will be fabricated of alloyed carbon steel material in accordance with the American Petroleum Institute (API) specification for pipeline. A factory-applied corrosion protection coating will be applied on the pipe. Joints will be welded.

1. **Trenching**—Trenching will consist of digging a 3- to 7-foot-wide trench. Trench width will depend on the type of soils encountered and underground obstructions. Trench depth will be sufficient to meet the requirements of the governing agencies. However, the pipeline will be buried to provide a minimum cover of 36 inches. The excavated soil will be piled on one side of the trench and used for backfilling after the pipe is installed in the trench. The pipeline will be installed through trenching at all locations except for the railroad crossing, which will be installed by the jack and bore method.
2. **Stringing**—Stringing will consist of trucking lengths of pipe to the ROW and laying them on wooden skids beside the open trench.
3. **Installation**—Installation will consist of bending, welding, and coating the weld joint areas of the pipe after it has been strung, padding the ditch with sand or fine spoil, and lowering the pipe string into the trench. Bends will be made by a cold bending machine or shop fabricated as required for various changes in bearing and elevation. Welding will meet the applicable API standards and be performed by qualified welders. Welds will be inspected in accordance with

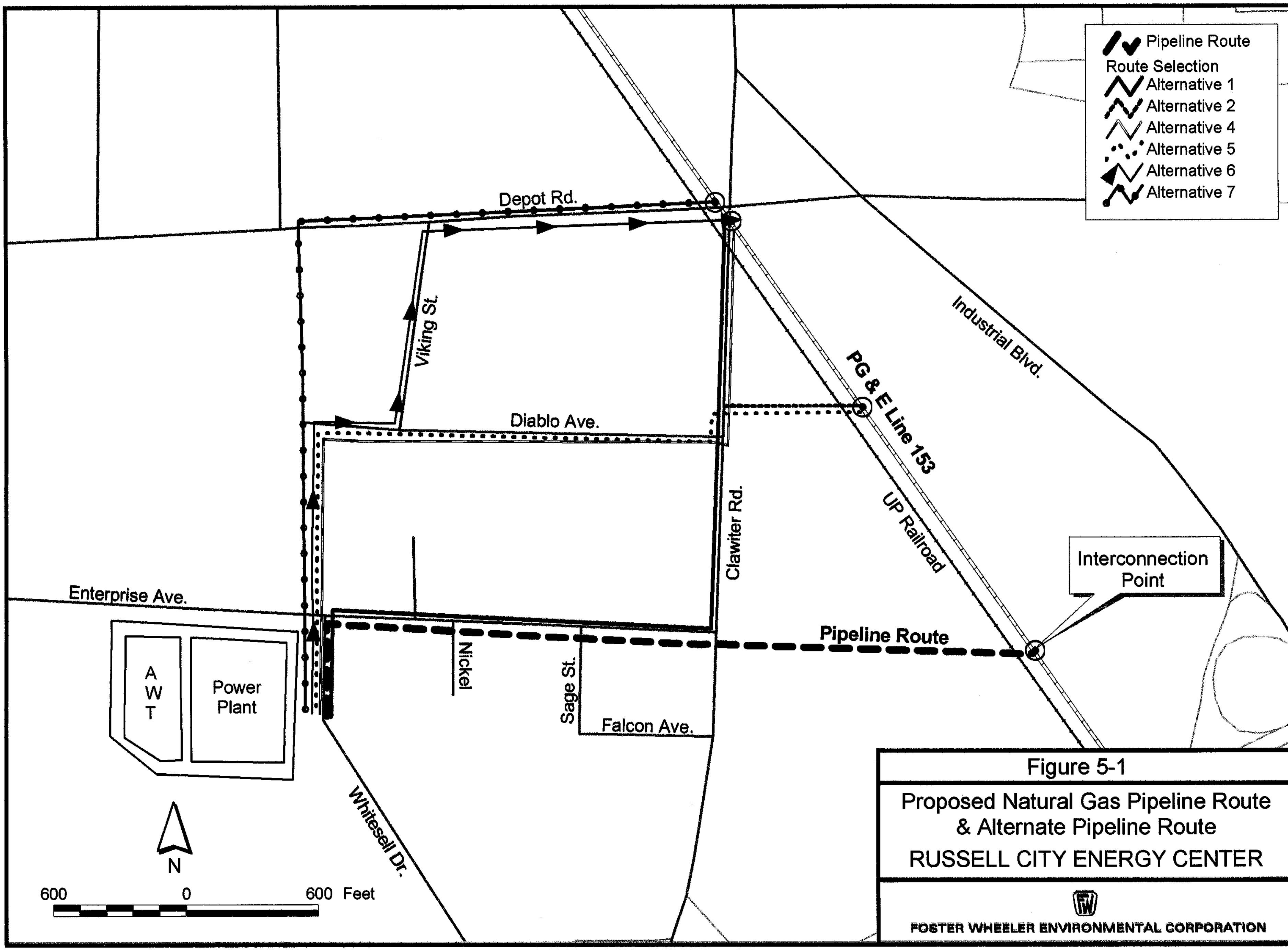


Figure 5-1

Proposed Natural Gas Pipeline Route & Alternate Pipeline Route

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

API Standard 1104. Welds will undergo 100 percent radiographical inspection by an independent, qualified radiography contractor. All coating will be checked for holidays (i.e., defects) prior to lowering into the trench.

4. **Backfilling**—Backfilling will consist of returning spoil back into the trench around and on top of the pipe, ensuring that the surface is returned to its original grade or level. The backfill will be compacted to protect the stability of the pipe and to minimize subsequent subsidence.
5. **Plating**—Plating will consist of covering any open trench at the end of a workday with steel plates to ensure public safety. Plates will be removed at the start of each workday. Efforts will be made to minimize the length of open trench along the ROW.
6. **Boring**—The boring method will be used for the moderately short crossing under the UPRR tracks, and may be required for the crossing under Clawiter Road. Boring pits will be dug on each side of the railroad right-of-way. On the inlet side, a boring machine with an auger typically will be used, or a ramming device may be used to "jack" the pipe into place. Provided that the pipeline is installed at a depth greater than 10 feet between the top of pipe and the bottom of the tracks, it is anticipated that this track crossing can be installed without casing.
7. **Hydrostatic Testing**—Hydrostatic testing will consist of filling the pipeline with water, venting all air, increasing the pressure to the specified code requirements, and holding the pressure for a period of time. It is expected that the fresh water required can be drawn from the municipal water supply. After hydrostatic testing of the pipeline, the test water will be chemically analyzed for contaminants and discharged into a dewatering structure consisting of hay bales, geotextile fabric, and silt fencing. The discharged water will filter through the hay bales and silt fence onto a jute matting before it is discharged. Temporary approvals for test water use and permits for discharge will be obtained as required.
8. **Cleanup**—Cleanup will consist of restoring the surface of the ROW by removing any construction debris, grading to the original grade and contour, and repairing and repaving where required.
9. **Commissioning**—Commissioning will consist of drying the inside of the pipeline, purging air from the pipeline, and filling the pipeline with natural gas.
10. **Safety**—A construction safety plan will be prepared for the project. This plan will address specific safety issues, such as working in an active railroad right-of-way, traffic control, working along traveled city streets, and other areas as required by permits.

5.4 PIPELINE OPERATIONS

The proposed gas supply pipeline will be designed, constructed, and operated in accordance with Title 49, Code of Federal Regulations, Part 192 (49 CFRI92) and the California Public Utility Commission's General Order (G.O.) 112-E. Specifically, the pipeline will be designed in accordance with the standards required for gas pipelines in proximity to populated areas, based on actual population densities along the proposed pipeline route. It will be buried a minimum of 36 inches, as required by Alameda County, Caltrans, or UPRR.

An operations and maintenance plan will be prepared addressing both normal procedures and conditions, and any upset or abnormal conditions that could occur. Periodic cathodic protection surveys will be performed along the pipeline, as required by 49 CFR 192 and G.O.112-E. The pipeline will be under a continuous cathodic protection system.

The proposed pipeline will adopt a proactive damage prevention program. Markers identifying the location of the pipeline will be placed at all road crossings. The markers will identify a toll-free number to call prior to any excavation near the pipeline. Buried warning tape will be placed above the pipeline to warn of its presence.

The transported gas will be odorized as received from PG&E's main pipeline. PG&E will develop an emergency plan to provide prompt and effective responses to upset conditions detected along the pipeline or reported by the public.

Isolation block-valves will be installed at both ends of the proposed pipeline. These valves will be manually controlled, lockable, gear-operated ball valves. Only PG&E will have access to the isolation block valve at the mainline tap, and the RCEC alone will have access to the downstream isolation ball valve at the RCEC property. A pipeline Supervisory Control and Data Acquisition (SCADA) system will provide flow rate and pressure data to PG&E and the RCEC.

5.5 ON-SITE FUEL SUPPLY SYSTEM

A description of the fuel supply system within the RCEC is provided in Section 2.2.

5.6 PERMITS AND PERMITTING SCHEDULE

The California Streets and Highways Code, Division 2, Chapter 5.5, Sections 1460-1470, mandates that an encroachment permit must be obtained from the City of Hayward Public Works Department if there is an opening or excavation for any purpose in any roadway. This and other permits, as well as the schedule for obtaining the permits, are discussed in Section 8.6, Land Use.

6.0 ELECTRICAL TRANSMISSION

6.1 INTRODUCTION

Section 6 discusses the transmission interconnection between the proposed Russell City Energy Center (RCEC) and the existing electrical grid and the anticipated impacts that operation of the facility will have on the flow of electrical power in this region of California. To better understand the impacts of the proposed energy center on the regional transmission system and power flows, the analysis presented in this section focuses on the following issues: the existing electrical transmission system in the immediate area of the RCEC; the proposed electrical interconnection between the RCEC and the electrical grid; the proposed electrical transmission line route; and the impacts of the electrical interconnection on the existing transmission grid. Alternatives to the proposed interconnection and line alignments are discussed in Section 9. Additional discussions focus on potential nuisances (electrical, magnetic, audible noise, and corona effects), safety of the interconnection, and a description of applicable laws, ordinances, regulations, and standards (LORS).

The site for the proposed RCEC was selected, in part, for its proximity to the anticipated load and to Pacific Gas & Electric Company's (PG&E) Eastshore Substation, which is located approximately 1.1 miles to the southeast. Figure 6.1-1 shows the proposed location of the RCEC in relationship to the Eastshore Substation and the existing regional transmission facilities. Figure 6.1-1 also shows that the proposed RCEC site is approximately 600 feet from the existing Eastshore-Grant 115-kV double circuit transmission line, which will allow for the use of the Eastshore-Grant transmission corridor for the 230-kV interconnecting transmission line between the proposed RCEC and the Eastshore Substation.

The high-voltage transmission lines in the vicinity of the proposed RCEC are part of PG&E's East Bay (Mission Division) operating region. This existing transmission system will deliver the power generated at the RCEC to the California electric grid. Figure 6.1-1 illustrates the existing transmission system in the immediate area of the proposed RCEC project.

The initial examination of the local transmission system concentrated on the anticipated RCEC power flows, the capacity and location of existing transmission lines, the availability of substation capacity, and the physical distances involved with the anticipated electrical interconnection. The interconnection feasibility study considered both radially connecting the RCEC to the existing transmission system at the Eastshore Substation and looping one of the existing 230-kV electrical transmission lines in the area into the proposed RCEC switchyard. As a result of the nominal 620 MW maximum generating capacity of the RCEC and the proximity of existing 230-kV lines, system analyses concentrated on the existing 230-kV transmission network.

The proposed electrical interconnection will connect the RCEC to the regional power grid, employing a radial connection. The connection will involve a double-circuit 230-kV line approximately 1.1 mile long connecting the RCEC switchyard to the 230-kV bus at the Eastshore Substation. The proposed connection will share new towers in the existing corridor with the existing Eastshore-Grant 115-kV transmission line. Figure 6.1-2 (in map pocket at back of section) illustrates the alignment of the proposed radial connection in relationship to the proposed RCEC site, the Eastshore-Grant 115kV transmission line, and the existing Eastshore Substation. In Figure 6.1-2, these features are superimposed on an aerial photograph of a portion of Hayward that allows the reader to compare the proposed components (plant site, connection corridor, and Eastshore Substation) with geographic features and recent commercial development of the area.

The proximity of the Eastshore Substation to the RCEC project allowed different conceptual interconnections to be considered with respect to their feasibility and anticipated impact on the existing transmission system and power flows. Primary consideration in the analysis was given to the ability of the existing transmission lines to carry the anticipated output of the RCEC. Additional aspects considered included environmental effects of building and maintaining the new interconnecting transmission line, right-of-way modification and/or acquisition, and engineering constraints. Alternative interconnection options were identified after analyses of these data and review of the PG&E operating diagram for this operating region of their service area. From these alternatives, the proposed transmission line alignment, interconnection configuration, and construction techniques were selected.

Figure 6.1-3 (in map pocket at back of section) is the operating diagram for PG&E's East Bay operating region. It should be noted that the Eastshore Substation has been completely rebuilt since the publication this enclosed operating diagram. The new configuration of the Eastshore Substation does not alter the conclusions of the analyses presented in this section. Further analysis based on the Generator Interconnection Data Sheet (Appendix 6-A) and discussion of the proposed interconnection and its alignment are presented in Sections 6.2 and 6.3.

6.2 TRANSMISSION INTERCONNECTION ENGINEERING

Preliminary engineering of the proposed transmission interconnection was completed based on the results of the interconnection feasibility studies performed. This section discusses the existing transmission facilities in the vicinity of the RCEC project and other associated electrical facilities, as well as the proposed transmission interconnection.

6.2.1 Existing Electrical Transmission Facilities

The proposed RCEC site is located approximately 1.1 miles northwest of PG&E's Eastshore Substation at the extreme western edge of Alameda County in Hayward, California. The Eastshore Substation is located just south of State Route 92 near the Clawiter Road-Eden Landing interchange.

An inventory and assessment of the transmission facilities in the immediate geographic area of the RCEC project were conducted. The regional transmission line assessment focused on the number of electrical transmission lines, the rating of each line, the existing loads, and the ability of the existing transmission grid to safely and reliably transmit the anticipated maximum nominal 620 MW capacity of the RCEC.

Based on the System Impact Study Plan base case provided by PG&E (Appendix 6-B), which is based on the 2001-series Transmission Assessment summer peak load case for 2003, the portion of the East Bay area that the RCEC might readily impact[1] has a peak load 3,530 megawatts (MW) and 955 MW of existing generation.[2] The transmission system in the vicinity consists of 230-kV and 115-kV transmission lines. These and other lines are shown geographically in Figure 6.1-1. Local 230-kV line ratings are typically 362 to 396 MVA. Typical ratings for local 115-kV lines are 139 to 162 MVA. Table 6.2-1 lists the ratings and conductor types for selected lines.

To evaluate the rated exit capability of the Eastshore Substation, an approach called the "first contingency rated exit capability," or FCREC, was used. The evaluation started with the Study Plan

[1] PG&E Mission (zones 316 and 346), Peninsula (zones 310 and 340), and San Francisco (zones 309 and 339) zones used to approximate this area.
[2] This represents the total generation modeled as running in the power flow case. An additional amount of roughly 1,200 MW of generation is proposed but not approved.

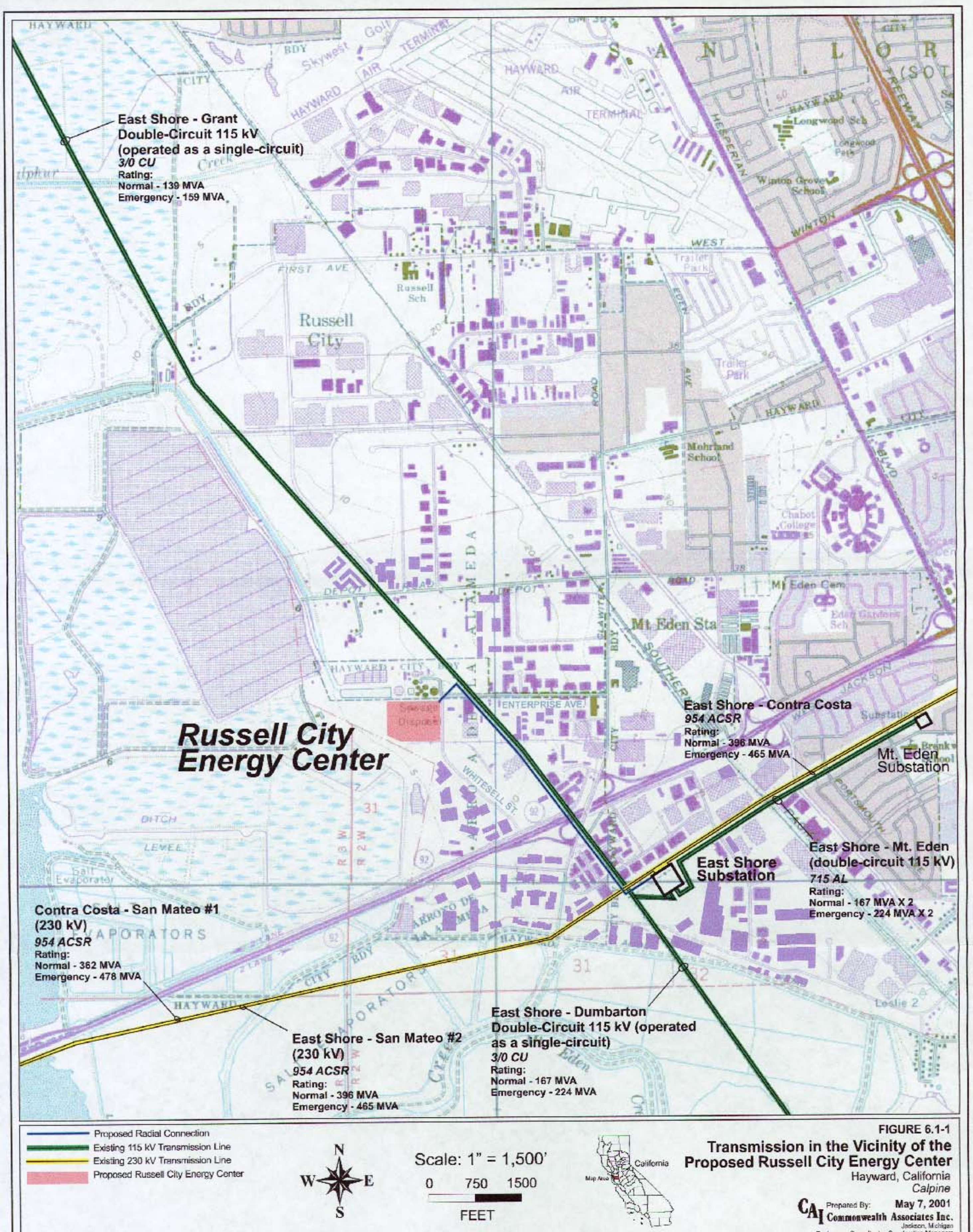


FIGURE 6.1-1
Transmission in the Vicinity of the Proposed Russell City Energy Center
Hayward, California
Calpine
Prepared By: CAI Commonwealth Associates Inc.
Jackson, Michigan
Engineers • Consultants • Construction Managers
May 7, 2001

Table 6.2-1. Capabilities of lines in the vicinity of the Eastshore Substation.

From	To	Ckt. No.	Description	Volt.	Normal Rate (MVA)	Emerg Rate (MVA)	Conductor
Eastshore	San Mateo	1	One circuit of a Double-circuit	230	396	465	954 ACSR
Eastshore	Pittsburg[1]	1	One circuit of a Double-circuit	230	433	465	477 ACSS
Pittsburg	San Mateo[2]	1	One circuit of a Double-circuit	230	398	478	954 ACSR
Eastshore	Mt. Eden	1	One circuit of a Double-circuit	115	167	224	715 AL
Eastshore	Mt. Eden	2	One circuit of a Double-circuit	115	167	224	715 AL
Eastshore	Dumbarton	1	Double-circuit (operated as a single circuit)	115	167	224	3/0 Copper
Eastshore	Grant	1	Double-Circuit (operated as a single circuit)	115	139	159	3/0 Copper

[1] One element of the Delta Energy Center (DEC) mitigation scheme is to swap the Contra Costa to Eastshore and San Mateo 230-kV lines with the Pittsburg to Moraga 230-kV lines. Since the DEC is currently projected to be on line before the RCEC, the swap is assumed to be in place for purposes of evaluating the RCEC.

[2] Looping this circuit into the Eastshore substation will result in two lines, each rated at 398 MVA.

case provided by PG&E. This information was supplemented with connection information and line ratings from the East Bay Region (East Bay Division, Sheet 3) Operating Diagram (Figure 6.1-3), taken from PG&E's Form 715 filing previously submitted to the Federal Energy Regulatory Commission (FERC). From this database, an inventory of substation buses, generation, load, and line capacities was developed for the Eastshore Substation. This inventory, starting with the substation itself, served as a starting point for the FCREC method of evaluation. To find the rated exit capability, the following steps were undertaken:

1. Add the rating of all lines leaving, or exiting, the group;
2. Subtract the rating of all generators attached to any bus within the group; and
3. Add the rating of all loads attached to any bus within the group.

The sum of Steps 1, 2, and 3, above, yields a number called the "normal total rated exit capability," or NTREC, for the group. The group of buses may also be called a "cut set." The NTREC represents the maximum possible additional generation that can be accommodated at the cut-set location under the best of conditions. This is an optimistic number, but it can be refined easily using standard power flow methodology.

The FCREC is the refined estimate of capacity. This number takes into account the most severe single contingency, or line outage. It provides a more realistic limit for added generation than does the NTREC found as a result of Steps 1, 2, and 3 above. To calculate the FCREC, or the final estimate of system capability, step 4 is added to the process:

4. Subtract the rating of the line exiting the cut set that has the highest rating.

The FCREC gives the maximum possible export that might be expected without implementing system improvements. Detailed estimates of the system impact will be determined in a System Impact Study conducted by PG&E in accordance with the study plan developed for the RCEC.

Table 6.2-1 gives the ratings for the elements in the vicinity of the Eastshore Substation. Since there is no load and no generation at the Eastshore Substation, the NTREC for the substation is 2,265 MVA. The FCREC is 1,832 MVA, which is the maximum amount of generation that one might expect to add to the Eastshore Substation without implementing system improvements. Based on this abbreviated analysis, the addition of new generation near the Eastshore Substation will result in minimal transmission impacts. A more accurate estimate of system impacts is presented in the section on system impacts below.

6.2.2 Proposed Transmission Interconnection System

The proposed interconnection between the RCEC and the Eastshore Substation will consist of the following major facilities:

- New 230-kV double-circuit overhead lines extending approximately 1.1 miles from the RCEC switchyard to radially connect into the Eastshore Substation reconfigured 230-kV bus
- A new 230-kV on-site switchyard at the RCEC using a ring-bus configuration
- Modifications in the Eastshore Substation to enlarge the 230-kV bus into an eight breaker ring-bus configuration to accommodate the two RCEC lines as well as the new incoming and outgoing connections of the existing Pittsburg to San Mateo 230-kV line

The transmission interconnection will exit the RCEC switchyard at the pull-off structure in a northeast direction and will span approximately 600 feet to the existing Eastshore-Grant 115-kV transmission corridor. From that point the line will be overbuilt over the Eastshore-Grant line and will extend approximately 1.1 mile in the existing right-of-way, until it leaves the right-of-way and enters the Eastshore Substation. Figure 6.1-2 shows the direction of the proposed electrical interconnection alignment in relation to the proposed RCEC, the Eastshore-Grant 115-kV transmission line, and the Eastshore Substation. It is anticipated that the new segment of the transmission corridor from the RCEC to the existing Eastshore-Grant corridor will occupy a right-of-way approximately 100 feet wide.

6.2.2.1 Russell City Energy Center 230-kV Switchyard Characteristics

The proposed RCEC 230-kV switchyard will consist of five 230-kV air-insulated circuit breakers. A ring-bus arrangement will be used in the switchyard to obtain a high level of service reliability. An electrical one-line diagram of the proposed RCEC switchyard arrangement appears in Figure 6.2-1. The switchyard layout is shown in Figure 6.2-2.

The switchyard and all equipment will be designed for a 63 kA interrupting capacity. The main buses, as well as the bays, will be designed for 3,000 A continuous current. As depicted in Figure 6.2-1, each generator will be provided with an independent tie to the switchyard. The RCEC ring bus will be connected to the existing transmission grid through a double-circuit radial connection at the 230-kV bus in the Eastshore Substation. The radial connection will require modifications at the Eastshore Substation, discussed in Section 6.2.2.2 below. Three line exits allow removal of a single circuit without limiting plant output. Redundant 18/13.8 kV Unit Auxiliary Transformers connected between CTG generator breakers 13 and 14 and the respective step-up transformers will provide power to start up the plant and provide power for all auxiliary loads within the RCEC facility. Auxiliary controls and protective relay systems for the 230-kV switchyard will be located in a control building separate from the power plant.

6.2.2.2 Interconnection and Mitigative Changes at the Eastshore Substation

The existing Eastshore Substation consists of three 230-kV circuit breakers, two 230-kV line exits, and two transformer feeds to the 115-kV network. The radial connection of the RCEC to the Eastshore Substation will necessitate changes at the Substation to meet the applicable system reliability criteria.

The 230-kV bus in the substation will be expanded to accommodate the two additional RCEC connections. In addition, the Pittsburg to San Mateo 230-kV transmission line, which now passes the substation, will be routed to the Eastshore bus to increase the total transmission capability across the San Francisco Bay to the Peninsula. It is proposed that the existing 230-kV switching arrangement be converted into an eight breaker ring bus to accommodate termination of the two new lines from the RCEC and the looping of the existing Pittsburg (Contra Costa) to San Mateo 230-kV line into Eastshore. Figure 6.2-1 is a one-line diagram that shows the proposed RCEC switchyard and Figure 6.2-2 illustrates the proposed expansion of the Eastshore Substation. Figure 6.2-3 is a plan view of the proposed expansion. Control house expansion and changes to the auxiliary AC and DC supplies will be a part of the final design.

An alternative 12-breaker, breaker-and-one half configuration is also being evaluated by PG&E. Although this alternative configuration would likely require development of more of the available land surrounding the existing substation, the incremental environmental impacts would be minimal. Adoption of a breaker-and-one-half configuration would not alter the conclusions of the analyses presented herein.

6.2.2.3 Overhead Transmission Line Characteristics

The proximity of the existing Eastshore-Grant 115-kV transmission corridor will permit the interconnecting line to be aligned along the existing right-of-way. The proposed line will exit the RCEC switchyard in a northeast direction for approximately 600 feet, where it will intersect the existing Eastshore-Grant 115-kV line. At that point the interconnecting line will follow the existing Eastshore-Grant right-of-way and will be overbuilt on new structures above the two 115-kV circuits. The two lines will remain in the H-frame configuration for approximately 4,500 feet to the southeast, where the interconnecting line will exit the Eastshore-Grant right-of-way to the northeast. From there, it will enter the Eastshore Substation approximately 500 feet to the northeast. Along this segment of the alignment, the interconnecting line will parallel the existing two 230-kV circuits of the San Mateo-Contra Costa (Eastshore) lines. Figure 6.2-2 illustrates the interconnection alignment in relation to the existing transmission resources and commercial development. The two interconnecting circuits will employ bundled conductors. The recommended conductor type is 1272 kcmil, 45/7 ACSR "Bittern." This is a standard conductor type used by PG&E.

The proposed interconnecting transmission line will be built as an overhead double-circuit 230-kV line between the RCEC switchyward and the expanded Eastshore Substation 230-kV bus. The proposed line will exit the RCEC switchyard in a slack span configuration to a pull-off (or dead-end) structure located in the northeast corner of the RCEC site (Figure 6.1-2). Figures 6.2-4 (elevation) and 6.2-5 (plan) illustrate the design of the dead-end structure, which will support the double-circuit 230-kV lines. The dead-end structure will be 108 feet tall.

The first span will be approximately 600 feet in length and will connect the pull-off structure to a new heavy angle structure to be constructed on the vacant parcel that lies immediately east of the City of Hayward's Water Pollution Control Facility (Figure 6.1-2). The heavy angle structure will be constructed within the existing Eastshore-Grant right-of-way to accommodate the 90 degree turn of the two 230-kV circuits as they enter the right-of-way approximately 220 feet southeast of Structure 13/86 of the Eastshore-Grant 115-kV line. Figures 6.2-6 (elevation) and 6.2-7 (plan) illustrate the design of the heavy angle structure, which will be 115 feet tall.

The proposed overhead transmission line will require that five of the existing tangent lattice steel towers (Structures 12/81 through 12/86) along the Eastshore-Grant corridor be replaced with new self-supporting tubular steel poles in a modified H-frame design to hold the conductors. Each structure will support the two new 230-kV interconnection circuits and the two existing 115-kV circuits in an overbuild configuration. Figure 6.2-8 illustrates the typical tangent structure proposed for the shared right of way and Figure 6.1-2 shows the approximate locations of the new tangent structures. The tangent towers are anticipated to be approximately 110 feet tall. Final tower placement locations and dimensions will depend on the final choices for design, layout, and the existing conditions in the field.

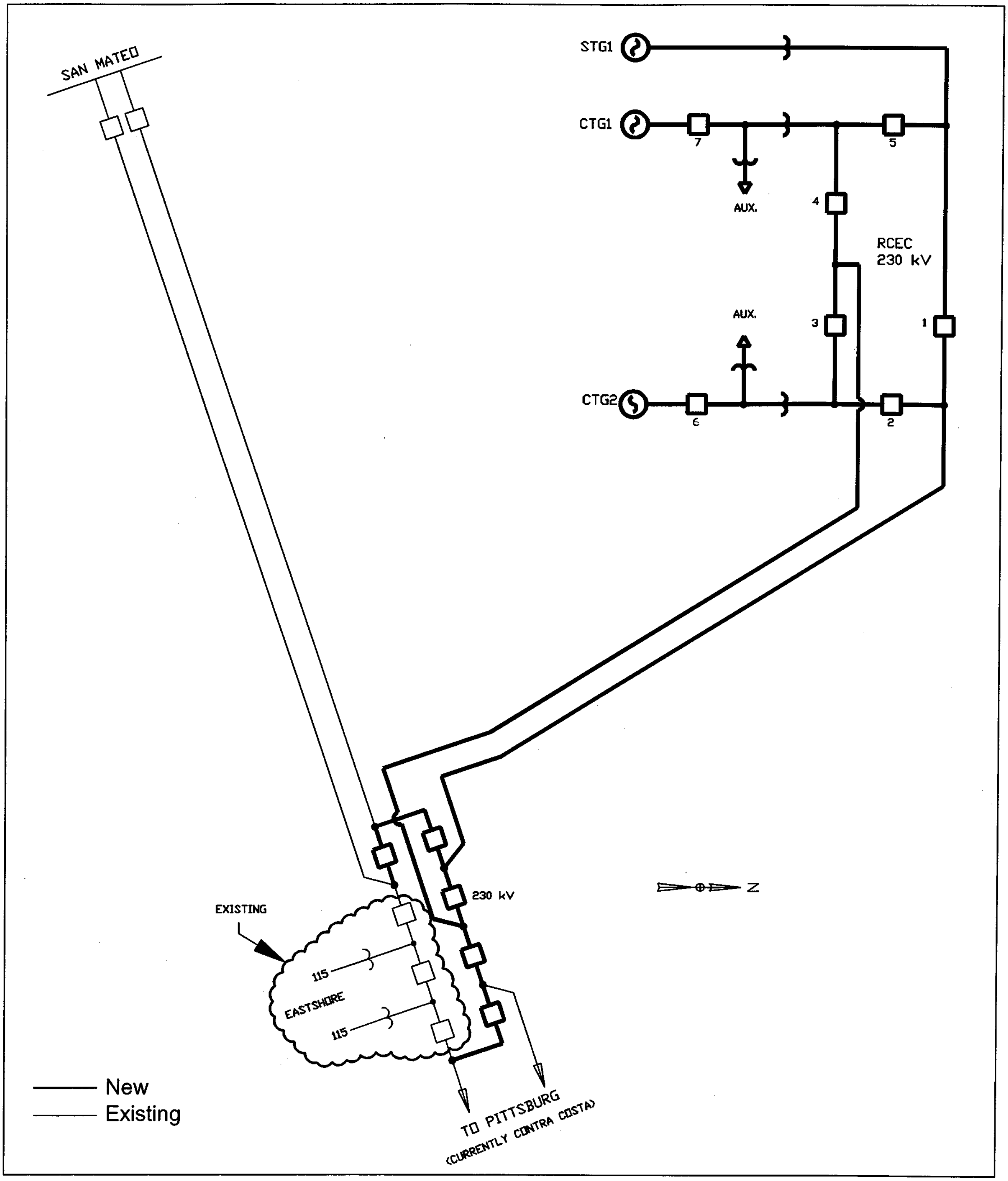
The overbuild configuration of the proposed transmission line will extend approximately 4,500 feet to a point approximately 150 feet northwest of Structure 12/80 (Figure 6.1-2). At this location, a second heavy angle structure will be constructed to accommodate the 90 degree turn of the RCEC 230-kV double circuits as they exit the Eastshore-Grant right-of-way and turn northeast to enter the Eastshore Substation property, parallel to the existing two 230-kV circuits of the San Mateo-Contra Costa (Eastshore) lines. Figure 6.1-2 illustrates the interconnection alignment in relation to the existing transmission resources and commercial development.

6.3 INTERCONNECTION STUDY

Interconnection studies are performed to assess the impacts of proposed new generation on the integrated transmission grid. Interconnection studies include analysis of power flow, short circuit, transient stability, and other factors. The Generator Interconnection Data Sheet for the RCEC is included in Appendix 6-A. After submitting an Interconnection Study request, Calpine/Bechtel initiated a System Impact Study. In accord with PG&E's regulatory filings, Calpine/Bechtel, PG&E, and the California Independent System Operator (Cal-ISO) subsequently developed a mutually agreeable Study Plan. A copy of this System Impact Study Plan is included as Appendix 6-B. These documents are included for information and to record the chronological development of the system impact studies to date.

Based on the Study Plan, PG&E's System Impact Study will be completed by August 6, 2001. In order to advance the schedule for the RCEC expeditiously, provide generation to meet California's needs, and offer the transmission benefits associated with the RCEC's location, and after consulting with the California Energy Commission (CEC), PG&E, and the Cal-ISO, it was agreed that for purposes of AFC filing Calpine/Bechtel could complete a system impact study for PG&E.[3] Using the Study Plan

[3] Item A, Paragraph 3, Section 2022.b, Article 7, Chapter 5, Title 20, California Code of Regulations requires "an interconnection study identifying the electrical system impacts and a discussion of the mitigation measures considered and those proposed to maintain conformance with NERC, WSCC, Cal-ISO or other applicable reliability or planning criteria based on load flow (sic), post transient, transient, and fault studies performed by or for the transmission owner in accordance with all applicable Cal-ISO or other interconnection authority's tariffs operating agreements, and scheduling protocols..."



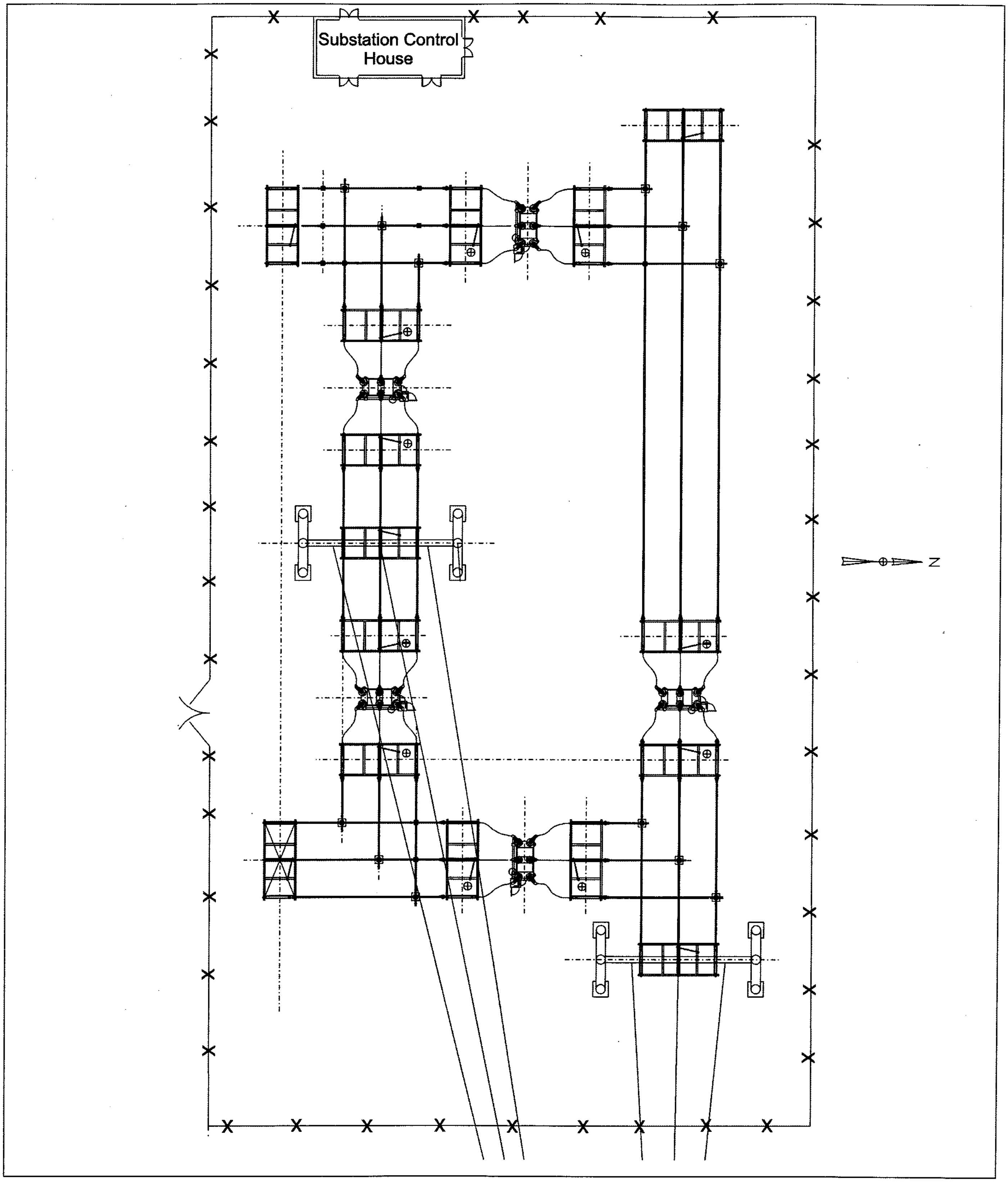
One-Line Schematic of the Proposed RCEC 230 kV Interconnection

Figure 6.2-1

May 7, 2001

Russell City Energy Center - Calpine/Bechtel

Prepared By: Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers



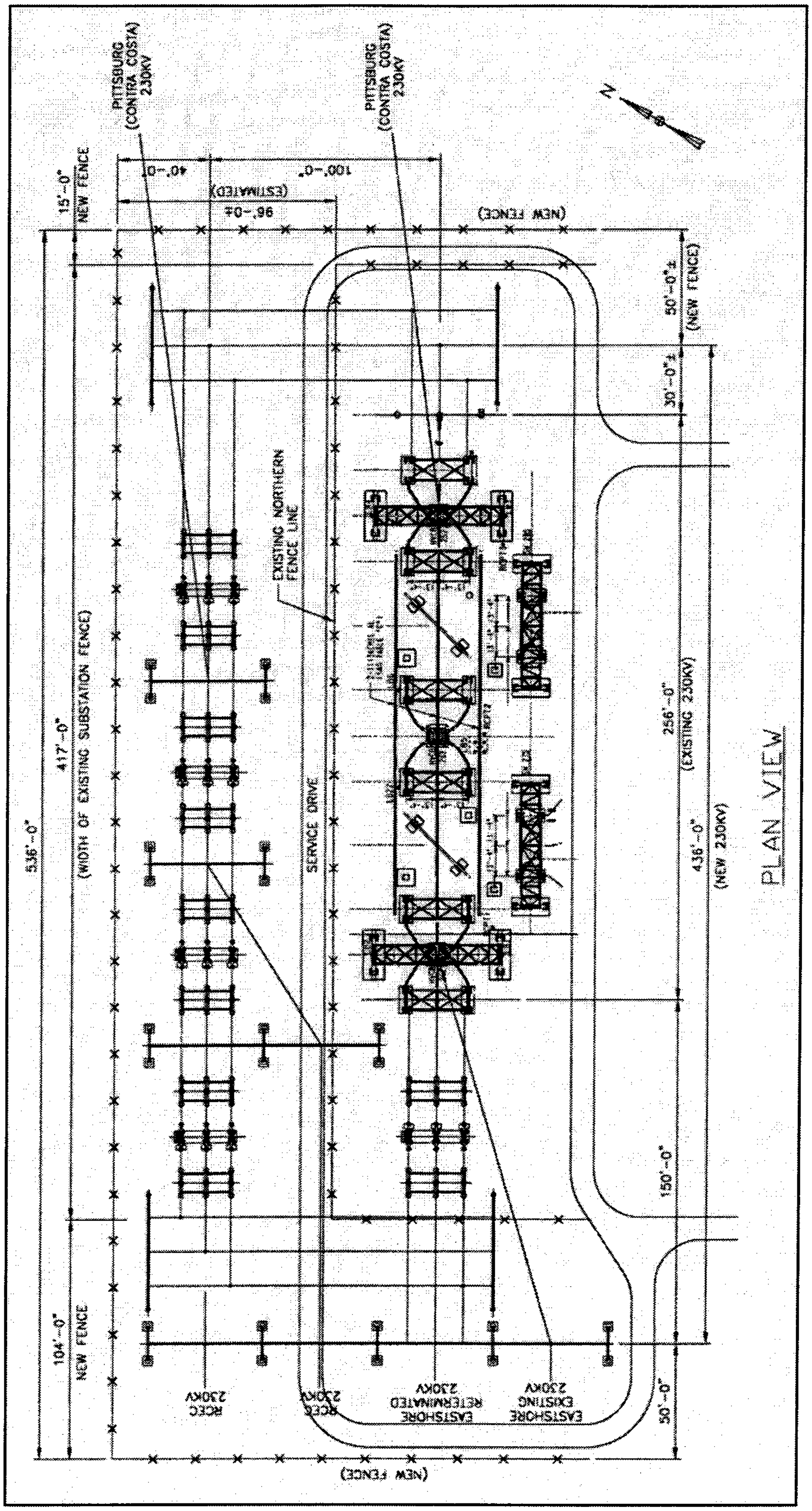
Layout of the Proposed RCEC 230 kV Switchyard

Figure 6.2-2

May 7, 2001

Russell City Energy Center - Calpine/Bechtel

Prepared By:
CAI Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers



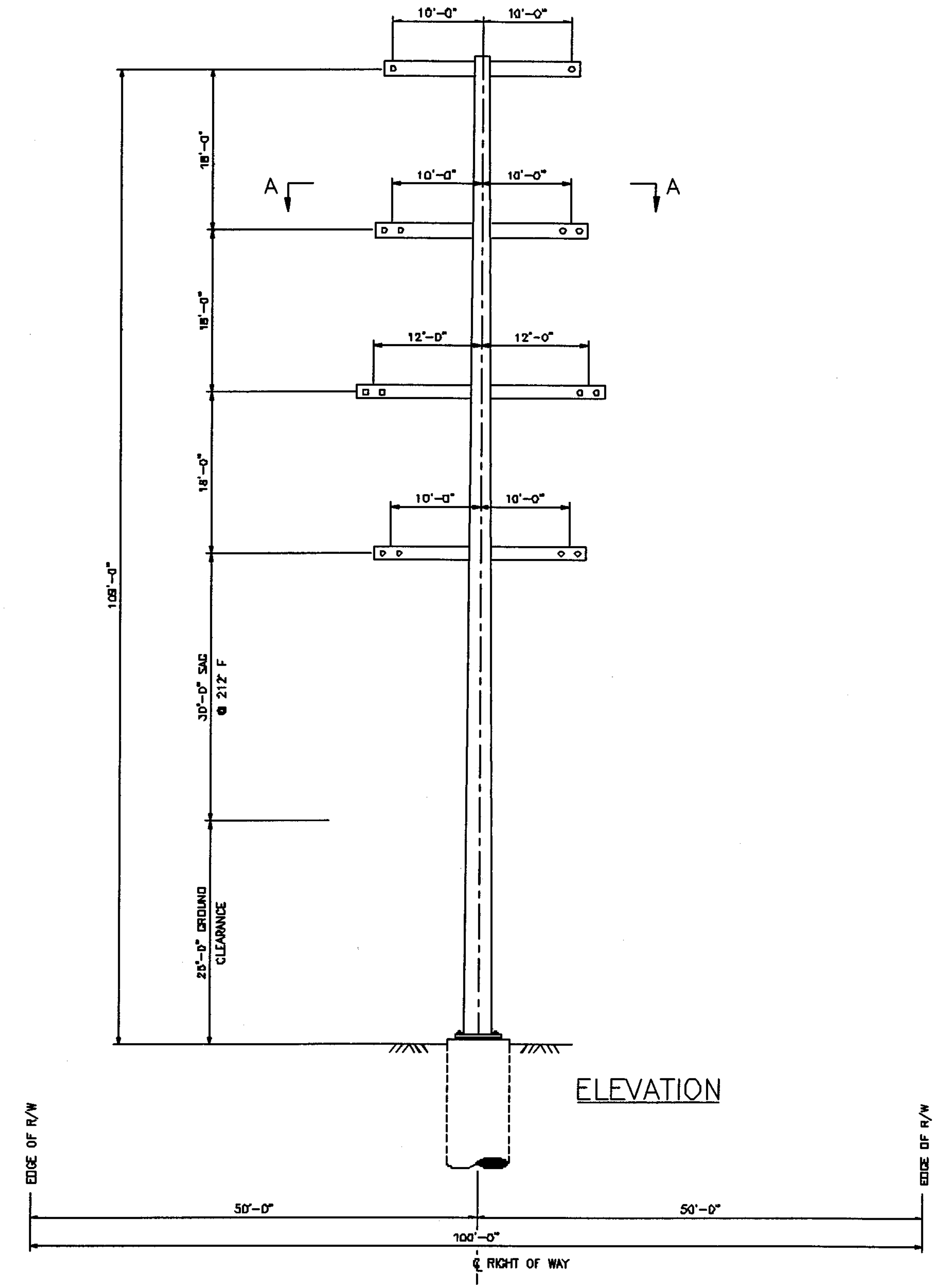
Layout of the Proposed Expansion at the Eastshore Substation

Russell City Energy Center - Calpine/Bechtel

Figure 6.2-3

May 7, 2001

Prepared By: Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers



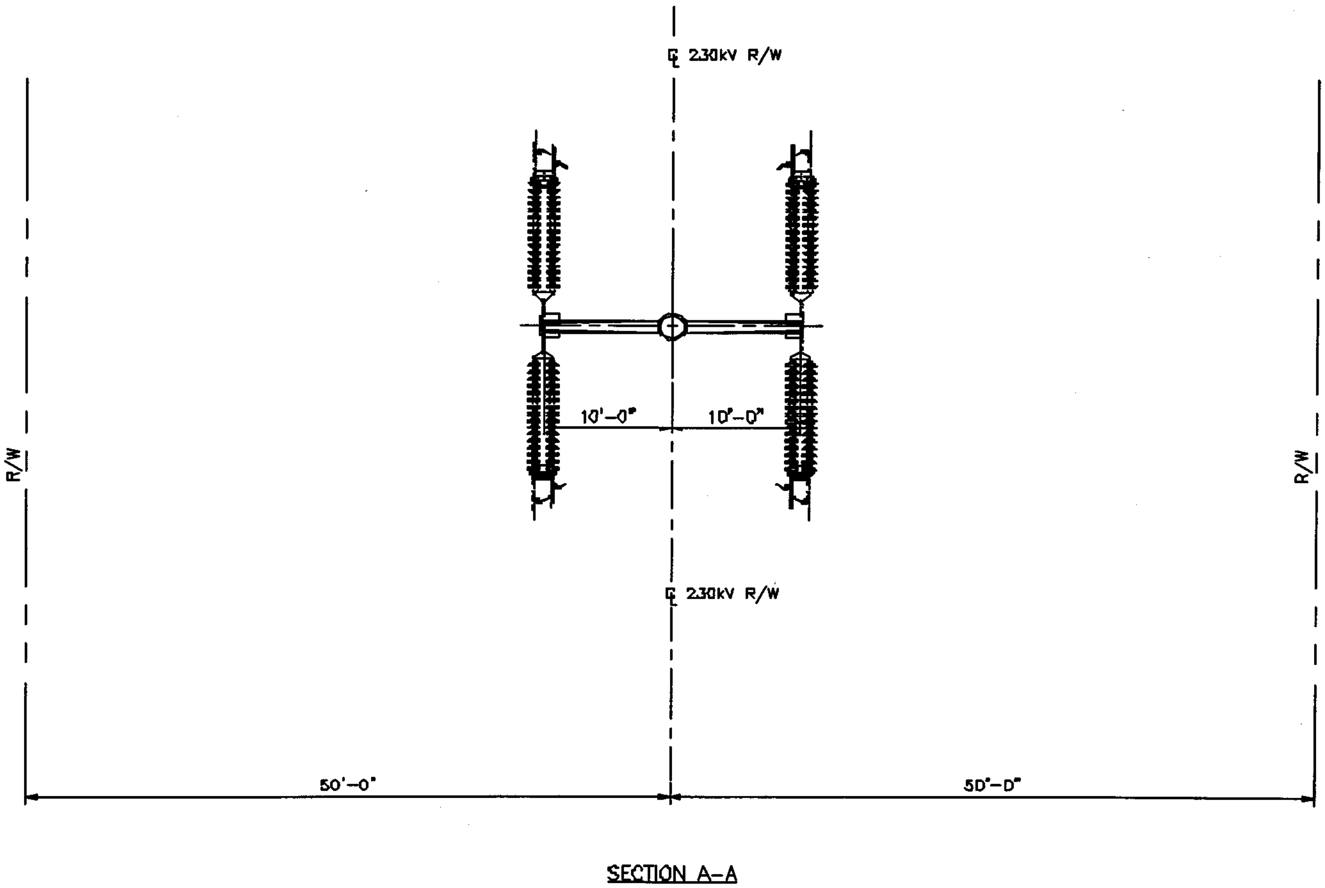
230 kV Transmission Line Double-Circuit Dead-End in RCEC Switchyard

Figure 6.2-4

May 7, 2001

Russell City Energy Center - Calpine/Bechtel

Prepared By: Commonwealth Associates Inc. Jackson, Michigan
Engineers Consultants Construction Managers



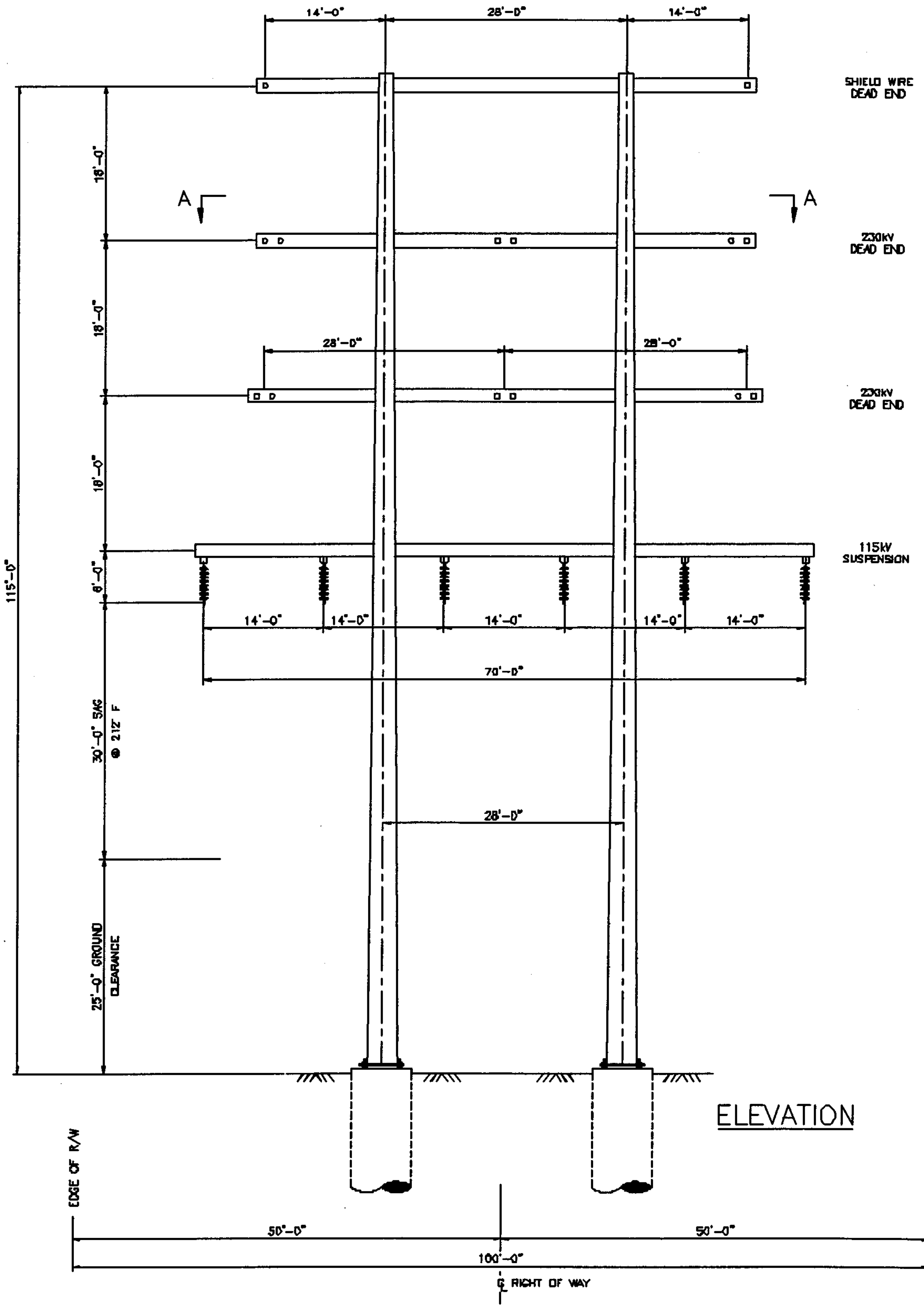
230 kV Transmission Line Double-Circuit Dead-End in RCEC Switchyard

Figure 6.2-5

May 7, 2001

Russell City Energy Center - Calpine/Bechtel

Prepared By:
Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers



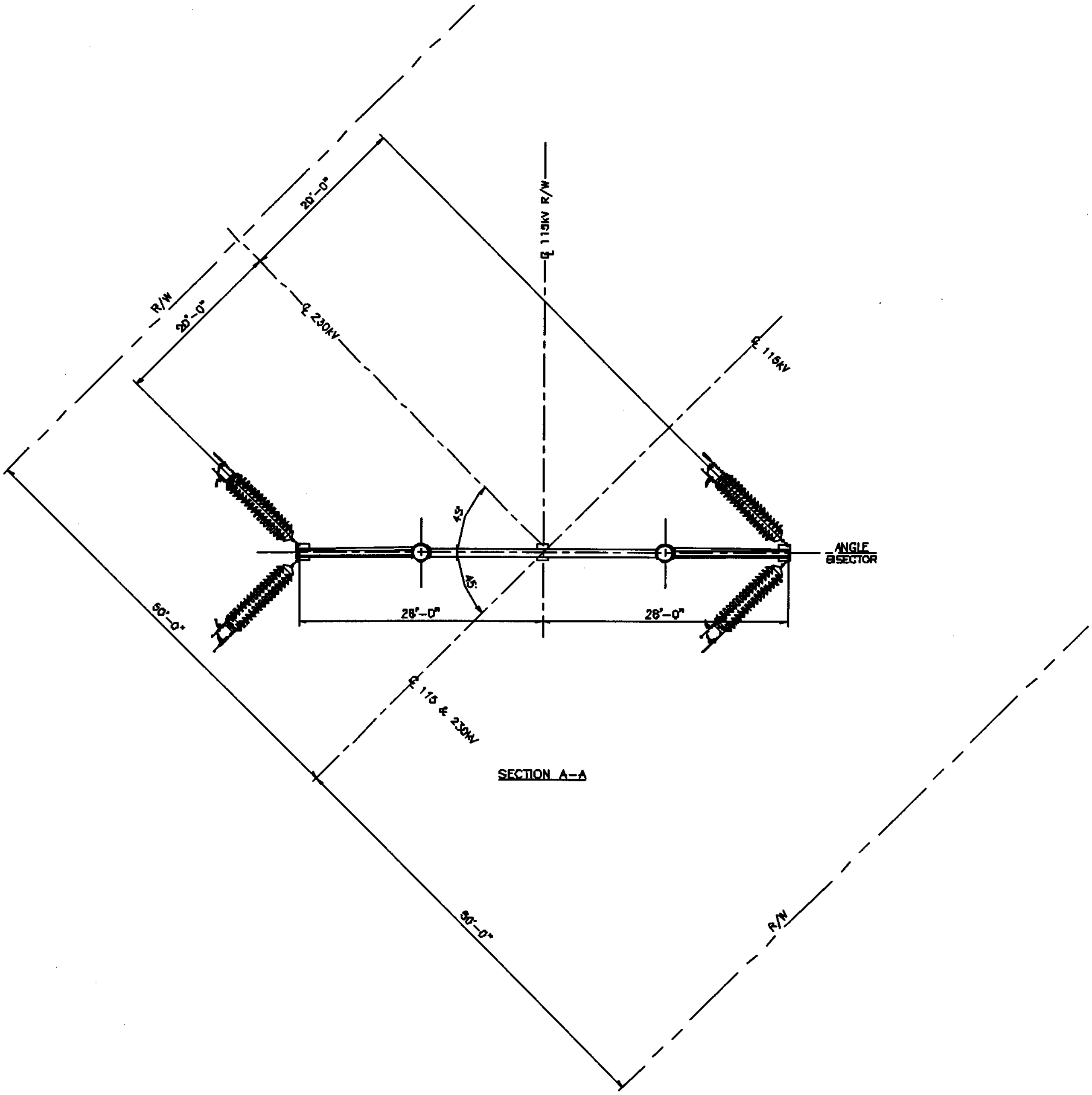
115/230 kV Heavy Angle Structure

Figure 6.2-6

May 7, 2001

Russell City Energy Center - Calpine/Bechtel

Prepared By: Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers



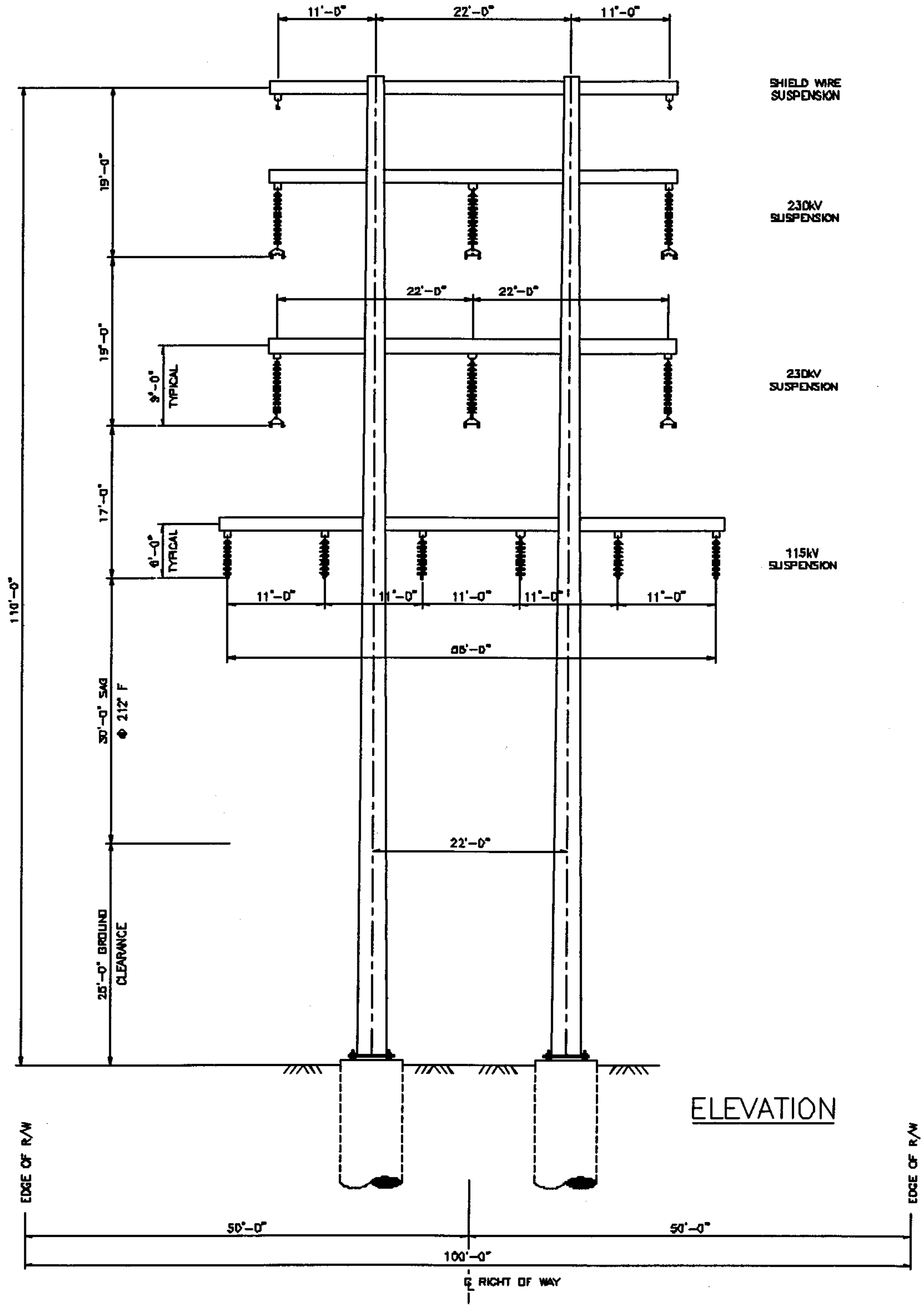
115/230 kV Heavy Angle Structure Plan View

Russell City Energy Center - Calpine/Bechtel

Figure 6.2-7

May 7, 2001

Prepared By: Commonwealth Associates Inc. Jackson, Michigan Engineers Consultants Construction Managers



115/230 kV Transmission Line Tangent Structure

Russell City Energy Center - Calpine/Bechtel

Figure 6.2-8

May 7, 2001

Prepared By: Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers

referenced above and developed jointly by Calpine/Bechtel, PG&E, and Cal-ISO, Calpine/Bechtel completed a study conforming to NERC, WSCC, Cal-ISO, PG&E, and other standard electrical transmission engineering practices. This section summarizes the results of this study and concludes that the project will not cause any significant adverse impact on the electrical system.

The analysis is divided into four parts relating to the power flow (load flow), post transient, transient, and fault duty analysis as mandated above.

6.3.1 Power Flow Analysis

Using the assumptions stated in the PG&E *System Impact Study—Study Plan for the Calpine/Bechtel Joint Development Russell City Energy Center* dated April 6, 2001 (Appendix 6-B) and the base case provided by PG&E for the study, the effects of adding the RCEC to the PG&E transmission system were evaluated as described in the study plan. This study is intended to identify any adverse impacts caused solely by the addition of the RCEC and further, system reinforcement necessary to mitigate any adverse impacts identified.

6.3.1.1 Study Assumptions

This study started with the PG&E's 2003 Summer Peak Full Loop Base Case (in General Electric ".epc" Power Flow format). This base case was developed from PG&E's 2001 base case series and has a 1-in-10 year extreme weather load level for the Greater Bay Area. Table 6.3-1 lists the major approved PG&E transmission projects that are included in the study.

Using PG&E's generation project queue as a guide (as implied in the study plan), the generation projects listed in Table 6.3-2 were included in the study. These projects are grouped by whether or not they are in the vicinity of the RCEC project or are located remote from the project. Projects remote from the RCEC are listed, although not necessarily at full output, since it is assumed that they have a relatively minor impact on the study area.

Table 6.3-1. PG&E transmission projects included in base case.

1.	Install a third 500/230-kV, 1120-MVA transformer at Tesla Substation
2.	Install a second 500/230-kV, 850-MVA transformer at Tracy Substation
3.	Install a third 500/230-kV, 1120-MVA transformer at Metcalf Substation
4.	A new Tesla – Newark 230-kV line
5.	Newark – San Mateo 230-kV line loop into Ravenswood Substation
6.	Static Capacitors (350 MVAR) at Metcalf 500 kV
7.	Static Capacitors (150 MVAR) at Martin 115-kV
8.	Newark Substation Bank #7, 9, and 11 TCAP
9.	Grant-Eastshore 115-kV Transmission Project
10.	Los Esteros Substation Project
11.	Tri-Valley Project—Phase I
13.	Pittsburg – Tassajara 230-kV Line Reconductoring
14.	Newark 230-kV—100 to 200 MVAR Static VAR Compensator

Table 6.3-2. Generation projects.

Bay Area Generation Projects
Calpine/Bechtel—880 MW Delta Energy Center (DEC), interconnecting with the 230-kV bus at the Pittsburg Power Plant switchyard.
Calpine/Bechtel—600 MW Metcalf Energy Center (MEC), interconnecting with the Metcalf – Monta Vista #4 230-kV line, through the MEC switchyard.
Calpine—500 MW Los Medanos Energy Center (LMEC), interconnecting with the 115-kV bus at the Pittsburg Power Plant switchyard.
Duke Energy North America Corporation (DENA)—1080 MW Moss Landing project (MLPP), interconnecting with the existing 230-kV bus at the Moss Landing Power Plant.
Southern Energy Company of California—530 MW Contra Costa Power Plant Capacity Increase Project, interconnecting to Contra Costa PP 230-kV bus.
United Golden Gate PP—595 MW generating facilities, interconnecting with the San Mateo – Martin #5 and #6 115-kV lines.
Project A—692 MW Tesla Generation Project, interconnecting near Tesla Substation.
Project B—580 MW Fremont Generating Project interconnecting to the 230-kV bus at Newark Substation.
Project C—581 MW Los Esteros Generating Project interconnecting to the 115-kV bus at Los Esteros Substation.
Mirant—600 MW Potrero Unit 7 Project, interconnecting Potrero and Hunters Point Switching Stations.
FPLE—150 MW High Wind, tapping off the Vaca –Contra Costa #2 230-kV line.
Panda—150 MW West 1-3, interconnecting with Vaca Dixon – Contra Costa #1 230-kV line.
Generation Project Outside the Study Area[1]
PG&E NEG—La Paloma generation facility interconnecting at Midway 230-kV bus section D; La Paloma generation facility will be will be modeled at 1110 MW in summer and 1160 MW in spring and winter.
Texaco—338 MW Sunrise Generation Facility interconnecting at La Paloma Switching Station. Connected.
Three Mountain Power Company—530 MW project interconnecting to PG&E's Pit 1 – Pit 3 and Pit 1 – Cottonwood 230-kV lines.
GWF—130 MW Hanford, interconnecting to Kingsburg – Henrietta 115-kV line in Fresno area.
Midway-Sunset generation facility—500 MW in summer, 540 MW in spring, and 540 MW winter. Midway-Sunset generation facility will be interconnected at Midway 230-kV bus section E.
Sempra—500 MW Elk Hills Power Project, interconnecting at Midway 230-kV bus.
Wellhead Electric—22 MW Stockton Cogen Project, interconnecting with Newark Sierra Paper Board 60-kV Tap on the Stockton "A" #1 60-kV line.
Morro Bay Modernization Project replacing the existing Morro Bay Power Plant with 1,200 MW of generation.
Calpine Corporation—500 MW Sutter facility, interconnecting with WAPA's Elverta - Olinda and Elverta - Keswick 230-kV.
FPLE —560 MW Elverta Project, interconnecting with WAPA system.
Calpine—1,070 MW East Altamont Generating Project interconnecting at loop the Tracy - Westley 230-kV circuit near Tracy Substation.
Project D—1000 MW in the Fresno area.
Project E—630 MW in Glenn and Colusa counties.

[1]Project F— which is a proposed (and queued) 1350 MW facility in Solano County, was originally included in PG&E's study plan, but was eliminated from this study at PG&E's recommendation because of the level of uncertainty as to whether the project will actually materialize.

The base analysis involves comparing cases with and without the proposed RCEC project:

- The Study Plan Case: This case includes the RCEC modeled as a 2x1 configuration at 635 MW with a 15 MW power plant load and connected to the Eastshore 230-kV or bus by two 230-kV lines. The output of each gas turbine was taken to be 190 MW, and the steam unit was assumed to produce 255 MW. Each turbine/generator unit will have a dedicated 15/230-kV, 18/230kV step-up transformer connecting the unit to the RCEC Switchyard. The RCEC will be connected at the 230-kV voltage level to the PG&E transmission grid via two new 230-kV generation tie lines into the Eastshore 230-kV bus. In addition, the Pittsburg to San Mateo 230-kV line is looped into the Eastshore Substation so that Eastshore Substation is modeled with six 230-kV lines (two from San Mateo, two from Pittsburg, and two from the RCEC).
- The base case: This case removes the RCEC and the loop into Eastshore Substation to assess system conditions without the RCEC. Generation balance for this case was maintained by increasing generation at Moss Landing Unit 6. This is the case to which all other cases were compared to assess system impacts.

Approximately 300 contingencies were studied. A list of the power flow contingencies is given in Appendix 6-C. These contingencies were derived from the contingencies provided by PG&E for the DEC and MEC Detailed Facilities Studies. Additional contingencies were generated to account for generation and transmission projects that were included in the base case as well as for the addition of the RCEC. For the normal conditions, the line and transformer ratings were assumed to be the first rating in the power flow data (Rate 1). This is assumed to be the Summer Normal Rating. For emergency conditions, the second rating in the power flow data was used (Rate 2). While not used, the third rating (Rate 3) is presumed to be the Winter Normal Rating. The set monitored for overloads included facilities with a base voltage greater than 100 kV in the Bay Area as well as facilities immediately adjacent to the Bay Area.

For the normal condition, all power flow controls were assumed to be active. For the emergency condition area, interchange controls and transformer taps were assumed to be inactive to simulate the situation a few seconds following the contingency.

For each scenario, three different reports were prepared. The first is a Case Summary Report, which identifies and confirms the study parameters for each scenario evaluated. The second is an Overload Summary Report showing all the overloaded facilities along with their base voltage, interchange area, zone, normal flow, and percentage overload for the worst contingency. The third report gives the results for the base case (Appendix 6-D) and the study plan scenarios (Appendix 6-E).

6.3.1.2 Loop of Pittsburg (Contra Costa) to San Mateo 230-kV into Eastshore

The simplest configuration for interconnection of the RCEC would be to loop into either the Eastshore-to-San Mateo or the Pittsburg-(Contra Costa)-to-San Mateo 230-kV circuits. However, such a connection would clearly cause an emergency overload on the remaining circuit if one of the circuits leaving the RCEC are lost. Radial connection of the RCEC to the Eastshore bus mitigates this by insuring that local load and the 115-kV system are available for loss of one of the 230-kV circuits. However, without looping the Pittsburg (Contra Costa) to San Mateo 230-kV circuit into Eastshore as well, system overloads of the remaining 230-kV circuit, the 230/115-kV transformers, or the 115-kV lines exiting Eastshore to Grant or Dumbarton will occur.

Consequently, the project contemplates looping the Pittsburg (Contra Costa) to San Mateo 230 circuit into the Eastshore Substation. This modification will insure that there will always be at least three 230-kV exits under all single-contingencies.

6.3.1.3 Analysis of the Base Results

Table 6.3-3 shows potential impacts based on the study plan scenario. Under this configuration, there are two impacts that result from the addition of the RCEC to the system. These potential impacts are overloads on the two Eastshore to San Mateo 230-kV circuits, which both overload to up to 106% of the emergency rating of the line under overlapping contingencies, and the Eastshore 230/115-kV transformers, which are overloaded prior to the addition of the RCEC. The overloads and contingencies causing each overload are summarized in Table 6.3-3.

Eastshore 230/115-kV Transformers

While these transformers overload in the study plan, they are also overloaded in the base case. Consequently, they are not an impact that can be attributed to the RCEC. The 115-kV system serving Mount Eden, Grant, and Dumbarton is supplied by the two 230/115-kV transformers at Eastshore and the Newark to Dumbarton 115-kV line. The transformers and the 115-kV line have emergency ratings of 144 and 189 MVA, respectively. Assuming loss of the Newark to Dumbarton 115-kV line, which is the highest rated element, the maximum emergency supply is 288 MVA. Based on the power flow case the loads total to 287 MVA. Thus, with line and transformer losses, it is easy to see that the system has to overload. This is an existing problem that must be addressed and therefore it is not an impact attributable to the RCEC.

Table 6.3-3. System overloads with the RCEC.

Facility	Caused by Contingency	Flow (MVA)	%Emergency Rating
Eastshore to San Mateo #1 230-kV	Overlapping Contingency—Loss of Potrero 7C and Eastshore to San Mateo #2	477	106
	Overlapping Contingency—Loss of UGGPP P4 and Eastshore to San Mateo #2	463	102
Eastshore to San Mateo #2 230-kV	Overlapping Contingency—Loss of Potrero 7C and Eastshore to San Mateo #1	477	106
	Overlapping Contingency—Loss of UGGPP P4 and Eastshore to San Mateo #1	463	102
Eastshore 230/115-kV transformer #1	Loss of 230/115-kV #2	190	132
	Loss of Dumbarton to Newark 115-kV	151	105
Eastshore 230/115-kV transformer #2	Loss of 230/115-kV #1	189	131
	Loss of Dumbarton to Newark 115-kV	150	104

Eastshore to San Mateo 230-kV

The Eastshore to San Mateo 230-kV overloads are based on the 396 MVA normal and 449 MVA emergency ratings on these lines as specified in the Study Plan. All analysis was conducted using these ratings. Since these lines are in PG&E's coastal zone and are generally subject to higher average winds, it has been determined that 4 ft/sec line ratings may be used on these lines. The appropriate 4 ft/sec line ratings for these lines are 433 MVA normal and 481 MVA emergency. Examination of the third column of Table 6.3-3 shows that the Eastshore to San Mateo 230-kV lines exceed neither their normal nor emergency ratings if 4 ft/sec ratings are used.

6.3.1.4 Power Flow Analysis Conclusions

The System Impact Study shows that the addition of the loop of the Pittsburg (Contra Costa) 230-kV line into Eastshore Substation mitigates all potential transmission impacts attributable directly to operation of the RCEC. Consequently, operation of the RCEC would cause no unmitigated negative impacts to the transmission system beyond the first point of interconnection of the project.

6.3.2 Post Transient Analysis

The transmission owner (PG&E), the Cal-ISO, and the CEC staff have agreed that a post-transient analysis is not required for Data Adequacy. This conclusion was based on the opinion of the experts that the addition of the RCEC to the grid would not likely result in post-transient stability problems. Since synchronous generators such as those proposed provide voltage support to the system, and the interconnection is designed so that no single contingency can remove the generator from the system, it was the consensus of the experts that the impact of the RCEC on system post-transient performance is likely to be only positive.

6.3.3 Transient Analysis

In accordance with the Study Plan, a transient stability analysis was performed to determine whether the RCEC project would cause criteria violations sufficient to require transmission system modifications beyond those identified in the engineering and power flow analysis. The assumptions and results of this analysis follow.

6.3.3.1 Dynamic Stability Study Conclusions

During summer peak hours, no system dynamic or transient instability was identified due to addition of the project.

6.3.3.2 Dynamic Stability Study Base Case Assumptions

The dynamic stability study was conducted using the same PG&E Summer Peak Full Loop Case used in the load flow analysis, in conjunction with a 'full loop' system dynamics data file provided by PG&E, modified to include other generation projects assumed on-line for this system study. The dynamics modeling data for the project was translated into General Electric's Positive Sequence Dynamics Simulation program format.

6.3.3.3 Dynamic Stability Analysis Results

Five contingencies were tested for system dynamic stability response with addition of the RCEC project. Table 6.3-4 shows the contingencies tested and the resulting stable system responses for the tested contingencies.

Table 6.3-4. RCEC project summer peak transient stability summary.

	3-Phase Bus Fault	Component Outage	Clearing Time (cycles)	Summer w/ Project Stable/ Unstable	Summer w/o Project[1] Stable/ Unstable
1.	RCEC 230-kV	Full Load Project Generation Rejection	6	Stable	
2.	RCEC 230-kV	'B' RCEC-Eastshore #1 230-kV	6	Stable	---
3.	Eastshore 230-kV	'B' Eastshore-San Mateo #1 230-kV	6	Stable	---
4.	Eastshore 230-kV	'B' Eastshore-Pittsburg #12 230-kV	6	Stable	---
5.	Pittsburg 230-kV	'C' Pittsburg 230-kV bus section (bus1 section E)	6	Stable	---

[1]'Without Project' analysis performed only if 'With Project' case is unstable.

Appendix 6.3-F provides the dynamic data for the project in GE format. Appendix 6-G contain sets of plots illustrating various system performance parameters for modeled monitoring points at the project, within PG&E's system, and remote locations on the greater WSCC system. There are five sets of plots corresponding to each of the outage cases used in the dynamic stability analysis. Appendix 6-H provides the execution control files for the five tested contingencies.

6.3.4 Fault Analysis

Using power flow data and other publicly available data, a short circuit data case was constructed that is sufficient to reasonably simulate the response of the transmission system to operation of the RCEC. PG&E's confidential short-circuit data will be used for its System Impact Study.

6.3.4.1 Short-Circuit Assumptions

While the power flow and transient stability data that has been employed to create the short-circuit model include sufficient information to evaluate three-phase faults, the lack of zero sequence and transformer connection data makes the calculation of single-line-to-ground faults impossible. However, since a single-line-to-ground fault current can be readily limited to the three-phase fault current value by the addition of neutral impedances, the three-phase fault current is sufficient for determining overall system impacts.

It can also be said that the computed increment in three-phase fault current due to a generator addition is exact. Since short-circuit calculations are linear, assuming that the power flow network model is accurate, the increase in flows throughout the network due to the generator addition will also be exact. However, the base case short circuits depend on the generators modeled throughout the system.

Western Loop

A full power flow model of the entire WSCC was initially selected because associated dynamic data were available with this case. The selected case is the 2003 Heavy Summer "Must Run" case developed in 1998 (1997 data). However, the dynamic data turned out to be unnecessary because it was determined that the generator sub-transient impedances were included in the power flow case. To fit the case within the existing dimensions of the Short Circuit program, this power flow case was reduced slightly by eliminating buses in areas remote from California.

Results from the converted case were compared to known fault currents computed by PG&E in various Detailed Facilities Studies. While these results compared well enough for the purpose outlined here, we were unable to continue with this case because significant detail on the low-voltage system was missing. This analysis will be completed in PG&E's System Impact Study.

PG&E Case

To produce a model that includes sufficient detail for accurate calculation of short-circuit currents at the RCEC, a PG&E Planning Assessment case, as modified for use in the Delta Energy Center (DEC) Detailed Facilities Study, was used. However, GE (.epc) format data cases such as this one do not include the generator sub-transient impedances necessary to perform a short-circuit calculation. This data was retrieved from the PG&E loop case. Since the bus numbers are not the same in both cases, they needed to be matched to allow the dynamic data to be included in the new model.

For the majority of cases, a match was possible. However, there are three instances where a match was not possible. First, the loop case did not have models of most of the new generators that are being added to the system. Second, in some instances generators were not modeled in the reduced loop model. Finally, even when they were modeled, occasionally the loop model inexplicably lumped generation. For example, some of the older Pittsburg units were lumped together. Whenever possible, these instances were resolved. The impact of missing generation always has the effect of lowering the predicted fault levels. However, when the fault-current levels were compared to known values, the values predicted by the model matched known values closely enough for purposes of the study. If detailed engineering is to be accomplished using these data, then careful review of the model, particularly in the vicinity of the study area, is necessary.

PG&E's planning assessment cases are a truncated model of the system with a fictitious injection of power at the tie points at Malin and Vincent. The fault contributions at these tie points were computed from the full loop case as shown in Table 6.3-5.

Table 6.3-5. Fault contributions.

Location	Contribution	Magnitude	Angle	Resistance	Reactance
Malin	Malin	7.0372	-85.633	0.0108	0.1417
	Malin	34.656	-84.416	0.0028	0.0287
	Grizzly	23.591	-85.044	0.0037	0.0422
Vincent	Lugo 1	48.295	-87.532	0.0009	0.0207
	Lugo 2	48.295	-87.532	0.0009	0.0207
	Vincent 1	35.662	-85.346	0.0023	0.0279
	Vincent 2	33.763	-85.002	0.0026	0.0295
	Vincent 3	33.513	-85.069	0.0026	0.0297

RCEC Plant Interconnection

The sub-transient reactances for the generators at the RCEC were obtained from the transient stability data provided for the project. For the RCEC steam turbine-generator "xd" is 0.2848 (311 MVA Base), and "xd" for the combustion turbine-generators is 0.1917 (226 MVA Base). These values yield admittance values of –7.935 pu and –11.79 pu, respectively, on the system base of 100 MVA. A number of generation projects in the Bay Area that are expected to be on-line ahead of the RCEC were also included in the analysis. These projects include DEC, LMEC, Fremont Generating Project, Los Esteros Generating Project, United Golden Gate Power Project, Potrero Expansion Project, and SECAL. In the absence of dynamic data for these projects, the steam and combustion units for these projects were assumed to have the same admittance values as the RCEC generators.

6.3.4.2 Short Circuit Conclusions

Table 6.3-6 shows the fault duties at the buses near the Eastshore Substation.

Table 6.3-6. Short circuit duties near Eastshore Substation.

		Short Circuit Currents (kA)			
Station	**kV**	**LMEC, DEC, No RCEC**	**LMEC, DEC, AND RCEC**	**New Bay Generators, No RCEC**	**New Bay Generators AND RCEC**
Eastshore 230-kV	230	14.0	21.6	14.2	22.1
Eastshore 115-kV	230	16.9	18.7	17.3	19.1
Grant	115	11.7	12.5	11.9	12.7
Mt. Eden	115	15.3	16.7	15.6	17.0
Dumbarton	115	19.5	20.3	20.0	20.9
Newark 230-kV	115	33.4	33.8	36.3	36.7
Newark 115-kV	115	45.9	46.6	49.5	50.2
San Mateo	230	22.2	23.4	22.2	23.8
San Mateo	115	30.0	30.7	38.7	40.8
Contra Costa PP	230	35.4	35.5	35.8	35.8
Pittsburg 230-kV	230	51.4	52.2	52.1	52.9
Pittsburg 115-kV	230	55.1	55.2	55.3	55.4

The column showing results for the current system with the Los Medanos Energy Center (LMEC) and Delta Energy Center (DEC) attached provide both the base for this study and model validation. The fault currents for the Contra Costa PP and Pittsburg 230-kV and the Pittsburg 115-kV buses compare favorably to those calculated in previous studies (35.4, 51.4, 55.1 versus 33.1, 53.6, 51.2 kA, respectively).

The increased fault duties are well within the capabilities of existing circuit breakers, so there is no impact that cannot be mitigated by a breaker replacement. In all cases, the increases in fault currents are moderate, making any breaker replacements to correct interrupting duty problems unlikely. Breaker duties for breakers in the vicinity of the RCEC are included in Appendix 6-I.

6.4 TRANSMISSION LINE SAFETY AND NUISANCES

This section discusses safety and nuisance issues associated with the proposed electrical interconnection of the RCEC. Construction and operation of the proposed overhead transmission line will be undertaken in a manner to ensure the safety of the public as well as maintenance and right-of-way crews, while supplying power with minimal electrical interference.

6.4.1 Electrical Clearances

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

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

The proposed RCEC transmission interconnection will be designed to meet all national, state, and local code clearance requirements. Since the designer must take into consideration many different situations, the generalized dimensions provided in the figures of this section should be regarded as reference for the electric and magnetic field calculations only and not absolute. The minimum ground clearance for 115-kV transmission per the NESC is 20.1 feet, based on the road-crossing minimum. The minimum ground clearance for 230-kV transmission per the NESC is 22.4 feet, based on the road-crossing minimum. These are the design clearances for the maximum operating temperature of the line. Under normal conditions, the line operates well below maximum conductor temperature, and thus the average clearance is much greater than the minimum. The electrical effects calculations are based on a 30-foot clearance for 115-kV and 230-kV lines per Pacific Gas and Electric Company ("PG&E") guidelines. The final design value will be consistent with General Order 95 (GO-95) of the California Public Utilities Commission and PG&E's guidelines for electric and magnetic field (EMF) reduction.

6.4.2 Electrical Effects

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

6.4.2.1 Electric and Magnetic Fields

Operating power lines, like the energized components of electrical motors, home wiring, lighting, and all other electrical appliances, produce electric and magnetic fields, commonly referred to as EMF. The EMF produced by the alternating current electrical power system in the United States has a frequency of 60 Hz, meaning that the intensity and orientation of the field changes 60 times per second.

The 60 Hz power line fields are considered to be extremely low frequency. Other common frequencies are AM radio, which operates up to 1,600,000 Hz (1,600 kHz); television, 890,000,000 Hz (890 MHz); cellular telephones, 900,000,000 Hz (900 MHz); microwave ovens, 2,450,000,000 Hz (2.4 GHz); and X-rays, about 1 billion (10^{18}) hertz. Higher frequency fields have shorter wavelengths and greater energy in the field. Microwave wavelengths are a few inches long and have enough energy to cause heating in conducting objects. Higher frequencies, such as X-rays, have enough energy to cause ionization (breaking of molecular bonds). At the 60 Hz frequency associated with electric power transmission, the electric and magnetic fields have a wavelength of 3,100 miles and have very low energy that does not cause heating or ionization. Unlike radio-frequency (RF) fields, the 60 Hz fields do not radiate.

Electric fields around transmission lines are produced by electrical charges on the energized conductor. Electric field strength is directly proportional to the line's voltage; that is, increased voltage produces a stronger electric field. The electric field is inversely proportional to the distance from the conductors, so that the electric field strength declines as the distance from the conductor increases. The strength of the electric field is measured in units of kilovolts per meter (kV/m). The electric field around a transmission line remains practically steady and is not affected by the common daily and seasonal fluctuations in usage of electricity by customers.

Magnetic fields around transmission lines are produced by the level of current flow, measured in terms of amperes, through the conductors. The magnetic field strength also is directly proportional to the current; that is, increased amperes produce a stronger magnetic field. The magnetic field is inversely proportional to the distance from the conductors. Thus, like the electric field, the magnetic field strength declines as the distance from the conductor increases. Magnetic fields are expressed in units of milligauss (mG). The amperes and, therefore the magnetic field around a transmission line, fluctuate daily and seasonally as the usage of electricity varies.

Considerable research has been conducted over the last 30 years on the possible biological effects and human health effects from EMF. This research has produced many studies that offer no uniform conclusions about whether long-term exposure to EMF is harmful or not. In the absence of conclusive or evocative evidence, some states, California in particular, have chosen not to specify maximum acceptable levels of EMF. Instead, these states mandate a program of prudent avoidance whereby EMF exposure to the public would be minimized by encouraging electric utilities to use low-cost techniques to reduce the levels of EMF. Additional information on EMF is provided in Appendix 6-J.

6.4.2.2 Audible Noise

Corona is a function of the voltage of the line, the diameter of the conductor, and the condition of the conductor and suspension hardware. The electric field gradient is the rate at which the electric field changes and is directly related to the line voltage.

The electric field gradient is greatest at the surface of the conductor. Large-diameter conductors have lower electric field gradients at the conductor surface and, hence, lower corona than smaller conductors, everything else being equal. Also, irregularities (such as nicks and scrapes on the conductor surface) or sharp edges on suspension hardware concentrate the electric field at these locations and, thus, increase corona at these spots. Similarly, contamination on the conductor surface, such as dust or insects, can cause irregularities that are a source for corona. Raindrops, snow, fog, and condensation are also sources of irregularities. Corona typically becomes a design concern for transmission lines having voltages of 345 kV and above.

6.4.2.3 EMF and Audible Noise Assumptions

It is important that any discussion of EMF and audible noise include the assumptions used to calculate these values and to remember that EMF and audible noise in the vicinity of the power lines vary with regard to line design, line loading, distance from the line, and other factors.

Both the electric field and audible noise depend upon line voltage, which remains nearly constant for a transmission line during normal operation. A worst-case voltage of 121 kV (115 + 5%) will be used in the EMF calculations for the 115-kV lines, and 242 kV (230-kV + 5%) will be used in the EMF calculations for the 230-kV lines.

The magnetic field is proportional to line loading (amperes), which varies as power plant generation is changed by the system operators to meet increases or decreases in demand for electrical power. Line loading values assumed for the EMF studies were based on PG&E's 2003 Summer Peak Full-Loop Base Case, which was developed from PG&E's 2001 base case series. The RCEC plant was assumed to be operating at a maximum nominal net generation of 620 megawatts (MW). The power will be transmitted from the power plant toward the Eastshore Substation. A power flow study was conducted, as described below, to calculate how the power is expected to distribute over the Eastshore outgoing circuits. The calculated power flow values used in the EMF calculations are presented in Table 6.4-1.

Another important parameter for these studies is the phase arrangement of the lines, both existing and after the RCEC is interconnected to the grid. The phasing (i.e., relative positions of A, B, and C phases) on a multi-circuit structure may offer some field cancellation, which results in reduced magnetic field values at the right-of-way edge. Studies have shown that cross-phasing double-circuit lines provides magnetic field reduction when both circuits are carrying power in the same direction. In cross-phasing, the circuit on one side of the structure is configured, for example, with phases A, B, and C arranged from top to bottom, while the other circuit is configured C, B, A from top to bottom. In this particular study the existing lines already incorporate cross-phasing. The data used for the EMF and audible noise studies can be noted from the discussions contained in the following paragraphs and the figures included in the following pages.

Figure 6.4-1 illustrates the plan view of the specific transmission lines represented by the four cross-sections (A1, A2, B, and C) that were included in the EMF studies. Cross-section A1 represents the corridor for EMF values calculated without the RCEC and is the existing Eastshore-Grant line. Cross-section A2 represents the same corridor for the EMF values calculated with the RCEC. Though the

Table 6.4-1. Normal flows out of Eastshore Substation at peak.

Line	Normal Rating (Amps)	*Base Case	*Study Plan	Low San Francisco Generation	Low Newark Generation	Low San Francisco and Newark Generation	High Pittsburg Generation
		PG&E 2003 Summer Peak (RCEC Study) Case Line Flow (Amps)					
Eastshore to RCEC #1 230-kV	***	N/A	-746	-750	-752	-756	-750
Eastshore to RCEC #2 230-kV	***	N/A	-746	-750	-752	-756	-750
Eastshore to San Mateo #1 230-kV	994	-220	595	944	749	1075	933
Eastshore to San Mateo #2 230-kV	994	376**	595	944	749	1075	933
Eastshore to Grant #1 115-kV	346	140	140	140	140	139	140
Eastshore to Grant #2 115-kV	346	140	140	140	140	139	140
Eastshore to Dumbarton 115-kV****	838	86	479	287	629	443	763

NOTE: All flows are referenced from the Eastshore Substation so that a negative sign indicates flow into Eastshore and a positive number indicates flow out of Eastshore.

* EMF calculations were based on Base Case and Study Plan line flows

** Construction of the RCEC entails looping the Pittsburg to San Mateo 230-kV line into the Eastshore Substation, thereby creating Eastshore to San Mateo #2 and Eastshore to Pittsburg #2. The 376 Amp value in the base case column represents the flow on the original Pittsburg to San Mateo line, where current flow is from Pittsburg to San Mateo.

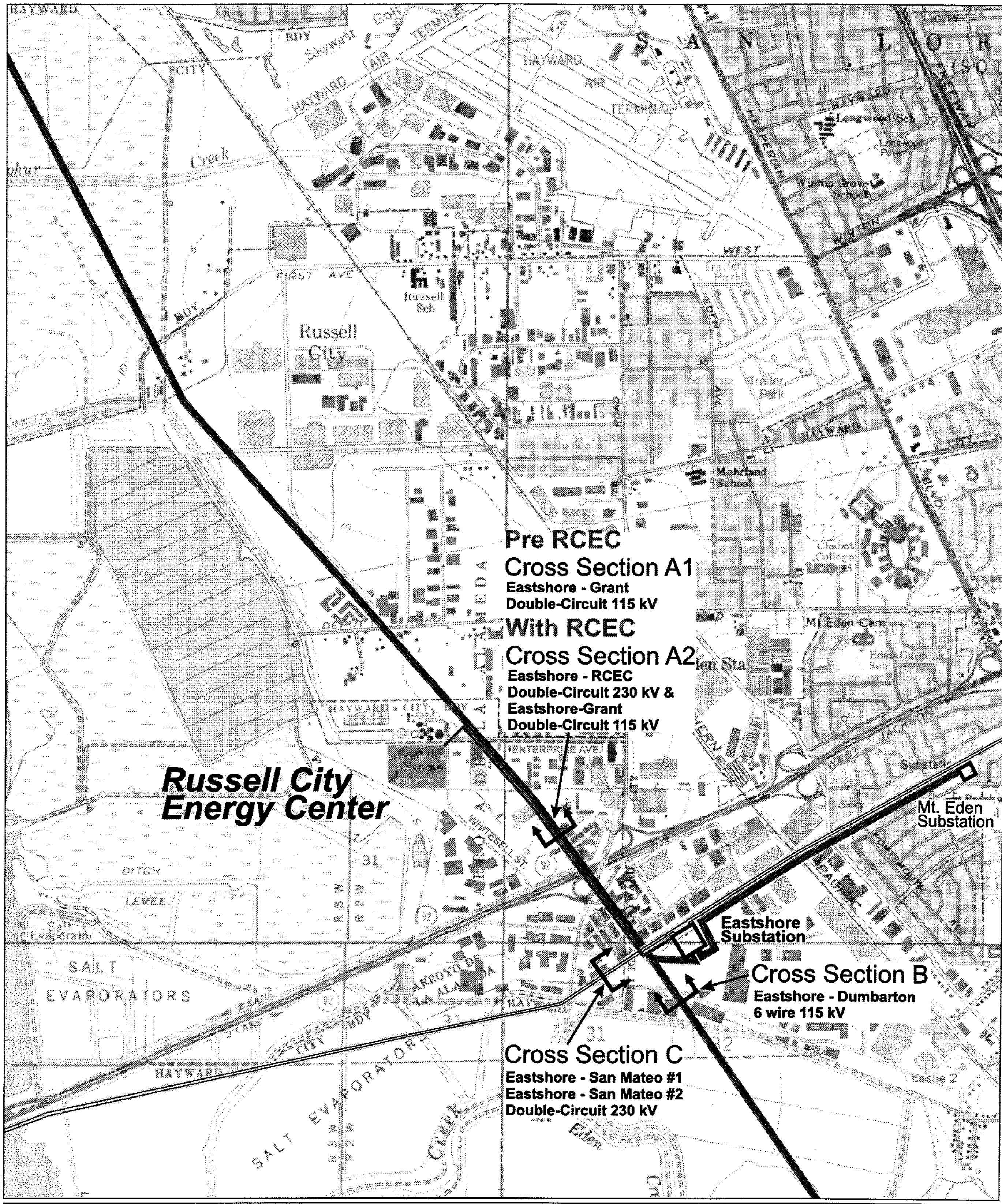
*** These lines are part of the RCEC project and will be designed to have a sufficient rating.

**** Six-wire circuit

cross sections represent the same corridor, the structure used after the addition of the RCEC will support all four circuits and the existing 115-kV towers will be removed. The two proposed 230-kV circuits would be constructed over the existing 115-kV circuits for approximately 4,500 feet to the Eastshore Substation. Cross-sections B and C are representative of the indicated transmission lines for the EMF values calculated without the RCEC and also for the EMF levels expected after the RCEC. In addition, for purposes of calculating magnetic field, it is assumed in this study that the lowest clearance for all cross sections described above is 30 feet at mid-span.

Figure 6.4-2 is Cross-section A1 and represents the existing PG&E Eastshore-Grant double-circuit 115-kV line. The cross-phasing configuration, conductor and shield wire used, and dimensions assumed for the EMF studies are pictured. After the RCEC interconnection, Cross-section A2, illustrated in Figure 6.4-3, will be representative of the proposed RCEC to Eastshore corridor. The proposed four-circuit structure, the horizontal cross-phasing configurations, conductor and shield wire used, and dimensions assumed for the EMF studies are pictured.

Cross-section B, as seen in Figure 6.4-4, is the PG&E Eastshore-Dumbarton 115-kV corridor. The lattice towers carry a 6-wire circuit. Cross-section B is just south of the Eastshore Substation site. The phasing configuration, conductor and shield wire, and dimensions assumed for the EMF studies are pictured.



Proposed Radial Connection
Existing 115 kV Transmission Line
Existing 230 kV Transmission Line
Proposed Russell City Energy Center

N W E S

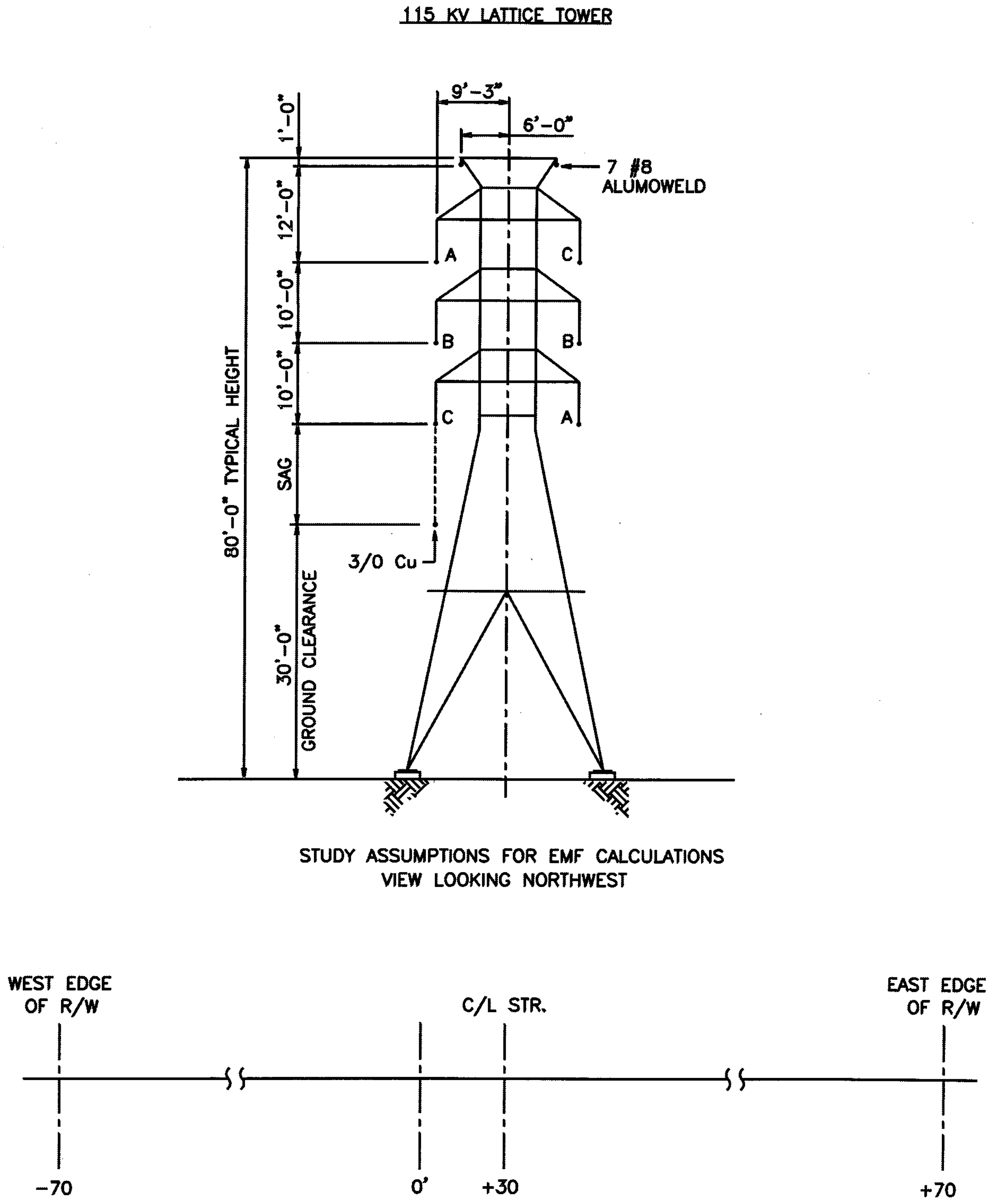
Scale: 1" = 2,000'
0 1000 2000
FEET

California

Figure 6.4-1
EMF Study Cross Sections
Proposed Russell City Energy Center
Hayward, California
Calpine

Prepared By: May 7, 2001
Commonwealth Associates Inc.
Jackson, Michigan
Engineers • Consultants • Construction Managers

Basemap: SureMaps Raster - USGS 7.5 Minute Topographic Quadrangle Maps.



NOT TO SCALE
ALL DIMENSIONS AND PHASING ARE ESTIMATES
AND ARE PROVIDED FOR PURPOSES OF CALCULATING EMF ONLY

Cross Section A1
115 kV Typical Double-Circuit Structure

Figure 6.4-2

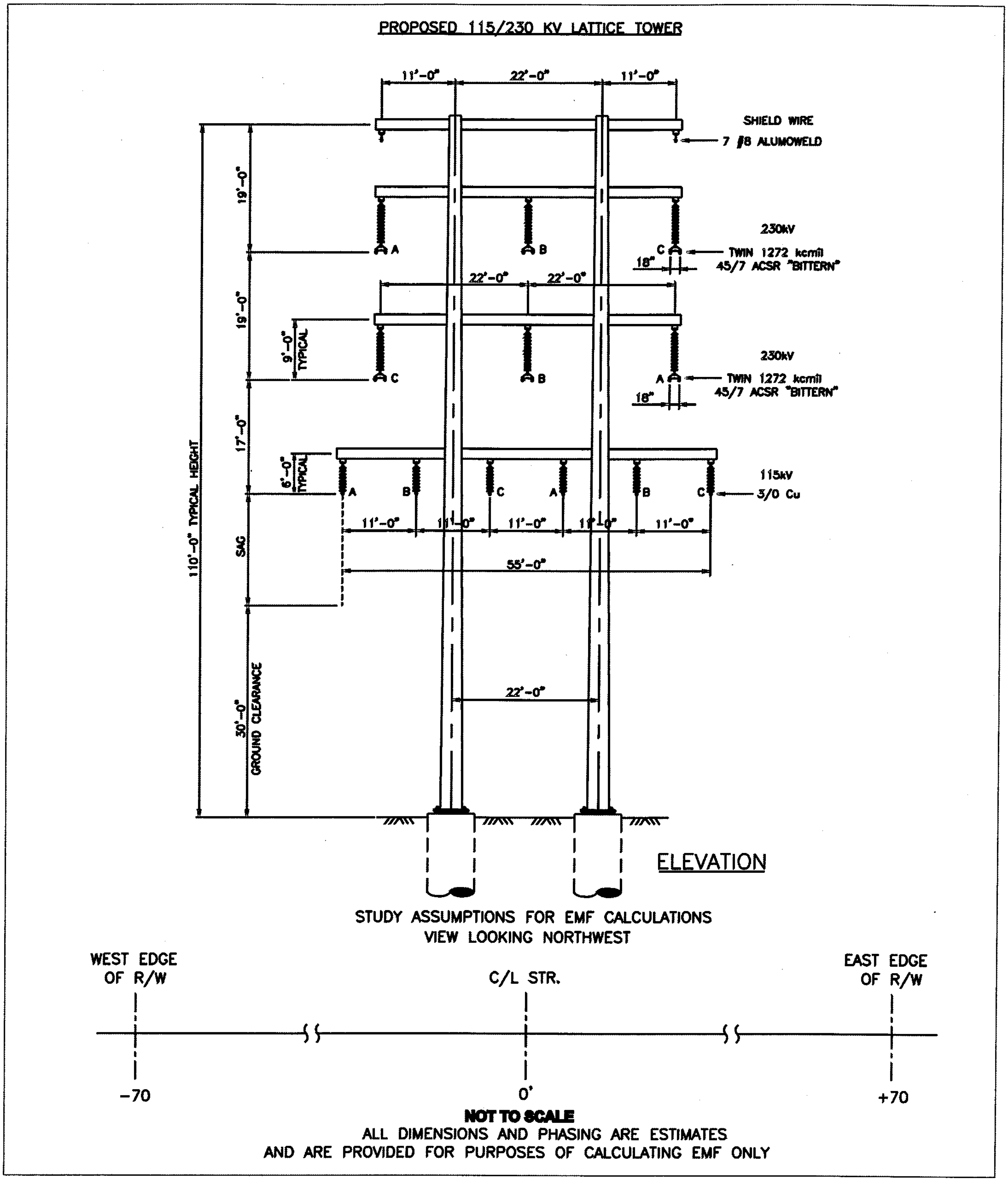
May 7, 2001

Russell City Energy Center -
Calpine/Bechtel

Prepared By:
Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers

Russell City Energy Center AFC

May 2001



Cross Section A2
115/230 kV Transmission Line Tangent

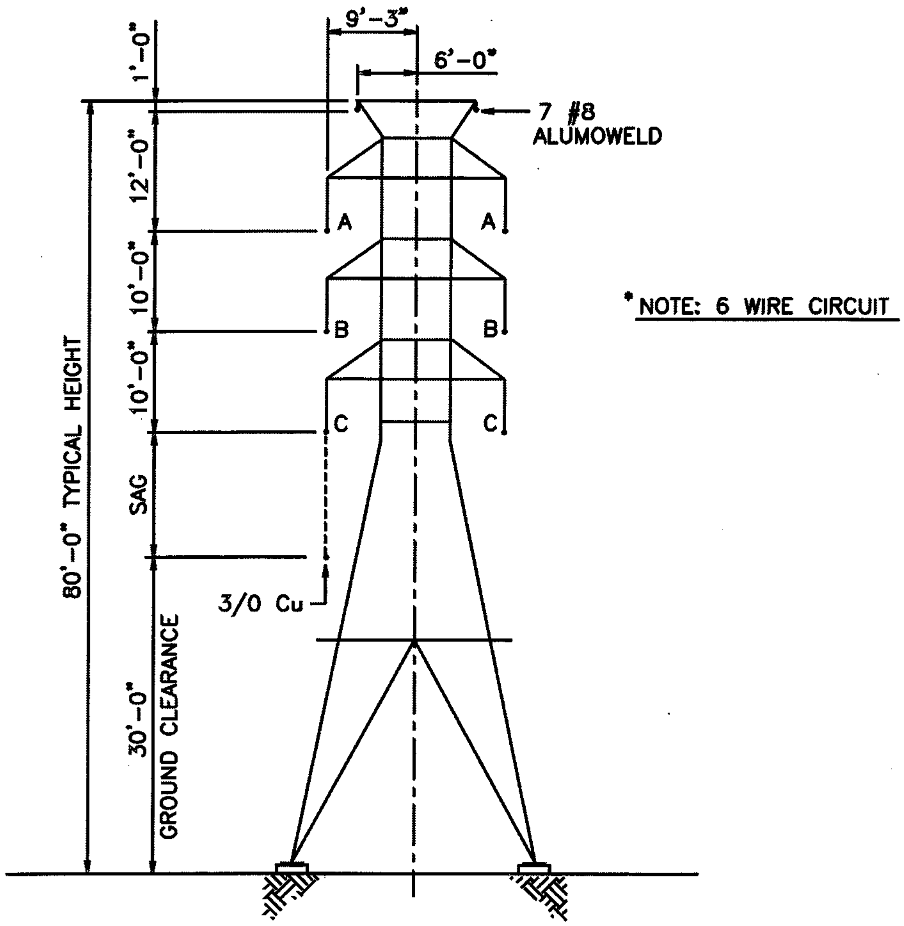
Russell City Energy Center - Calpine/Bechtel

Figure 6.4-3

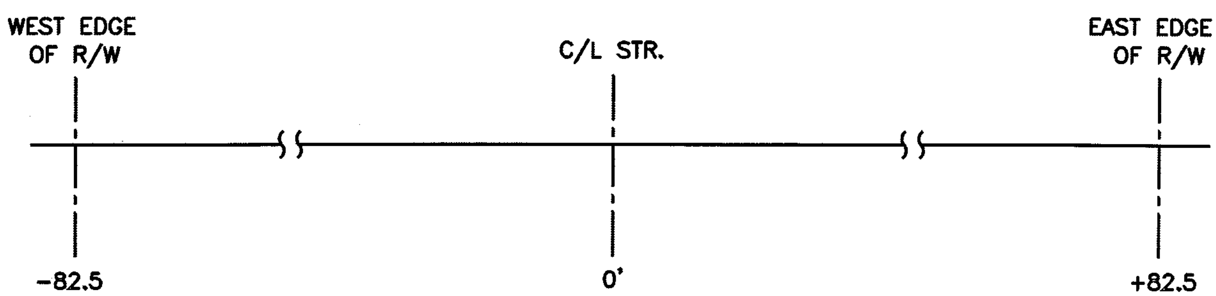
May 7, 2001

Prepared By: Commonwealth Associates Inc. Jackson, Michigan
Engineers Consultants Construction Managers

115 KV LATTICE TOWER



STUDY ASSUMPTIONS FOR EMF CALCULATIONS
VIEW LOOKING NORTHWEST



NOT TO SCALE
ALL DIMENSIONS AND PHASING ARE ESTIMATES
AND ARE PROVIDED FOR PURPOSES OF CALCULATING EMF ONLY

Cross Section B
115 kV Typical Double-Circuit Structure

Figure 6.4-4

May 7, 2001

Russell City Energy Center -
Calpine/Bechtel

Prepared By:
Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers

Cross-section C is illustrated in Figure 6.4-5. This section consists of existing PG&E 230-kV double-circuit lattice towers. The assumed phasing, conductor and shield wire, and dimensions used for the EMF studies are pictured.

EMF Calculations

EMF levels were calculated at one meter above flat terrain using ENVIRO, a TLWorkstation (TLW) program developed by the Electric Power Research Institute. Measurements for electric and magnetic fields at one meter above the ground surface are in accordance with the Institute of Electrical and Electronic Engineers (IEEE) standards. ENVIRO calculates the electric field levels expressed as kilovolts per meter (kV/m) and the magnetic field levels expressed in milliGauss (mG). The various inputs for the calculations include voltage, current load (amps), current angle (i.e., phasing), conductor type and spacing, number of subconductors, subconductor bundle symmetry, spatial coordinates of the conductors and shield wire, various labeling parameters, and other specifics. The field level is calculated perpendicular to the line and at mid-span where the overhead line sags closest to the ground (calculation point). The mid-span location, therefore, provides the maximum value for the field. Also using an ENVIRO mathematical model, audible noise is calculated at a 5-foot microphone height above flat terrain with information concerning rain, snow, and fog rates for daytime and nighttime hours as input. Audible noise is expressed in decibels (db(A)). Graphs and tables in support of Section 6 were produced by importing ENVIRO data into Microsoft Excel.

A power flow model was developed from a PG&E data set (PG&E's 2003 Summer Peak Full-Loop Base Case). Two scenarios were calculated for comparison:

- without the proposed RCEC operating (Base Case)
- with the proposed RCEC nominal net generation of 620 MW added (Study Plan)

The variations in the power flow for the studied cross sections are presented in the following table.

Results of EMF and Audible Noise Calculations

Electric Field and Audible Noise

Line voltage and arrangement of the phases determine the electric field. The PG&E lines represented by Cross-sections B and C have no changes in either the voltage or the phasing. Therefore, the electric field in these vicinities will remain the same. However, the corridor represented by Cross-sections A1 and A2 has both voltage and phasing changes. The analytical results of the electric field are shown in Appendix 6-K. Graphical views are shown in Figures 6.4-6 through 6.4-9.

The highest levels of corona and, hence, audible noise will occur during foul weather when the line conductors are wet. For these conditions, the conductor will produce a small amount of corona. However, no change in audible noise over the existing lines will occur because the conductor and voltages will remain the same as those of the existing system. For the proposed tap line, the hardware used to connect the conductors to the structures will be of low-corona design. Special care will be employed during stringing of the conductor to minimize nicks and scrapes to the conductor. These actions will ensure a low-corona design. The analytical results for the audible noise calculations are shown in Appendix 6-L. Graphical views are shown in Figures 6.4-10 through 13.

Magnetic Field

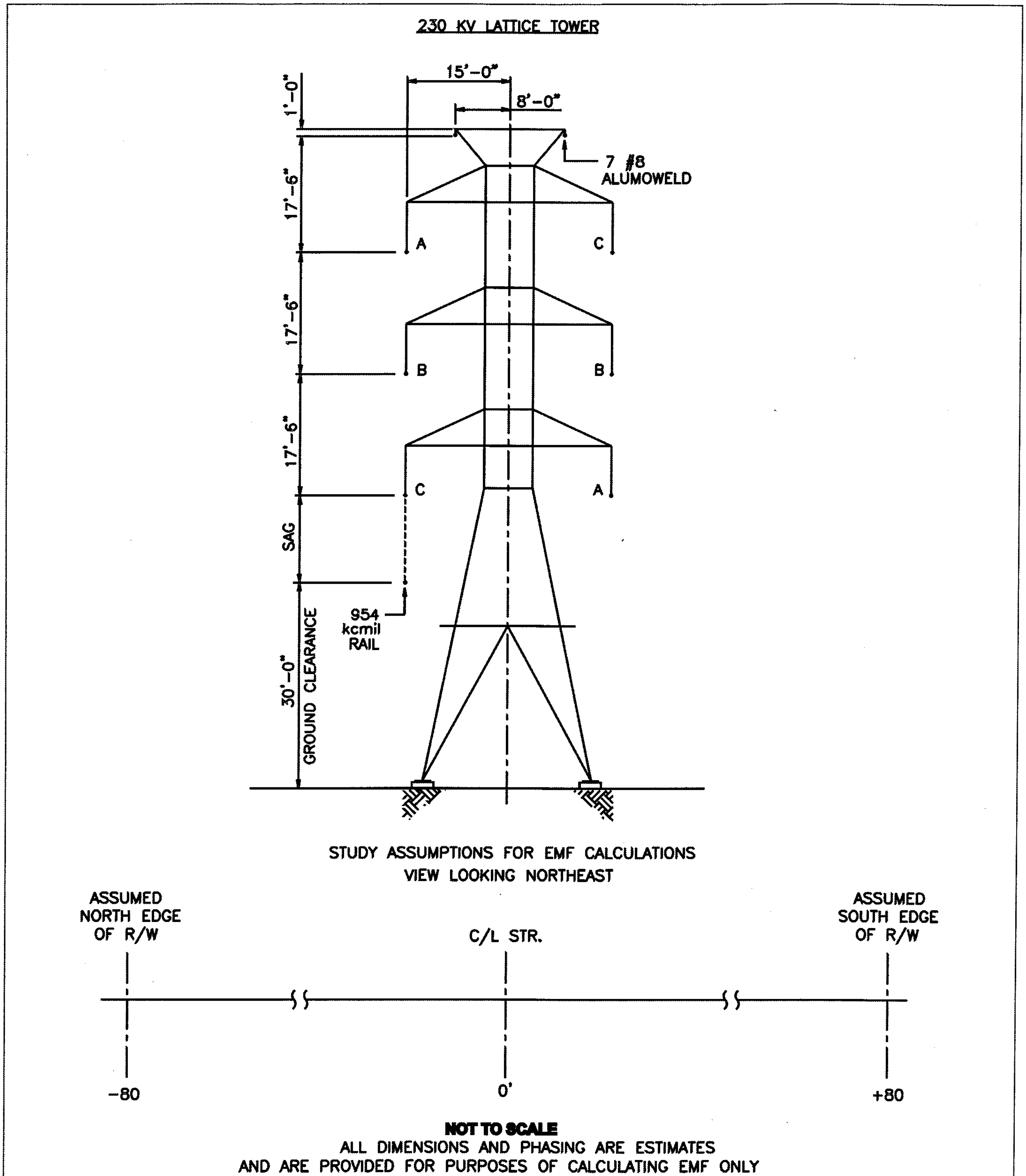
The complete analytical results of the magnetic field calculations are provided in Appendix 6-M, and a graphical view is given in Figures 6.4-14 through 16. Table 6.4-2 summarizes calculated values for the magnetic field. The ±70 feet from centerline coincides with the edge of right-of-way for Cross-sections A1 and A2 and the ±80 feet from the centerline represents the edge of right-of-way for Cross-sections B and C. For each cross-section, the distance is given where the maximum field value was located.

Table 6.4-2. Magnetic field (mG), calculated field at mid-span perpendicular to transmission centerline.

	Distance from Transmission Centerline (feet)				
System at Peak Load	**-80**	**-70**	**Location of Maximum Value**	**+70**	**+80**
Cross-section A1	**West of Centerline**		**+30**	**East of Centerline**	
Without RCEC Plant		0.54	12.18	3.84	
Cross-section A2			**At Centerline**		
With RCEC Plant		19.09	61.98	18.30	
Cross-section B	**West of Centerline**		**At Centerline**	**East of Centerline**	
Without RCEC Plant	1.31		6.53		1.32
With RCEC Plant	7.32		36.46		7.36
Cross-section C	**North of Centerline**		**+15**	**South of Centerline**	
Without RCEC Plant	13.82		55.54		16.22
			At Centerline		
With RCEC Plant	10.28		83.81		9.58

Transmission Line EMF Reduction

While the State of California does not set a statute limit for electric and magnetic field levels, the California Public Utilities Commission (CPUC), which regulates electric transmission lines, mandates EMF reduction as a practicable design criterion for new and upgraded electrical facilities. As a result of this mandate, the regulated electric utilities, including PG&E, have developed their own design guidelines to reduce EMF at each new facility. The CEC, which regulates new transmission lines from new generators to the point of connection to the utility grid, requires generators to follow the existing guidelines that are in use by local electric utilities or transmission-system owners.



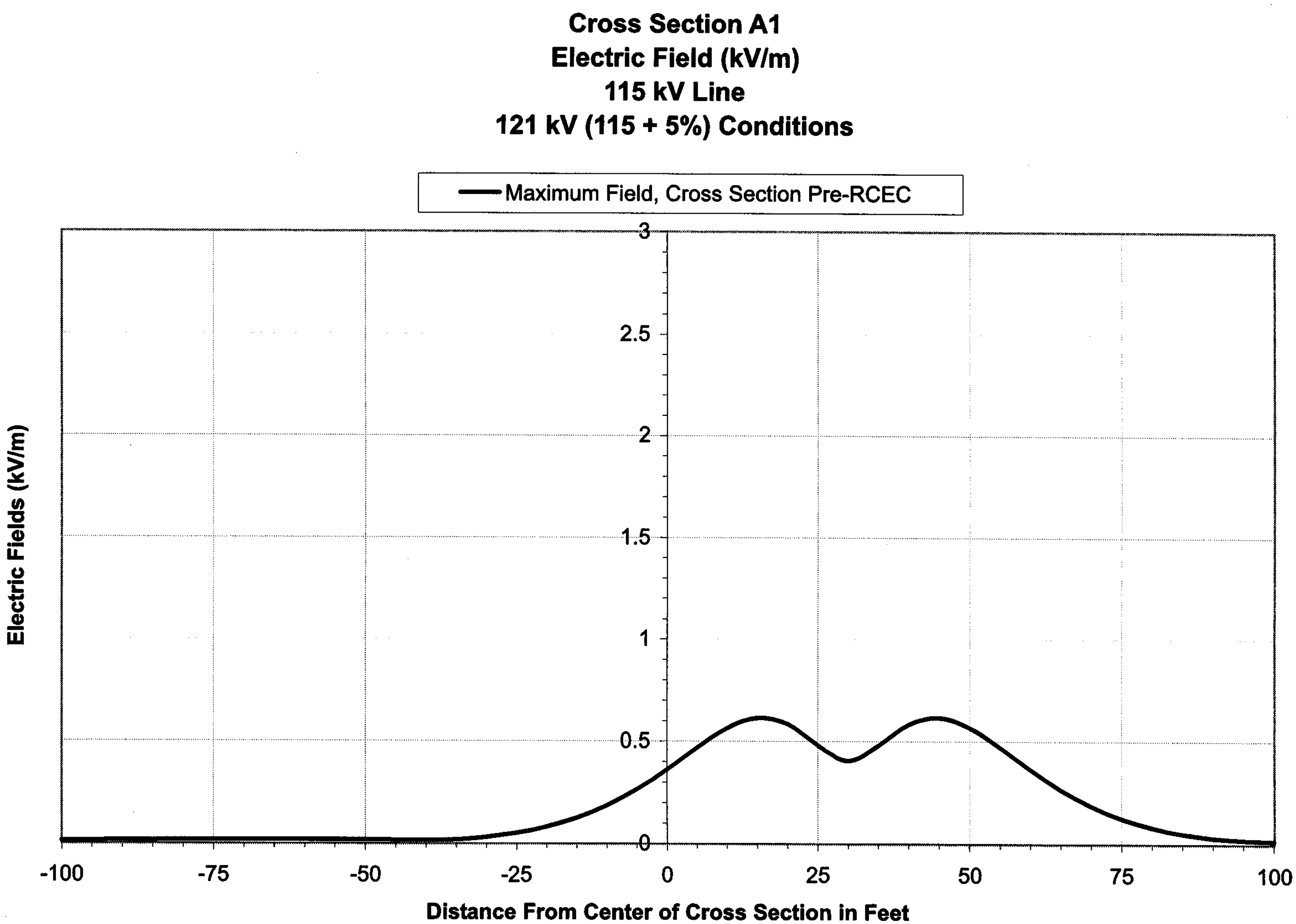
Cross Section C
230 kV Typical Double-Circuit Structure

Russell City Energy Center - Calpine/Bechtel

Figure 6.4-5

May 7, 2001

Prepared By: Commonwealth Associates Inc.
Jackson, Michigan
Engineers Consultants Construction Managers

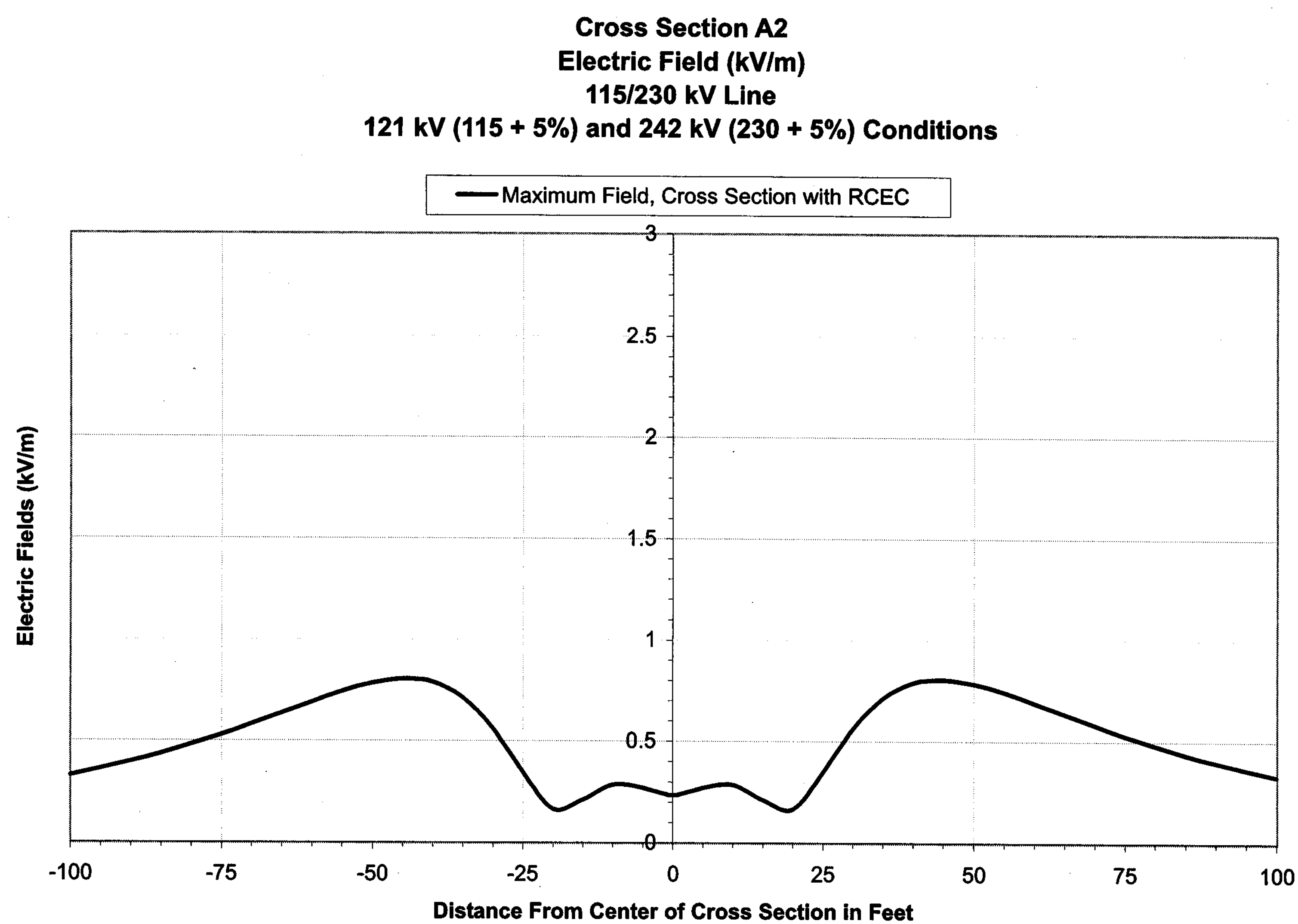


Cross Section A1
Electric Field

M:Proj/Calpine/172028/Cross Section A/Section A1 Graph, E Field

Figure 6.4-6

Commonwealth Associates, Inc.



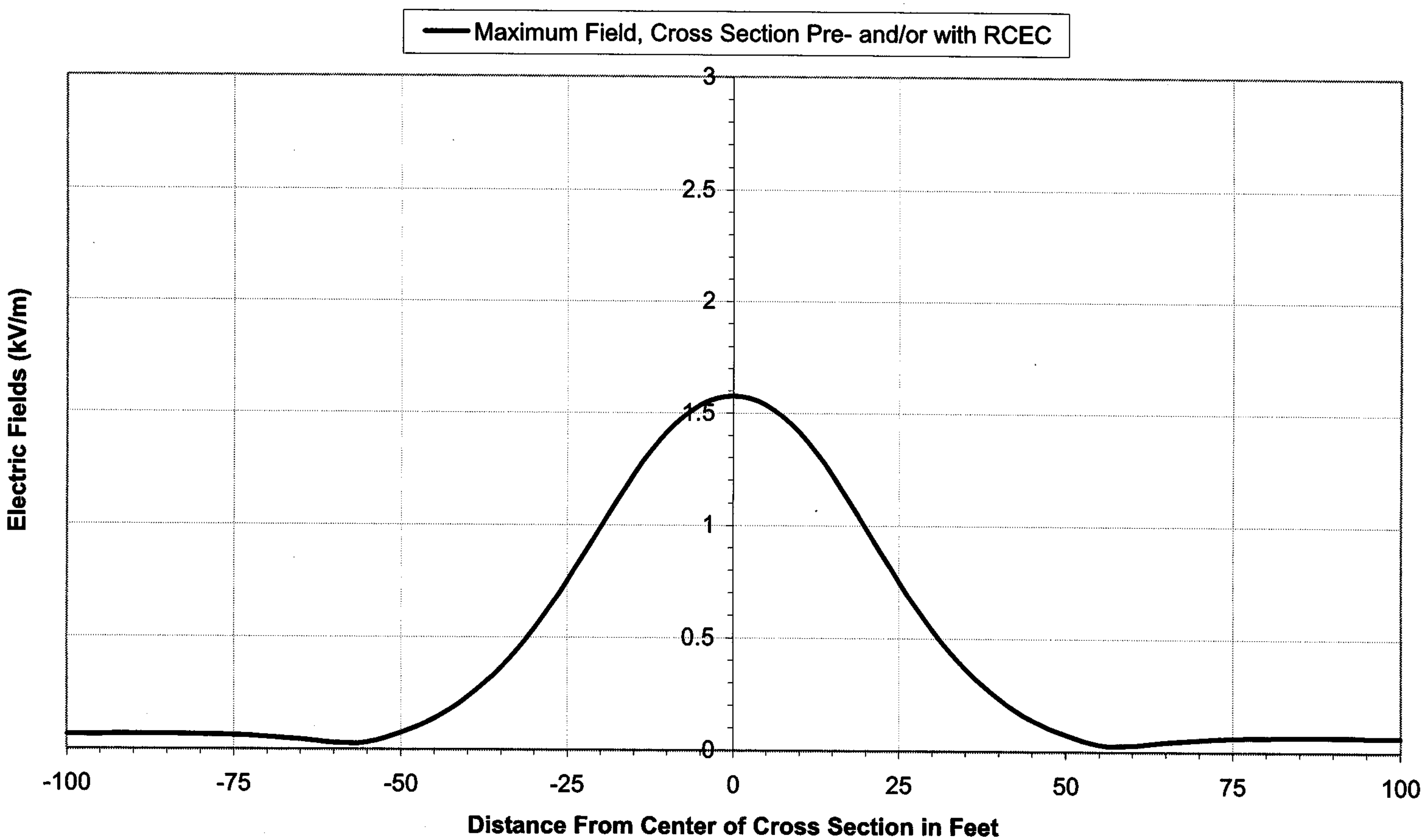
Cross Section A2
Electric Field

M:Proj/Calpine/172028/Cross Section A/Section A2 Graph, E Field

Figure 6.4-7

Commonwealth Associates, Inc.

Cross Section B
Electric Field (kV/m)
115 kV Line
121 kV (115 + 5%) Conditions

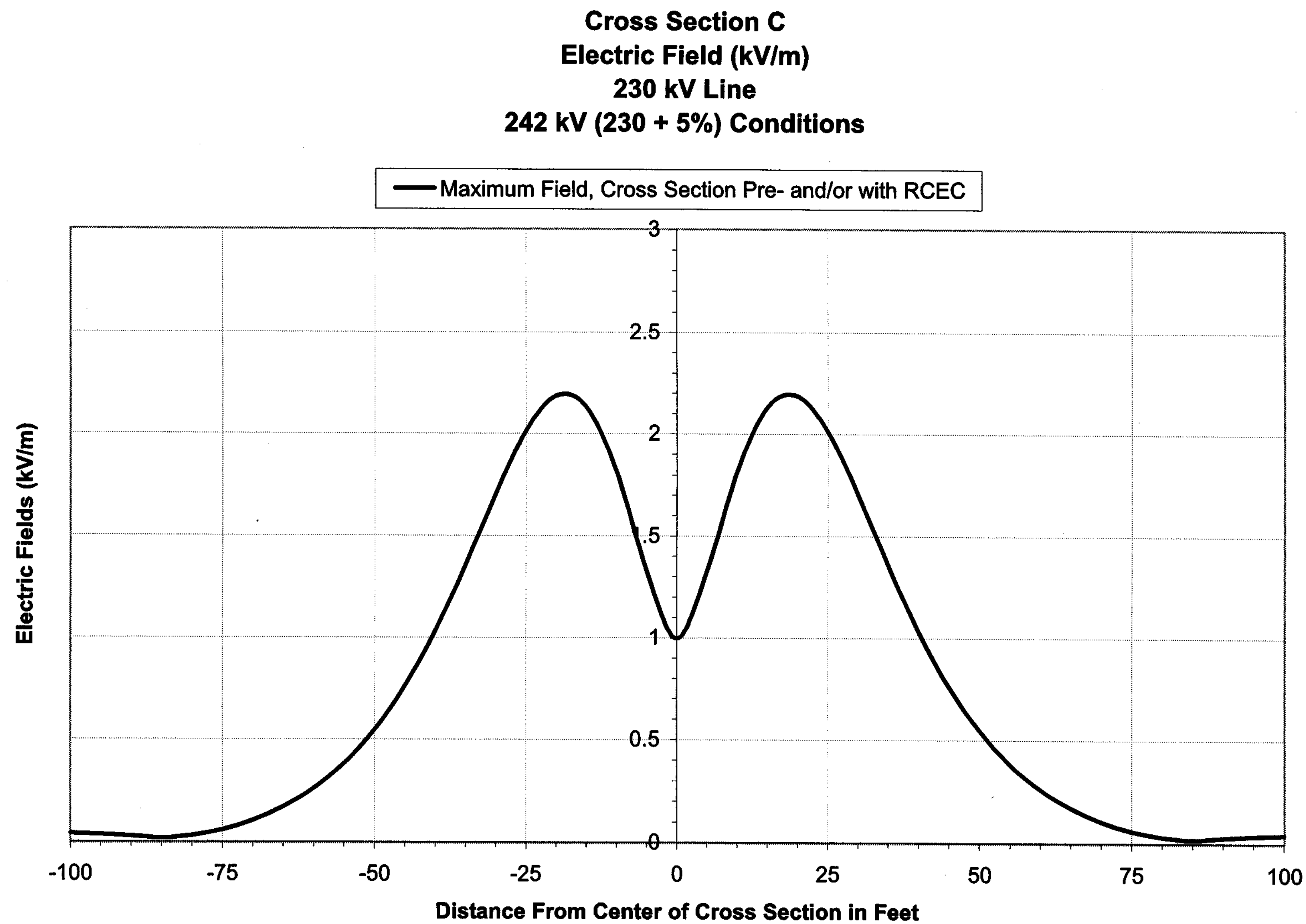


Cross Section B
Electric Field

M:Proj/Calpine/172028/EMF/TLW/Cross Section B/Section B Graph, E Field

Figure 6.4-8

Commonwealth Associates, Inc.

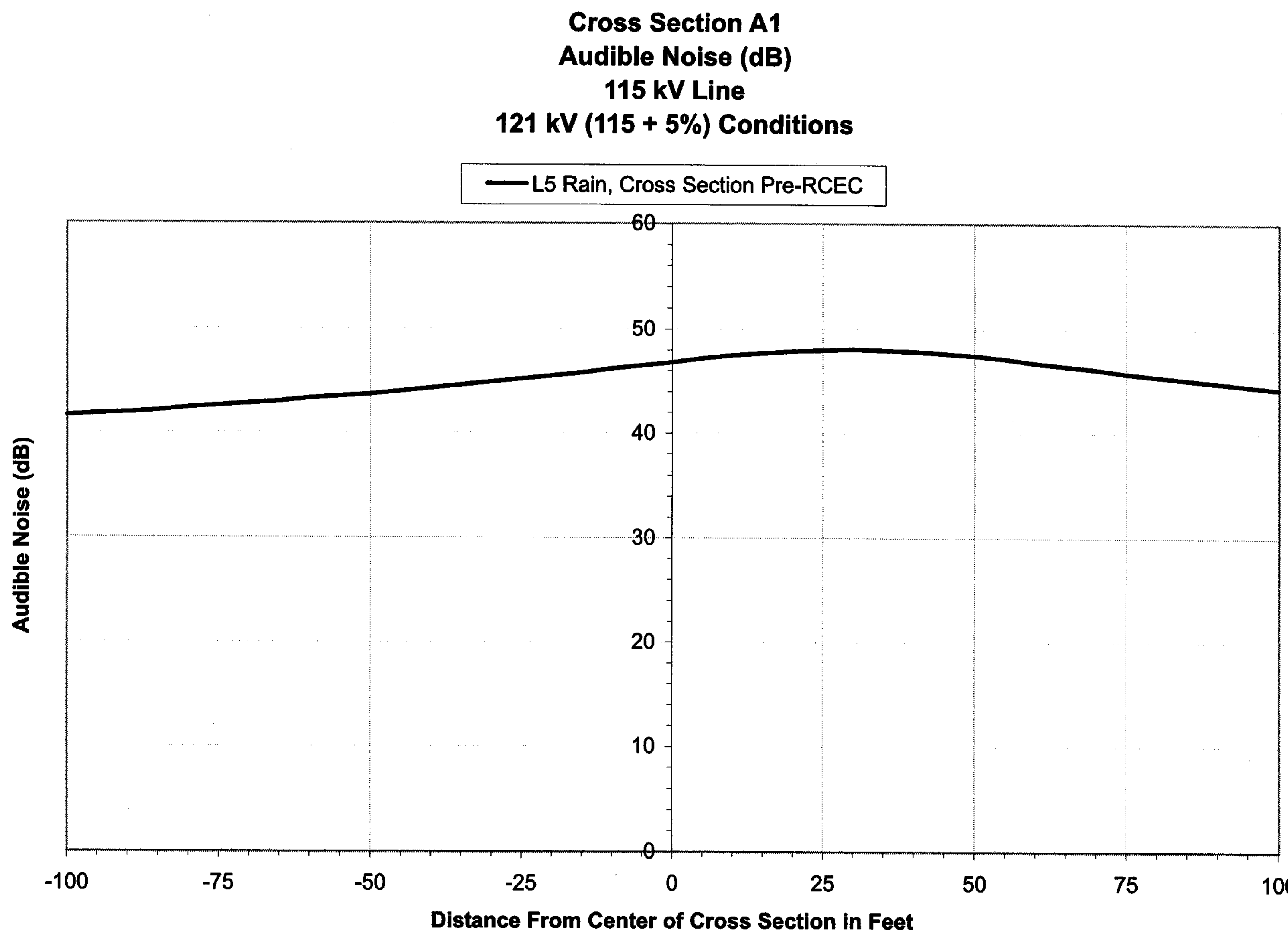


Cross Section C
Electric Field

M:Proj/Calpine/172028/EMF/TLW/Cross Section C/Section C Graph, E Field

Figure 6.4-9

Commonwealth Associates, Inc.

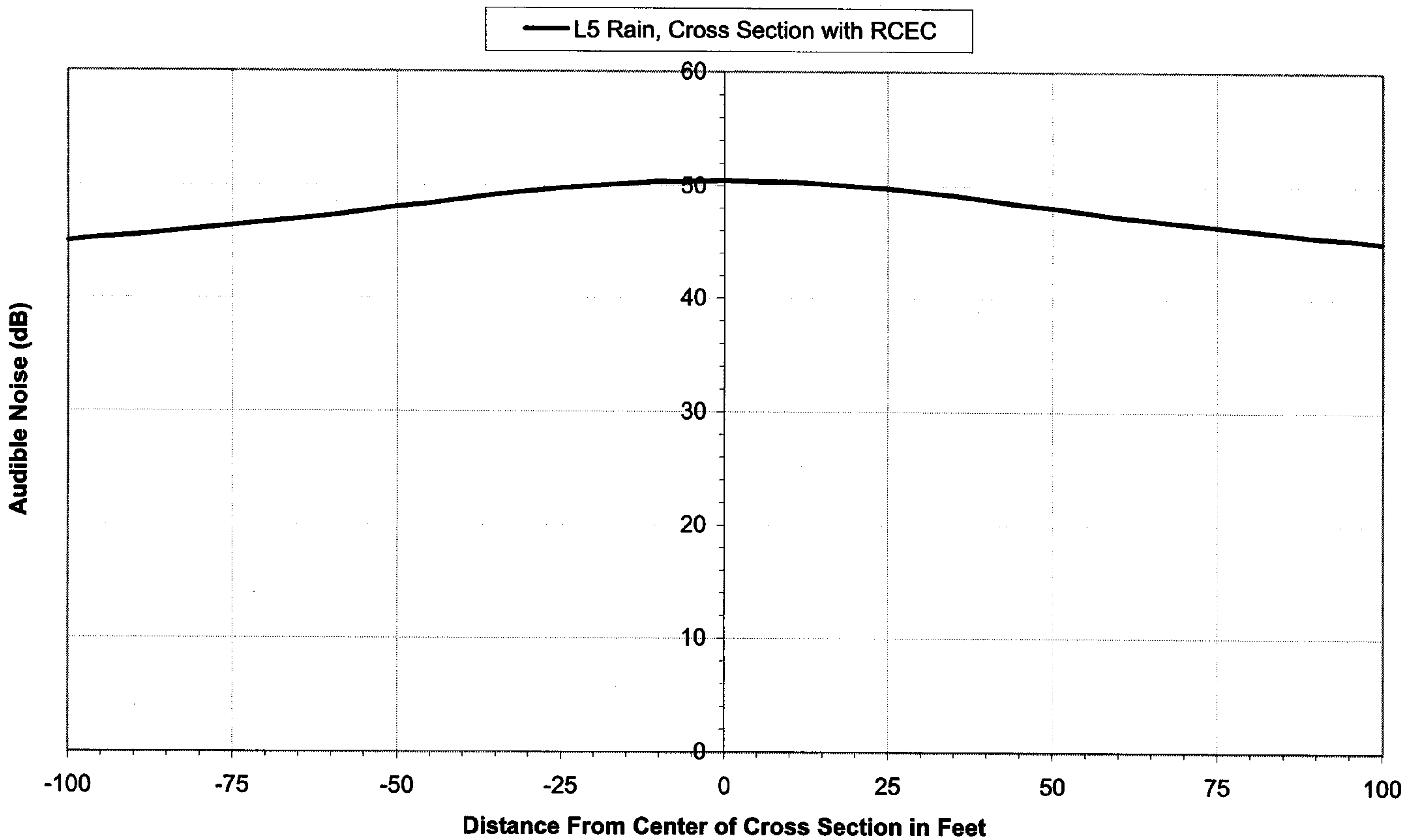


Cross Section A1
Audible Noise

M:Proj/Calpine/172028/EMF/TLW/Cross Section A/Section A1 Graph, Audible Noise **Figure 6.4-10**

Commonwealth Associates, Inc.

Cross Section A2
Audible Noise (dB)
115/230 kV Line
121kV (115 + 5%) and 242 kV (230 + 5%) Conditions

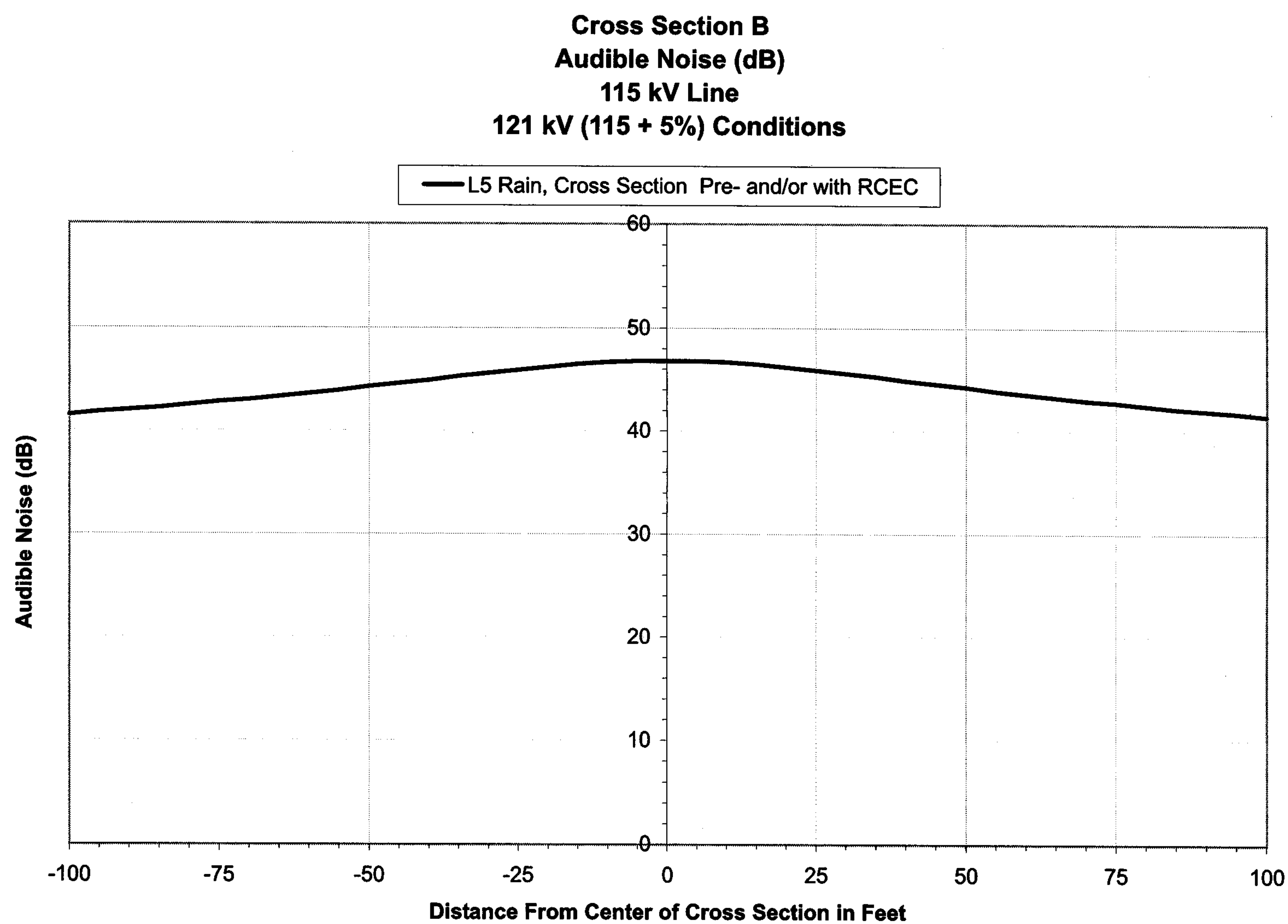


Cross Section A2
Audible Noise

M:Proj/Calpine/172028/EMF/TLW/Cross Section A/Section A2 Graph, Audible Noise

Figure 6.4-11

Commonwealth Associates, Inc.

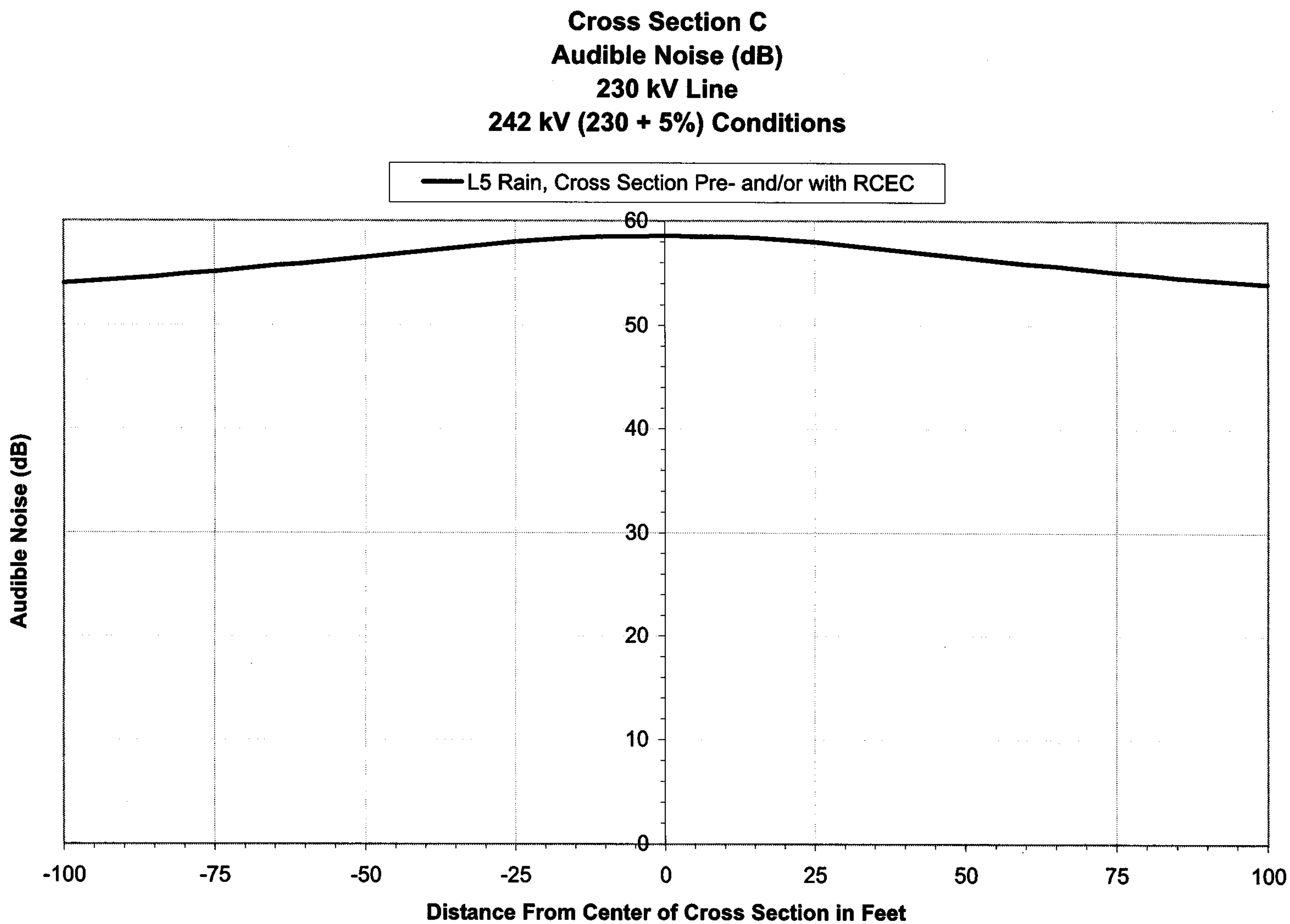


Cross Section B
Audible Noise

M:Proj/Calpine/172028/EMF/TLW/Cross Section B/Section B Graph, Audible Noise

Figure 6.4-12

Commonwealth Associates, Inc.

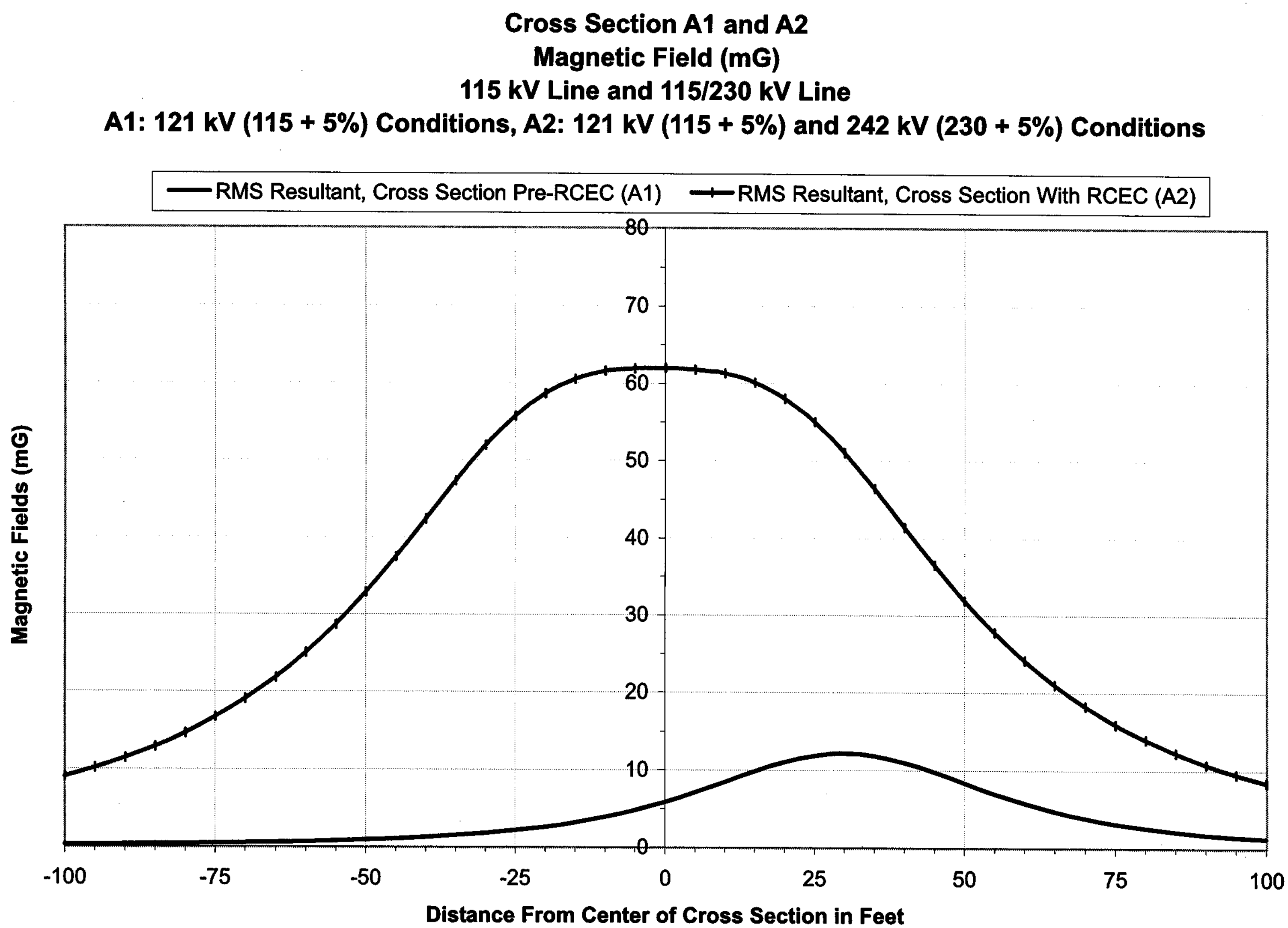


Cross Section C
Audible Noise

M:Proj/Calpine/172028/EMF/TLW/Cross Section C/Section C Graph, Audible Noise

Figure 6.4-13

Commonwealth Associates, Inc.

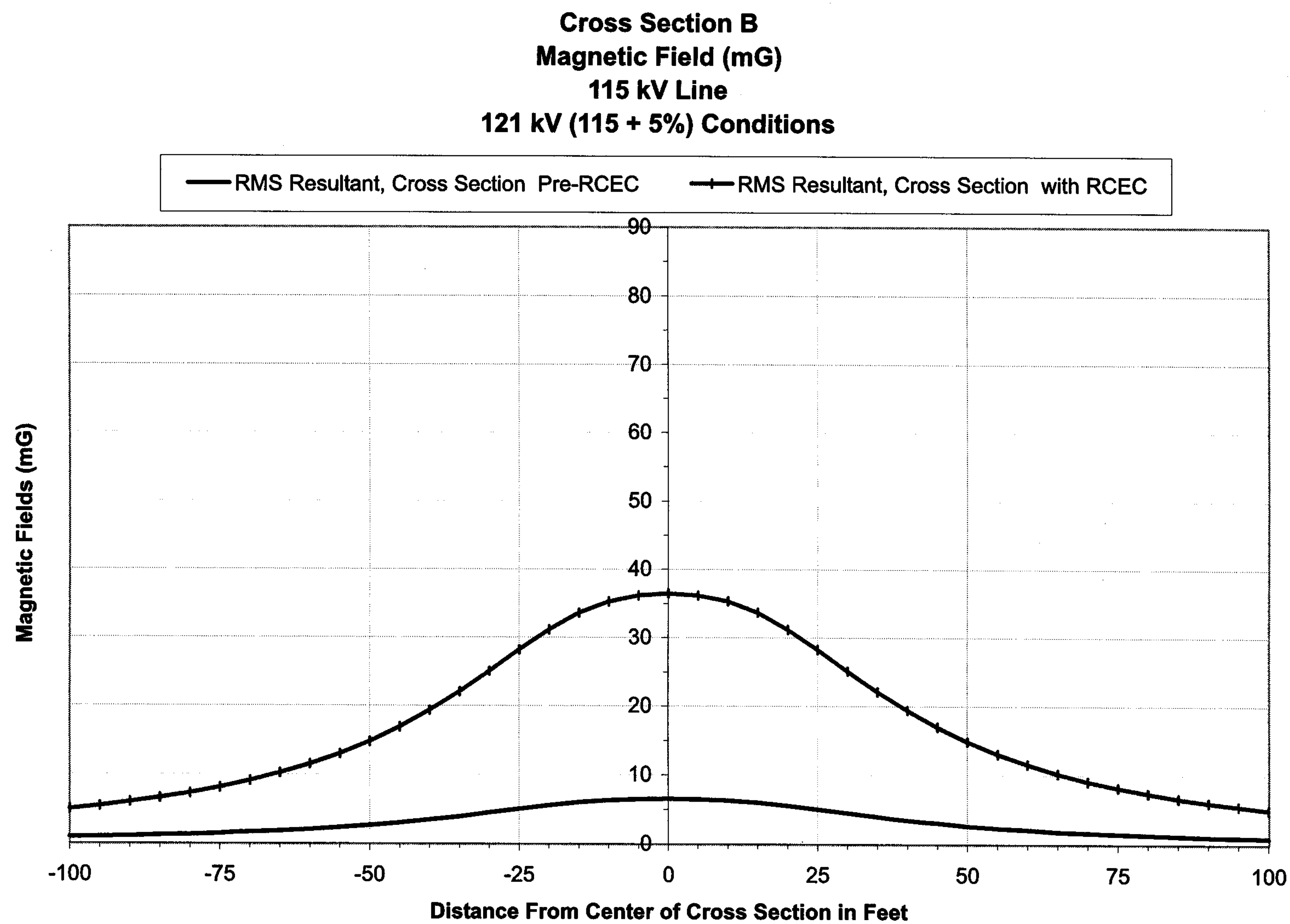


Cross Section A1 and A2
Magnetic Field

M:Proj/Calpine/172028/EMF/TLW/Cross Section A/Section A Graph, Mag Field

Figure 6.4-14

Commonwealth Associates, Inc.



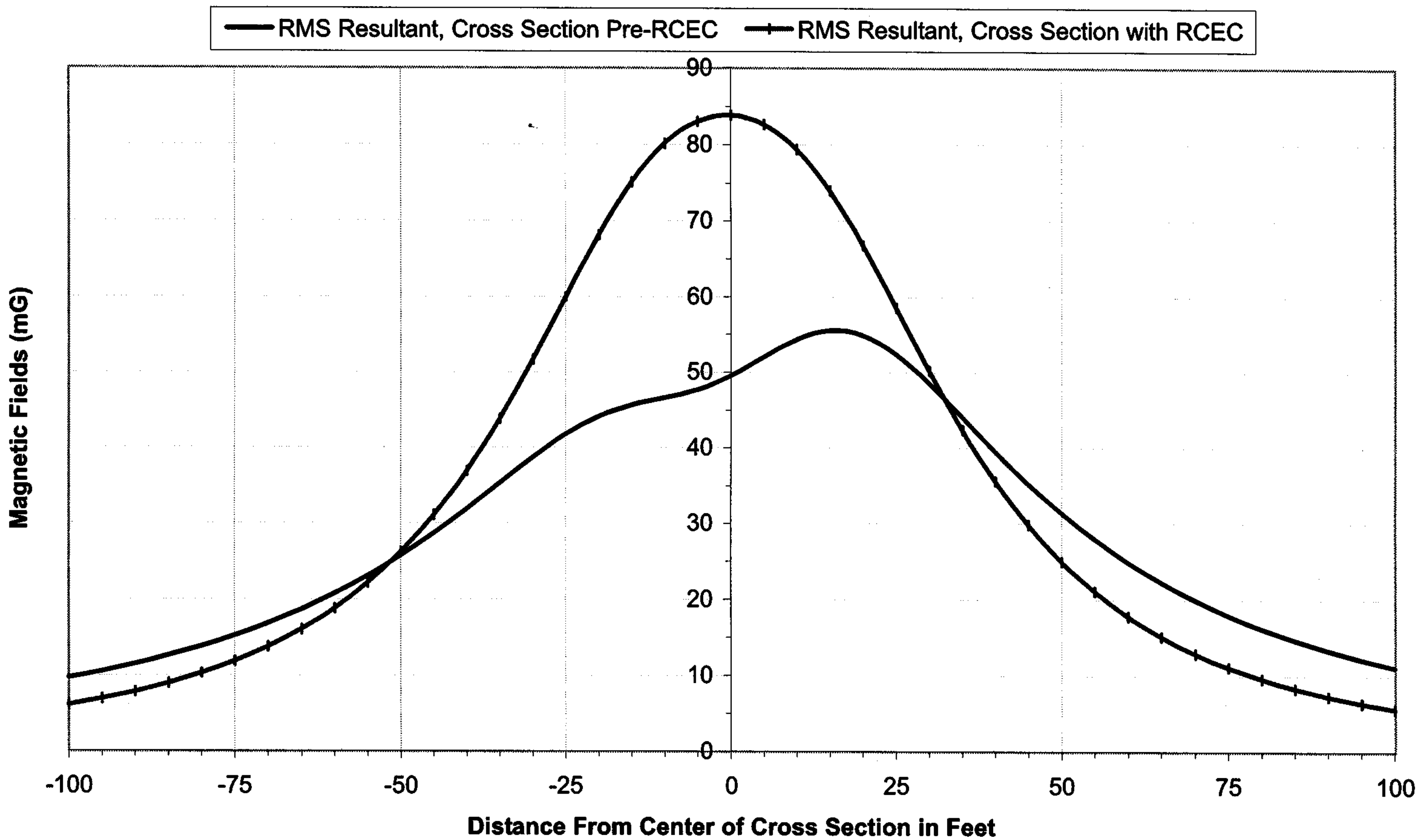
Cross Section B
Magnetic Field

M:Proj/Calpine/172028/EMF/TLW/Cross Section B/Section B Graph, Mag Field

Figure 6.4-15

Commonwealth Associates, Inc.

Cross Section C
Magnetic Field (mG)
230 kV Line
242 kV (230 + 5%) Conditions



Cross Section C
Magnetic Field

M:Proj/Calpine/172028/EMF/TLW/Cross Section C/Section C Graph, Mag Field

Figure 6.4-16

Commonwealth Associates, Inc.

In keeping with the goal of EMF reduction, the interconnection of the RCEC will be designed and constructed using the principles outlined in the PG&E publication, "Transmission Line EMF Guidelines." These guidelines explicitly incorporate the directives of the CPUC by developing design procedures compliant with Decision 93-11-013 and General Orders 95, 128, and 131-D. That is, when the towers, conductors, and rights-of-way are designed and routed according to the PG&E guidelines, the transmission line is consistent with the CPUC mandate.

From page 12 of the PG&E guidelines, the primary techniques for reducing EMF anywhere along the line are as follows:

1. Increase the distance between conductors and EMF sensors
2. Reduce the spacing between the line conductors
3. Minimize the current on the line
4. Optimize the configuration of the phases (A, B, C)

Anticipated EMF levels have been calculated for the RCEC interconnection as designed. If required, the pre- and post-interconnection verification measurements will be made consistent with IEEE guidelines and will provide sample readings of EMF at the edge of right-of-way. Additional measurements will be made, as required, for locations of particular concern.

Conclusion on EMF and Audible Noise

In conclusion, for Cross-sections B and C, there will be no change to the existing lines' electric field or audible noise levels, as there will be no change to the voltage or line configurations. There will, however, be an increase of magnetic field levels because there is an increase of current load. No changes to these existing lines are anticipated.

Some changes do occur between Cross-sections A1 and A2. An entirely new structure involving changes in voltage, line configurations, and current load is shown in Cross-section A2. The new circuits result in an increase of calculated EMF strengths. The construction and operation of the RCEC will not result in any significant increases in EMF levels or audible noise.

6.4.2.4 Induced Current and Voltages

A conducting object such as a vehicle or person in an electric field will experience induced voltages and currents. The strength of the induced current will depend upon the electric field strength, the size and shape of the conducting object, and the object-to-ground resistance. Examples of measured induced currents in a 1 kV/m electric field are about 0.016 mA for a person, about 0.41 mA for a large school bus, and about 0.63 mA for a large trailer truck.

When a conducting object is isolated from the ground and a grounded person touches the object, a perceptible current or shock may occur as the current flows to ground. Shocks are classified as below perception, above perception, secondary, and primary. The mean perception level is 1.0 mA for a 180-pound man and 0.7 mA for a 120-pound woman. Secondary shocks cause no direct physiological harm, but may annoy a person and cause involuntary muscle contraction. The lower average secondary-shock level for an average-sized man is about 2 mA.

Primary shocks can be harmful. Their lower level is described as the current at which 99.5 percent of subjects can still voluntarily "let go" of the shocking electrode. For the 180-pound man this is 9 mA; for the 120-pound woman, 6 mA; and for children, 5 mA. The NESC specifies 5 mA as the maximum allowable short-circuit current to ground from vehicles, trucks, and equipment near transmission lines.

The mitigation for hazardous and nuisance shocks is to ensure that metallic objects on or near the right-of-way are grounded and that sufficient clearances are provided at roadways and parking lots to keep electric fields at these locations sufficiently low to prevent vehicle short-circuit currents from exceeding 5 mA.

Magnetic fields can also induce voltages and currents in conducting objects. Typically, this requires a long metallic object, such as a wire fence or above-ground pipeline that is grounded at only one location. A person who closes an electrical loop by grounding the object at a different location will experience a shock similar to that described above for an ungrounded object. Mitigation for this problem is to ensure multiple grounds on fences or pipelines, especially those that are orientated parallel to the transmission line.

Where railroads are crossed or are parallel to the transmission line, coordination is required with the railroad company to ensure that the magnetically induced voltages and currents in the rails do not interfere with railroad signal and communications circuits, which often are transmitted through the rails.

The proposed 230-kV transmission interconnection and the associated existing 115-kV line will be constructed in conformance with GO-95 and Title 8 CCR 2700 requirements. Therefore, hazardous shocks are unlikely to occur as a result of project construction or operation.

6.4.3 Aviation Safety

Federal Aviation Administration (FAA) Regulations, Part 77 establishes standards for determining obstructions in navigable airspace and sets forth requirements for notification of proposed construction. These regulations require FAA notification for any construction over 200 feet in height above ground level. In addition, notification is required if the obstruction is less than specified heights and falls within any restricted airspace in the approach to airports. For airports with runways longer than 3,200 feet, the restricted space extends 20,000 feet (3.3 nautical miles) from the runway. For airports with runways measuring 3,200 feet or less, the restricted space extends 10,000 feet (1.7 nautical miles). For heliports, the restricted space extends 5,000 feet (0.8 nautical mile).

The St. Rose Hospital Helistop Heliport is located approximately 2.4 nautical miles (14,400 feet) southeast of the proposed the RCEC site. The proposed interconnecting 230-kV transmission line would extend approximately 5,500 feet southeast toward the Eastshore Substation. However, the proposed alignment of the transmission line will place the closest structure no closer than 8,800 feet to the heliport. This places the structures of the interconnection outside the sector of restricted space around the heliport. Hayward Executive Airport is located approximately 3,600 feet (0.6 nautical miles) north-northeast of the proposed location of the RCEC. Its main runway is 3,107 feet long; however, the runway lies in a northwest-to-southeast orientation. This will place the RCEC, the interconnecting transmission line, and the Eastshore Substation outside the restrictive approach sectors to the airport.

Although it may be necessary to notify the FAA due to other tall elements of the project, the height of the new transmission towers (115 feet maximum) does not trigger a review. As a result of their location and height in relation to the Hayward Executive Airport, and the St. Rose Hospital Heliport, the structures of the preferred electrical transmission interconnection will pose no deterrent to aviation safety as defined in the FAA regulations.

6.4.4 Fire Hazards

The proposed double-circuit 230-kV transmission interconnection and the associated existing underbuilt, double-circuit 115-kV lines will be designed, constructed, and maintained in accordance with GO-95, which establishes clearances from other man-made and natural structures as well as tree-trimming requirements to mitigate fire hazards. It is not anticipated that the right-of-way for the proposed interconnecting transmission line will have any trees or brush due to its industrial/manufacturing location and its present use for an existing line (Figure 6.1-2). PG&E will maintain the interconnection corridor and immediate area in accordance with existing regulations and accepted industry practices that will include identification and abatement of any fire hazards.

6.5 APPLICABLE LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

This section provides a list of applicable laws, ordinances, regulations, and standards (LORS) that apply to the proposed transmission line, substations and engineering. The following compilation of LORS is in response to Section (h) of Appendix B attached to Article 6, of Chapter 6, of Title 20 of the California Code of Regulations. Inclusion of these data is further outlined in the CEC's publication entitled "Rules of Practice and Procedure & Power Plant Site Certification Regulations."

6.5.1 Design and Construction

Table 6.5-1 lists the applicable LORS for the design and construction of the proposed transmission line and substations.

Table 6.5-1. Design and construction LORS.

LORS	Applicability
General Order 95 (GO-95), CPUC, "Rules for Overhead Electric Line Construction"	California Public Utility Commission (CPUC) rule covers required clearances, grounding techniques, maintenance, and inspection requirements.
Title 8 California Code of Regulations (CCR), Section 2700 et seq. "High Voltage Electrical Safety Orders"	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical installation and equipment to provide practical safety and freedom from danger.
General Order 128 (GO-128), CPUC, "Rules for Construction of Underground Electric Supply and Communications Systems"	Establishes requirements and minimum standards to be used for the station AC power and communications circuits.
General Order 52 (GO-52), CPUC, "Construction and Operation of Power and Communication Lines"	Applies to the design of facilities to provide or mitigate inductive interference.
ANSI/IEEE 693 "IEEE Recommended Practices for Seismic Design of Substations"	Provides recommended design and construction practices.
IEEE 1119 "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	Provides recommended clearance practices to protect persons outside the facility from electric shock.
IEEE 998 "Direct Lightning Stroke Shielding of Substations"	Provides recommendations to protect electrical system from direct lightning strokes.

Table 6.5-1. (continued)

LORS	Applicability
IEEE 980 "Containment of Oil Spills for Substations"	Provides recommendations to prevent release of fluids into the environment.
Suggestive Practices for Raptor Protection on Powerlines, April 1996	Provides guidelines to avoid or reduce raptor collision and electrocution.

6.5.2 Electric and Magnetic Fields (EMF)

The applicable LORS pertaining to electric and magnetic field interference are tabulated in Table 6.5-2.

Table 6.5-2. Electric and magnetic field LORS.

LORS	Applicability
Decision 93-11-013 of the CPUC	CPUC position on EMF reduction.
General Order 131-D (GO-131), CPUC, Rules for Planning and Construction of Electric Generation, Line, and Substation Facilities in California	CPUC construction-application requirements, including requirements related to EMF reduction.
Pacific Gas & Electric Company, "Transmission Line EMF Design Guidelines"	Large local electric utility's guidelines for EMF reduction through structure design, conductor configuration, circuit phasing, and load balancing. (In keeping with CPUC D.93-11-013 and GO-131)
ANSI/IEEE 644-1994 "Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines"	Standard procedure for measuring EMF from an electric line that is in service.

6.5.3 Hazardous Shock

Table 6.5-3 lists the LORS regarding hazardous shock protection for the project.

Table 6.5-3. Hazardous shock LORS.

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

6.5.4 Communications Interference

The applicable LORS pertaining to communication interference are presented in Table 6.5-4.

Table 6.5-4. Communications interference LORS.

LORS	Applicability
Title 47 CFR Section 15.25, "Operating Requirements, Incidental Radiation"	Prohibits operations of any device emitting incidental radiation that causes interference to communications. The regulation also requires mitigation for any device that causes interference.
General Order 52 (GO-52), CPUC	Covers all aspects of the construction, operation, and maintenance of power and communication lines and specifically applies to the prevention or mitigation of inductive interference.
CEC staff, Radio Interference and Television Interference (RI-TVI) Criteria (Kern River Cogeneration) Project 82-AFC-2, Final Decision, Compliance Plan 13-7	Prescribes the CEC's RI-TVI mitigation requirements, developed and adopted by the CEC in past siting cases.

6.5.5 Aviation Safety

Table 6.5-5 lists the aviation safety LORS that may apply to the proposed construction and operation of the RCEC.

Table 6.5-5. Aviation safety LORS.

LORS	Applicability
Title 14 CFR Part 77 "Objects Affecting Navigable Airspace"	Describes the criteria used to determine whether a "Notice of Proposed Construction or Alteration" (NPCA, FAA Form 7460-1) is required for potential obstruction hazards.
FAA Advisory Circular No. 70/7460-1G, "Obstruction Marking and Lighting"	Describes the FAA standards for marking and lighting of obstructions as identified by Federal Aviation Regulations Part 77.
Public Utilities Code (PUC), Sections 21656-21660	Discusses the permit requirements for construction of possible obstructions in the vicinity of aircraft landing areas, in navigable airspace, and near the boundary of airports.

6.5.6 Fire Hazards

Table 6.5-6 tabulates the LORS governing fire hazard protection for the RCEC project.

Table 6.5-6. Fire hazard LORS.

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

6.5.7 Involved Agencies and Agency Contacts

Table 6.5-7 identifies national, state, and local agencies with jurisdiction to issue permits or approvals, conduct inspections, and/or enforce the above referenced LORS. Table 6.5-7 also identifies the associated responsibilities of these agencies as they relate to the construction and operation of the RCEC.

Table 6.5-7. Jurisdiction.

Agency or Jurisdiction	Responsibility
California Energy Commission (CEC)	Jurisdiction over new transmission lines associated with thermal power plants that are 50 megawatts (MW) or more (PRC 25500).
CEC	Jurisdiction of lines out of a thermal power plant to the interconnection point to the utility grid (PRC 25107).
CEC	Jurisdiction over modifications of existing facilities that increase peak operating voltage or peak kilowatt capacity 25 percent (PRC 25123).
CPUC	Regulates construction and operation of overhead transmission lines (General Order No. 95 and 131-D) (those not regulated by the CEC).
CPUC	Regulates construction and operation of power and communications lines for the prevention of inductive interference (General Order No. 52).
Federal Aviation Administration (FAA)	Establishes regulations for marking and lighting of obstructions in navigable airspace (AC No. 70/7460-1G).
Local Electrical Inspector	Jurisdiction over safety inspection of electrical installations that connect to the supply of electricity (NFPA 70).
Cal-ISO	Provides Final Interconnection Approval.
County of Alameda	Establishes and enforces zoning regulations for specific land uses. Issues variances in accordance with zoning ordinances. Issues and enforces certain ordinances and regulations concerning fire prevention and electrical inspection.

6.6 REFERENCES

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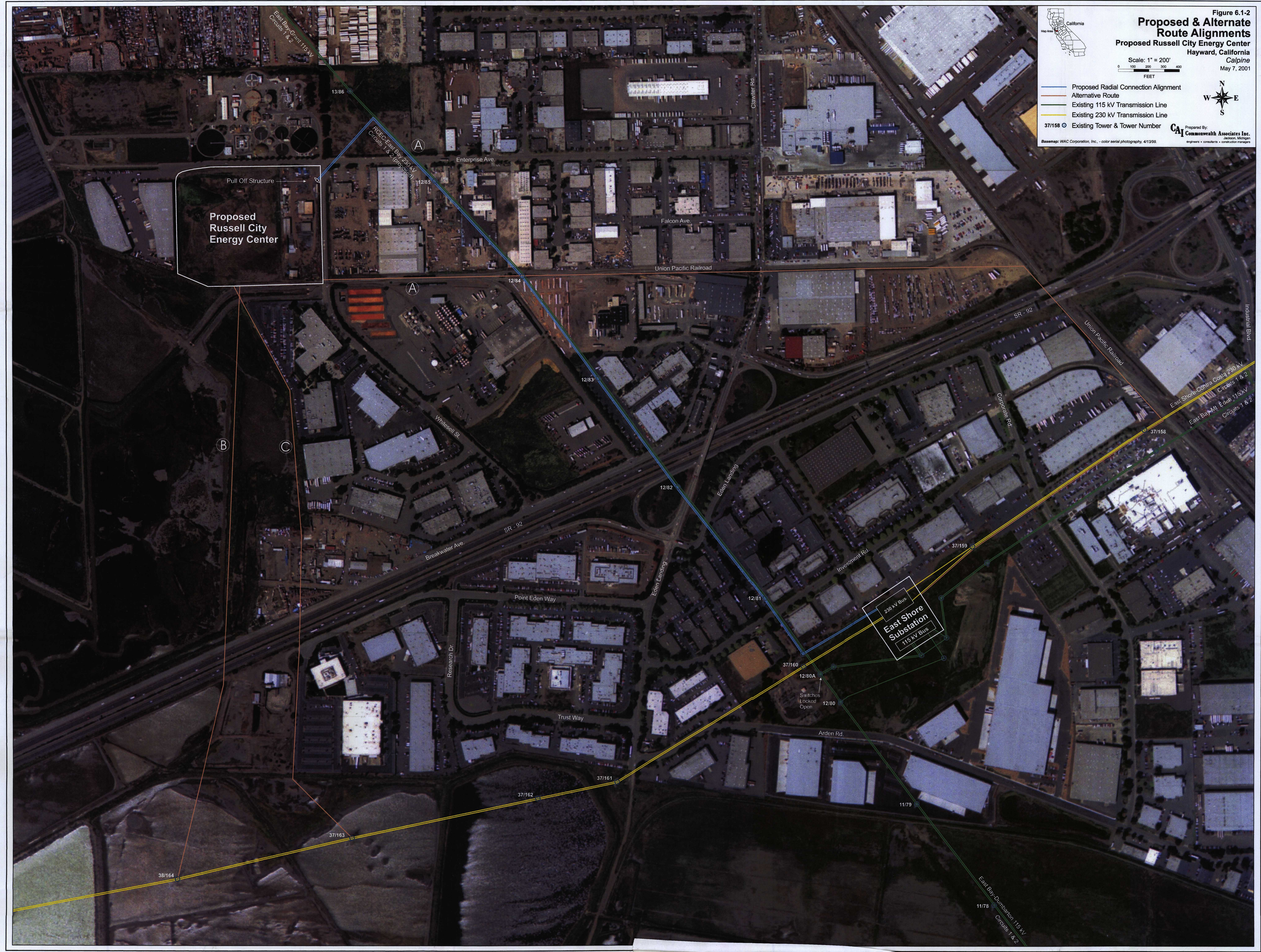
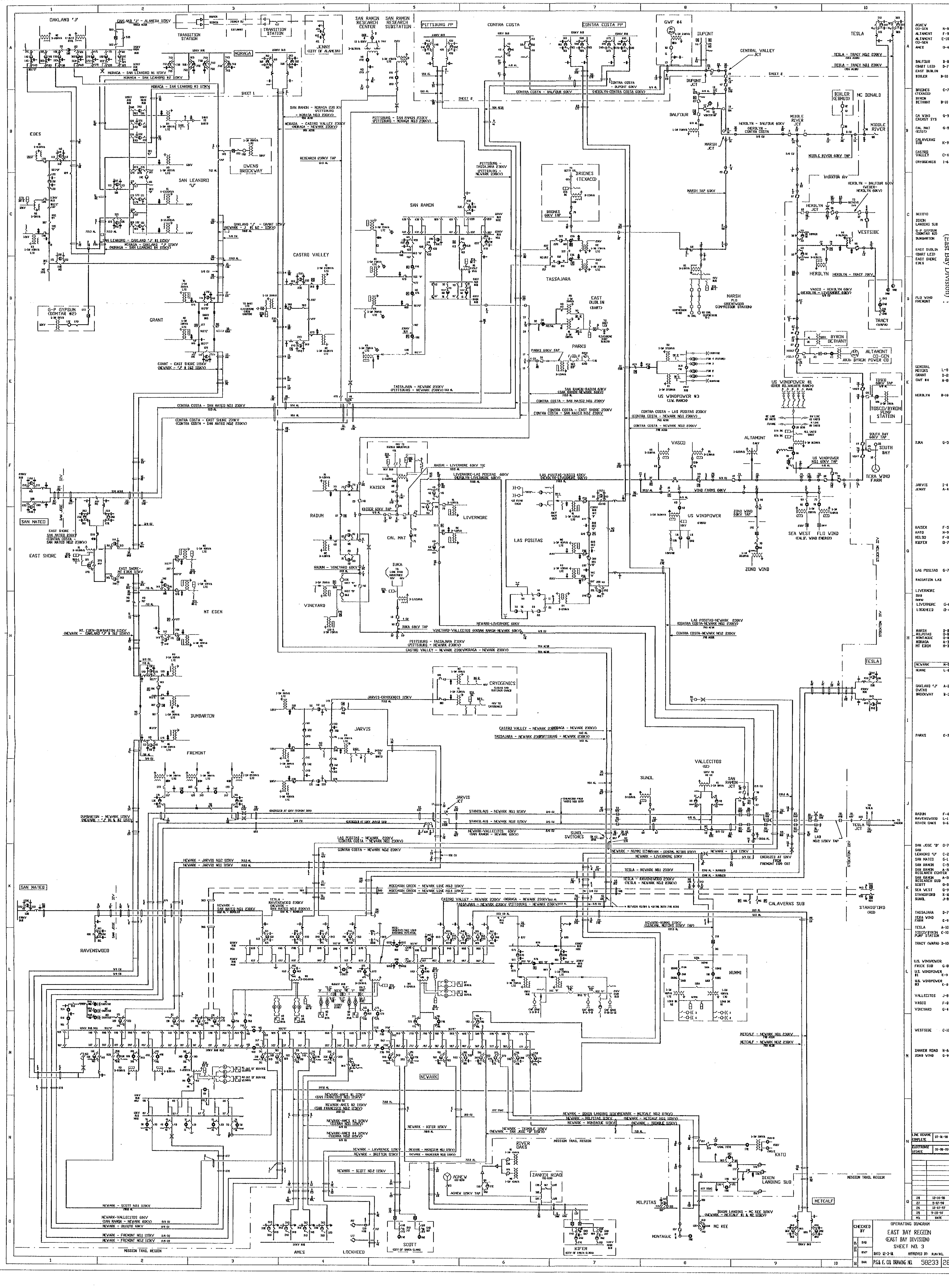


Figure 6.1-2
Proposed & Alternate Route Alignments

Operating Diagram
PG&E East Bay Region
(East Bay Division)



7.0 WATER SUPPLY

Section 2 describes the quantity of water required, the primary and back-up water supply sources, treatment process description, and planned discharges for the RCEC and AWT Plant. This section presents a discussion of the water quality of these streams and the treatment of waste streams prior to discharge.

7.1 WATER QUALITY

The water quality of the secondary effluent from the Hayward WPCF and of the back-up secondary effluent supply from USD/EBDA is shown on Table 7-1. City of Hayward potable water quality is also shown. The City of Hayward WPCF is currently planning significant plant upgrades over the next 5 years that are designed to improve the quality of the secondary effluent. Therefore, the quality of the influent to the AWT plant is expected to improve within a few years of its commissioning. However, the treatment system described in Section 2.3 of this AFC will be designed to treat the AWT plant secondary effluent of the current quality to the levels required for use at the power plant and to treat waste streams to meet existing requirements for discharge.

7.2 WATER TREATMENT

The proposed AWT plant described in Section 2.3 will produce water suitable for use as cooling tower makeup and as feedwater for the power cycle makeup water treatment system. The AWT plant layout is shown in Figure 2.3-1. Anticipated product quality for key parameters is summarized in Table 7-2.

7.3 WASTEWATER COLLECTION, TREATMENT, AND DISPOSAL

The expected wastewater streams from the RCEC and AWT plant sites include the following:

- Combined Liquid Streams from Copper Removal/Treatment, Solids Clarification and Microfilter Backwash
- Cooling Tower Blowdown
- Sanitary Wastewater
- Plant Drainage
- AWT Plant Stormwater Drainage

The average and peak flow rates for these streams are presented in Section 2. Pipelines for each of these discharges are shown on Figure 2.3-2. Each waste stream will be monitored prior to discharge to the existing sewer to assure that it meets appropriate discharge limits. A description of each of these streams, and any treatment performed prior to discharge, is given below. Figure 7-1 is a process flow chart that describes the water treatment system. Figure 7-2 diagrams the microfiltration reverse osmosis (MF/RO) system.

7.3.1 Liquid Streams from Copper Removal/Treatment and Solids Clarification

Wastewater influent into the Hayward WPCF contains concentrations of copper ranging from 24 ug/L to 140 ug/L, with an average of 65 ug/L. In addition to the Hayward contribution, the EBDA pipeline receives effluents from five other dischargers (Oro Loma/Castro Valley Sanitary Districts, City of San Leandro, USD, Livermore-Amador Valley Water Management Agency, which includes the City of

Livermore, and Dublin-San Ramon Services District). The current EBDA permit limit for copper is an interim daily maximum limit of 23 ug/L, for which the point of compliance is the EBDA outfall. The average copper concentration at the EBDA outfall, which represents the blended effluent of all of the EBDA dischargers, is 13 ug/L.

Operations at the AWT plant will result in a concentrated wastestream rejected from the Reverse Osmosis process (RO concentrate) containing concentrations of copper above 23 ug/L. A second stream, generated from backwashing the Microfiltration system ahead of the Reverse Osmosis process, will contain copper concentrations identical to the Hayward secondary effluent concentrations, approximately 23.5 ug/L.

To ensure achievement of EBDA concentration permit limits, a copper treatment process has been incorporated into the AWT plant, which will significantly reduce the total mass loadings of copper ultimately discharged into the EBDA pipeline and San Francisco Bay. Copper treatment will involve pH adjustment with clarification and precipitation of copper. Lime will be added to raise the pH of the streams, ferric chloride ($FeCl_3$) will be added as a clarifying agent, and sodium sulfide (Na_2S) will be added to aid in copper precipitation. The chemical dosages are projected at approximately 1000 mg/l lime, 30 mg/l ferric chloride, and 4.5 mg/l sodium sulfide. Preliminary lab testing of this copper treatment process has been successful in achieving significant reduction in copper concentrations.

Following copper treatment and solids clarification, the resulting waste stream will be discharged to the Hayward WPCF secondary effluent 48-inch discharge line, upstream of the WPCF's chlorination facility. Water quality characterization of the Hayward effluent with the AWT plant and the RCEC Plant discharges compared to the EBDA limits is shown in Table 7-3. All copper removal and solids clarification facilities will be designed and operated so that the contribution of the Hayward WPCF's effluent to the EBDA pipeline meets EBDA permit limit targets, of which copper and suspended solids are understood to be the most critical.

Associated with the copper removal process, solids will be generated which will be handled onsite, prior to ultimate disposal in a landfill. From the reactor clarifier where the copper removal process will occur, the solids will be processed through gravity thickeners, conditioning, and plate and frame presses for dewatering to achieve 50 percent solids quality. The filtrate from the dewatering process will be conveyed to the post-treatment facilities. After dewatering, the resulting sludge will be transported off-site for ultimate disposal. The dominant species in the residual sludge will result from the lime dosage, described above, and will be calcium carbonate. Ferric hydroxide will be present to a much lesser extent. Other constituents of the sludge will result from incidental removal from the concentrate stream. The most notable constituent of concern that is removed from the concentrate in the treatment scheme is copper. The projected concentration of copper in the waste sludge resulting from this treatment is less than 100 mg/kg. The TTLC concentration of concern is listed as 2500 mg/kg. Therefore, it is unlikely that there will be any restrictions with respect to disposal of this sludge from a hazardous waste standpoint.

Table 7-1. Summary of average water quality characteristics for potential sources of project water.

Water quality parameter †	Hayward secondary effluent (primary source)	Union Sanitary District effluent (secondary source)	Hayward potable water supply	Drinking Water Standard
Turbidity	17 (11-33)	—	0.3 (0.2-0.6)	1-5 ntu
Color	—	—	2	15 Pt-Co units
Odor Threshold	—	—	1	3 units
pH	7.8	7.8	8.8	6.0 – 9.0 units
Total Alkalinity	255	—	60	no standard (mg/l)
Bicarbonate	—	—	—	no standard (mg/l)
Total Dissolved Solids	564	910	128	1,500 mg/l
BOD	17	9	ND	no standard (mg/l)
TOC	32	—	ND	no standard (mg/l)
Phosphate	4	—	ND	no standard (mg/l)
Total Nitrogen	28	—	ND	no standard (mg/l)
Nitrate as NO_3	6.0	—	ND	45 mg/l
Fluoride	2.2	—	0.1	2 mg/l
Chloride	153	—	12	500 mg/l
Hardness	160	250	63	200 mg/l
Arsenic	0.0017	0.0088	ND	0.05 mg/l
Calcium	33	52	11	no standard (mg/l)
Magnesium	14	33	6	no standard (mg/l)
Manganese	0.06	—	ND	0.05 mg/l
Sodium	133	—	13	350 mg/l
Potassium	16	—	0.9	no standard (mg/l)
Silica	13	17	6	no standard (mg/l)
Silver	0.002	0.0033	ND	0.1 mg/l
Sulfate	44	97	13	500 mg/l
Cadmium	0.0006	0.0006	ND	0.005 mg/l
Chromium	0.0051	0.0022	ND	0.05 mg/l
Copper*	0.024	0.018	0.058	1.3 mg/l
Cyanide	< 0.003	—	ND	0.2 mg/l
Iron	1.4	—	< 0.1	0.30 mg/l
Lead*	0.0022	0.0125	0.004	0.015 mg/l
Mercury	0.00005	—	ND	0.002 mg/l
Nickel	0.012	0.0085	ND	0.1 mg/l
Boron	0.5	—	ND	no standard (mg/l)
Selenium	0.0012	0.0242	ND	0.05 mg/l
Thallium	—	—	ND	0.002 mg/l
Zinc	0.073	0.038	ND	5.0 mg/l

† units of measure for each analyte are given in the last column
ND = analyte not detected
* Lead and copper values from City of Hayward tap water. 90th percentile value for copper is 0.08 mg/L

Table 7-2. Circulating water quality.

Contaminant	Units	RO Permeate (To Cooling Tower)	Cooling Tower Blowdown at 100 Cycles
Alkalinity-Bicarbonate	mg/L	11.000	301.400
Alkalinity-Carbonate	mg/L	0.000	8.500
Alkalinity-P-BaCl2	mg/L	0.000	0.000
Alkalinity-Phenol	mg/L	0.000	8.500
Alkalinity-Total	mg/L	11.000	309.900
Aluminum	mg/L	0.000	0.000
Ammonia*	mg/L	2.000	200.000
Arsenic	mg/L	0.000	0.000
Biochemical Oxygen Demand	mg/L	0.300	< 1.0
Boron	mg/L	0.420	42.000
Bromide	mg/L	0.000	0.000
Cadmium	mg/L	0.000	0.000
Chloride	mg/L	5.000	839.830
Chromium	mg/L	0.000	0.000
Copper	mg/L	0.0001	0.010
Cyanide	mg/L	0.00019	0.019
Fluoride	mg/L	0.000	0.000
Hardness-Calcium	mg/L	0.100	10.000
Hardness-Magnesium	mg/L	0.100	10.000
Hydrogen Sulfide	mg/L	0.000	0.000
Iron	mg/L	0.000	1.000
Lead	mg/L	0.000	0.000
Manganese	mg/L	0.000	0.000
Mercury	mg/L	0.000	0.000
Nickel	mg/L	0.0001	0.010
Nitrate as NO_3	mg/L	1.000	100.000
Nitrite as NO_2	mg/L	0.300	30.000
Nitrogen-Total	mg/L	2.700	270.000
pH	s.u.	5.200	8.060
Phosphate	mg/L	0.000	15.000
Potassium	mg/L	1.000	100.000
Selenium	mg/L	0.000	0.000
Silica	mg/L	0.400	40.000
Silver	mg/L	0.000	0.000
Sodium	mg/L	4.000	400.000
Sulfate	mg/L	1.000	100.000
Total Dissolved Solids	mg/L	20.000	2461.000
Total Organic Carbon	mg/L	1.000	1.000
Total Suspended Solids	mg/L	0.000	10.000
Temperature	Degrees F	64	100
Zinc	mg/L	0.0004	0.040

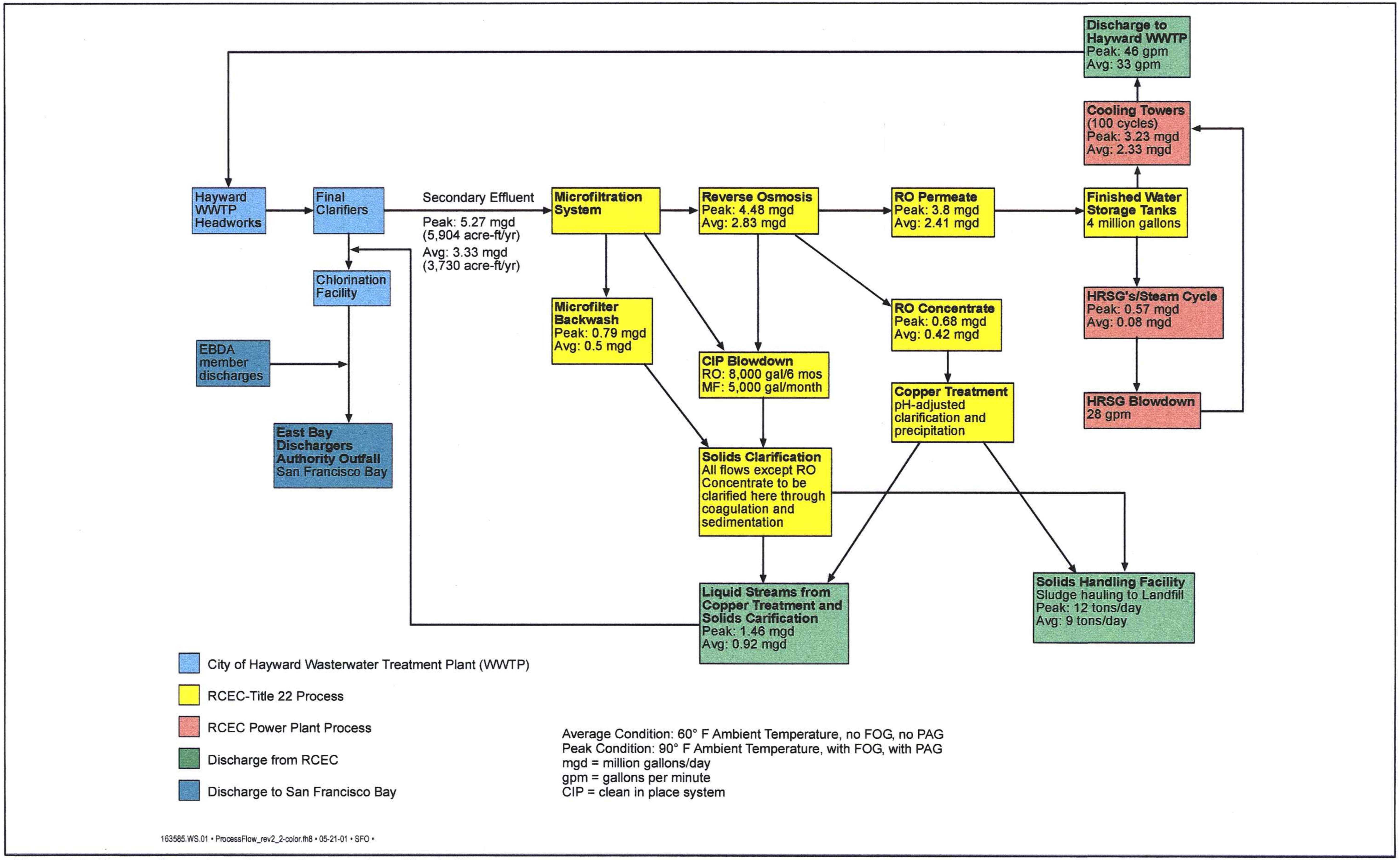
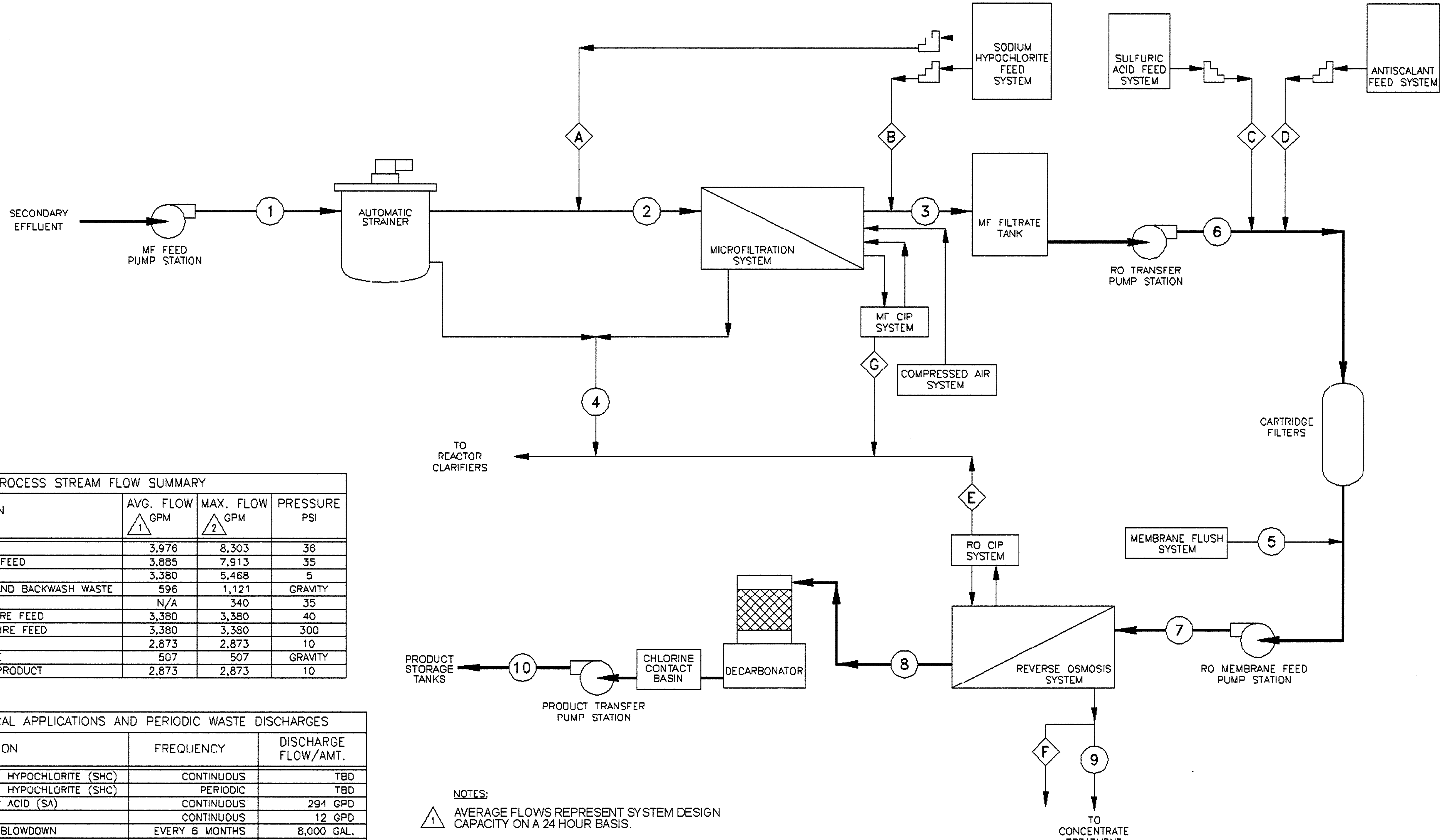


Figure 7-1. Process flow schematic showing operation of the facility.



PROCESS STREAM FLOW SUMMARY				
STREAM	DESCRIPTION	AVG. FLOW (1) GPM	MAX. FLOW (2) GPM	PRESSURE PSI
1	MF FEED	3,976	8,303	36
2	MF PRETREATED FEED	3,885	7,913	35
3	MF FILTRATE	3,380	5,468	5
4	MF SCREENING AND BACKWASH WASTE	596	1,121	GRAVITY
5	RO FLUSH FEED	N/A	340	35
6	RO LOW PRESSURE FEED	3,380	3,380	40
7	RO HIGH PRESSURE FEED	3,380	3,380	300
8	RO PERMEATE	2,873	2,873	10
9	RO CONCENTRATE	507	507	GRAVITY
10	DECARBONATED PRODUCT	2,873	2,873	10

SUMMARY OF CHEMICAL APPLICATIONS AND PERIODIC WASTE DISCHARGES			
STREAM	DESCRIPTION	FREQUENCY	DISCHARGE FLOW/AMT.
A	12.5% SODIUM HYPOCHLORITE (SHC)	CONTINUOUS	TBD
B	12.5% SODIUM HYPOCHLORITE (SHC)	PERIODIC	TBD
C	93% SULFURIC ACID (SA)	CONTINUOUS	294 GPD
D	ANTISCALANT	CONTINUOUS	12 GPD
E	PERIODIC CIP BLOWDOWN	EVERY 6 MONTHS	8,000 GAL.
F	SYSTEM SHUTDOWN FLUSH	PERIODIC	300 GPM/20 MIN.
G	PERIODIC CIP BLOWDOWN	EVERY MONTH	5,000 GAL.

NOTES:

(1) AVERAGE FLOWS REPRESENT SYSTEM DESIGN CAPACITY ON A 24 HOUR BASIS.

(2) MAXIMUM FLOWS REPRESENT PEAK INSTANTANEOUS FLOW CONDITIONS.

CHLORINE CONATCT BASIN NOT INCLUDED IN SPI DESIGN

Figure 7-2

MF/RO Process Flow Diagram
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Source: CH2M Hill

Table 7-3. Predicted water quality characteristics for project wastewater.

Constituent	Hayward + RCEC Wastewater Discharge		EBDA Discharge Limit*	
Turbidity	2.0	ntu	NA	
pH	7-8	units	6-9	
Total Dissolved Solids	852	mg/l	NA	
Total Suspended Solids	22.8	mg/l	30 ‡	mg/l
BOD	22.3	mg/l	25 ‡	mg/l
Hardness	168	mg/l	NA	
Calcium (total)	38	mg/l	NA	
Magnesium (total)	13	mg/l	NA	
Manganese	0.1	mg/l	NA	
Sodium (total)	123	mg/l	NA	
Potassium	23	mg/l	NA	
Total Alkalinity	255	mg/l	NA	
Silica	13	mg/l	NA	
Sulfate	113	mg/l	NA	
Chloride	172	mg/l	NA	
Copper (total)	0.023	mg/l	0.023	mg/l
Cadmium	0.3	mg/l	NA	
Chromium (total)	2.7	mg/l	NA	
Cyanide (total)	0.0043	mg/l	0.021	mg/l
Iron (total)	1.9	mg/l	NA	
Lead (total)	0.0024	mg/l	0.056	mg/l
Mercury (total)	0.00007	mg/l	0.00021	mg/l
Nickel (total)	0.016	mg/l	0.021	mg/l
Nitrate	5.6	mg/l	NA	
Fluoride	3.2	mg/l	NA	
Arsenic	0.9	mg/l	NA	
Boron	0.5	mg/l	NA	
Selenium (total)	0.0017	mg/l	0.050	mg/l
Silver (total)	0.0025	mg/l	0.023	mg/l
Zinc (total)	0.073	mg/l	0.58	mg/l

*EBDA discharge limits for settleable matter, benzo(a)anthracene, bis(2-Ethylbexyl) Phthalate, Chrysene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene also exist and will be met in the combined Hayward + RCEC discharge.

‡ Monthly average concentration

Approximately 9 tons/day (average) to 12 tons/day of sludge will be generated, requiring one to two truckloads per day. All lime storage, copper treatment, and solids handling facilities are shown in Figure 2.3-1.

7.3.2 Cooling Tower Blowdown

Circulating (or cooling) water system blowdown will consist of AWT plant RO product water that has been concentrated between 50 to 100 cycles and residues of the chemicals added to the circulating water. These chemicals will control scaling and biofouling of the cooling tower and corrosion of the circulating water piping and condenser tubes. Cooling water treatment will require the addition of a pH control agent (acid or caustic), a mineral scale dispersant (i.e. polyacrylate polymer), a corrosion inhibitor (phosphate based), and a biocide (i.e. bleach or equivalent). MSDS information for representative chemicals used are included in Appendix 7-B. As cooling tower makeup water will be very low in TDS, soda ash or some other form of buffering may also be required during operation at lower cycles.

This waste stream will be discharged via a separate pipeline to the existing 8" sanitary sewer along Enterprise Avenue, as shown on Figure 2.3-2. This stream will have a separate monitoring point, prior to entering the sewer, to assure it meets appropriate discharge limits. The volume of this relatively minor waste stream is expected to be 33 gpm under average conditions and 46 gpm under peak conditions. In order to determine the worst case impact of operation, varying assumptions were used for flow balance determination and for cooling tower blowdown quality. Flows were determined assuming operation at 50 cycles of concentration, as greater flowrates results at the lower cycles of operation. Cooling tower blowdown was determined for operation at 100 cycles of concentration, to project the highest concentrations in the discharge. The water quality characterization of this wastewater stream is shown on Table 7-2.

Due to the use of cooling towers with the lowest achievable drift (0.0005%), the amount of TDS discharged to the atmosphere is very low. The drift quality is equivalent to the blowdown quality, therefore, the concentration of TDS in the drift is expected to be a maximum of 2,461 mg/L at a flowrate of approximately 0.69 gpm, or equivalent to 20 lb/day.

7.3.3 Sanitary Wastewater

Sanitary wastewater from sinks, toilets and other sanitary facilities will be collected and discharged to the existing sanitary sewer, shown on Figure 2.3-2. An average flow of 2 gpm is expected to be discharged.

7.3.4 Plant Drainage

Miscellaneous general plant drainage will consist of area washdown, sample drainage, equipment leakage, and drainage from facility equipment areas. Water from these areas will be collected in systems of floor drains, sumps, and pipes within the RCEC and AWT Plant and discharged to the existing 8" sanitary pipeline along Enterprise Avenue, as shown on Figure 2.3-2. These streams will have separate monitoring points, prior to entering the sewer, to assure they meet appropriate discharge limits. Drains that could contain oil or grease will be routed through an oil/water separator. An average flow of 53 gpm and peak flow of 66 gpm is projected.

7.3.5 Stormwater from AWT Plant

Stormwater from the AWT plant will be collected and discharged via a separate pipeline, as shown on Figure 2.3-2. A maximum flow of approximately 2.6 (4.0 cfs) based on 25-year, 24-hour storm volume is projected for the site assuming all impervious surfaces.

7.4 BENEFITS OF MF/RO COMBINED WITH COPPER REMOVAL

The use of MF/RO and copper treatment to treat the secondary effluent for the RCEC will result in several environmental benefits. These include, most importantly: 1) reduced discharge from the cooling tower and HRSG blowdown, and 2) significant reduction in mass loadings of copper discharged to San Francisco Bay.

Reduced discharge—The higher quality of water available for cooling tower operations will allow much greater cycling of water than would otherwise be possible. If conventional Title 22 treatment were used for treatment of typical Hayward WPCF secondary effluent, cycling of cooling water would be limited to 3 to 5 cycles due to the higher level of impurities in typical recycled secondary effluent. Use of MF/RO technology results in significantly lower impurities, including lower TDS levels; therefore, the water is able to be cycled up to100 times before blowing down any impurities. (Average cycling in the RCEC's circulating water system will likely be about 50 times.)

Reduced copper mass loadings—The planned copper removal process will reduce mass loadings of copper from the Hayward WPCF by 12 kg/month (from 36 kg/month to 24 kg/month) during peak power plant operation. This is a reduction of approximately 33 percent. The effect of the mass reduction on the total copper discharged to the San Francisco bay (i.e. including the mass loadings from the other five EBDA members) is a reduction from 159 kg/month of copper to 147 kg/month, a reduction of 8 percent.

8.1 AIR QUALITY

8.1.1 Air Quality Setting

8.1.1.1 Geography and Topography

The Russell City Energy Center (RCEC) is located approximately 2.14 miles west-southwest of the intersection of State Route 92 and I-880 in Hayward, California. The site is located 1.24 miles east of Johnson Landing on the southeastern shore of San Francisco Bay (Alameda County). Approximately 1.65 miles northeast of the site lies the Hayward Municipal Airport complex. The nearest residential area is approximately 0.82 miles northeast of the proposed project site.

The project site is relatively flat, at an elevation of 10 feet above sea level on the floor of the San LeandroValley. To the immediate north and north-northwest of the site lies the upper portion of the San Leandro Valley and the City of Oakland. To the west, northwest, and southwest of the site is the San Francisco Bay. To the immediate northeast, east, and southeast lie the cities of San Leandro, Hayward, and the Union City-Fremont areas respectively. To the south and southeast of the site lie extensive bay marsh and salt evaporator areas. Figure 8.1-1 (in pocket at end of section) shows the terrain within 6 miles of the project.

8.1.1.2 Climate and Meteorology

The overall climate in the project area is dominated by the semi-permanent eastern Pacific high pressure system, centered over the northeastern Pacific Ocean. This high is typically centered between the 140 W and 150 W meridians. Its position and size typically governs California's weather. In the summer, the high is strongest and moves to its northernmost position, which results in strong northwesterly air flow and negligible precipitation. A thermal low pressure area from the Sonoran-Mojave Desert also causes air to flow onshore over the San Francisco Bay area much of the summer.

The steady northwesterly flow around the eastern edge of the Pacific high pressure cell exerts a stress on the ocean surface along the west coast. This causes cold water to form at the surface, which cools the air even further. This cooling produces a high incidence of fog and clouds along the northern California coast in summer.

In the winter, the high weakens and moves southwestward toward Hawaii, which allows storms originating in the Gulf of Alaska to reach northern California, bringing wind and rain. About 80 percent of the region's annual rainfall of approximately 19.5 inches occurs between November and March. During the winter rainy periods, inversions are weak or nonexistent, winds are often moderate, and the air pollution potential is very low. During summer and fall, when the Pacific high becomes dominant, inversions become strong and often are surface based; winds are light and the pollution potential is high. These periods are often characterized by winds that flow out of the Central Valley into the Bay Area and often include tule fog.

Historical climatic data for the project area was derived from the following sites located to the north and south of the project site.

- San Leandro, elevation 394 ft. amsl

  Latitude 37 deg, 46 min N, Longitude 122 deg, 10 min W

- Newark, elevation 10 ft. amsl

  Latitude 37 deg, 31 min N, Longitude 122 deg, 2 min W

A summary of data from these sites indicates the following:

- Maximum average daily temperature is 67.7 deg F
- Minimum average daily temperature is 48.8 deg F
- Average days per year with maximum daily temperature > 90 deg F = 8
- Average days per year with maximum daily temperature <= 32 deg F = 0
- Average days per year with minimum daily temperature <= 32 deg F = 4
- Average days per year with minimum daily temperture <= 0 deg F = 0
- Average annual precipitation = 19.5 in. year
- Average annual days with precipitation >= 0.1 in. = 37

Air quality is determined primarily by the type and amount of pollutants emitted into the atmosphere, the topography of the air basin, and the meteorological conditions. In the project area, stable atmospheric conditions and light winds can provide conditions for pollutants to accumulate in the air basin. The predominant winds in California are shown in Figures 8.1-2 through 8.1-5 (all of the figures in this section are located at the end of the section). As the figures indicate, winds in California generally are light and easterly in the winter, but strong and westerly in the spring, summer, and fall.

Wind patterns in the area of the project site are presented in Figures 8.1-6a through 8.1-6e, which are the annual and quarterly wind roses for the Union City (1990-1994) meteorological station. The wind roses indicate that winds are persistent and predominantly from the west through the north-west. Calm conditions occur approximately 0.42% percent of the time. A total of about 56% percent of the winds come from west through north-northwest. In general, the northwesterly winds are associated with a convective flow of cool marine air (i.e., off San Francisco Bay) inland to the warm interior during the warm part of the day and the warm part of the year. However, there is also a significant incidence of southeast through south-southeast wind flow (approximately 16.8 percent). These southeasterly winds occur under conditions of relatively cold temperatures inland, i.e., during the cool parts of the year and the cool parts of the day, when temperatures over the Bay are warmer than those inland and cause an offshore convective flow. Figure 8.1-6f shows the stability/wind rose for the Union City data.

Seasonal wind flow patterns for the Bay Area are shown on Figure 8.1-7. Statistical data for these patterns is summarized in Table 8.1-1.

The mixing heights of the area are affected by the eastern Pacific high pressure system and marine influences. Often the base of an inversion is found at the top of a layer of marine air because of the cooler nature of the marine environment. Smith, et al. (1984), reported that at Oakland, the nearest upper-level meteorological station (located approximately 7 miles north-northwest of the project site), 50th percentile morning mixing heights for the period 1979-80 were approximately 1770 feet (530-550 meters) in summer and fall, and 3600-3900 feet (1100-1200 meters) in winter and spring. The 50th percentile afternoon mixing heights ranged between 2150 and 3030 feet (660-925 meters) in summer and fall, and over 3900 feet (>1200 meters) in winter and spring. Such mixing heights provide generally favorable conditions for the dispersion of pollutants. Inland areas, where the marine influence is weaker, often experience strong ground-based inversions during cold weather periods. These inversions inhibit dispersion of low-lying sources of air pollution such as cars, trucks, and buses, which can result in high pollutant concentrations.

Table 8.1-1. San Francisco Bay Area air basin surface airflow types: seasonal and diurnal percentage of occurrence (1977-1981 Data).

Time - PST	Ib North-westerly (Weak)	Ia North-Westerly (Moderate to Strong)	II South-erly	III South-easterly	IV North-easterly	V Bay Inflow	VI Bay Out-Flow	VII Calm
Winter								
4 a.m.	3	4	19	14	8	21	5	24
10 a.m.	4	5	19	20	10	11	19	9
4 p.m.	16	16	16	12	13	3	22	1
10 p.m.	6	9	14	14	10	20	3	21
All Times	7	9	17	15	10	14	12	14
Spring								
4 a.m.	27	25	11	2	4	15	5	12
10 a.m.	29	25	14	6	5	3	17	1
4 p.m.	22	60	7	4	4	2	2	*
10 p.m.	40	34	8	2	4	5	3	5
All Times	29	36	10	3	4	6	7	5
Summer								
4 a.m.	40	37	4	*	0	6	2	10
10 a.m.	37	44	4	*	1	1	13	0
4 p.m.	20	77	2	0	1	0	*	0
10 p.m.	39	55	2	0	*	1	1	1
All Times	34	53	3	0	1	2	4	3
Fall								
4 a.m.	25	13	7	6	3	22	3	19
10 a.m.	28	15	6	11	6	7	23	4
4 p.m.	31	46	5	2	6	2	2	*
10 p.m.	37	24	6	4	3	13	13	12
All Times	30	24	6	6	4	11	11	9
Yearly								
4 a.m.	24	20	10	6	4	16	4	16
10 a.m.	25	22	11	9	6	6	18	4
4 p.m.	22	50	8	5	6	2	7	*
10 p.m.	31	30	8	5	4	10	2	10
All Times	26	30	9	6	5	8	8	8

Note: * <0.5%

8.1.2 Existing Air Quality and Overview of Standards and Health Effects

The U.S. Environmental Protection Agency (USEPA) has established national ambient air quality standards (NAAQS) for ozone, nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), 10-micron particulate matter (PM_{10}), 2.5-micron particulate matter ($PM_{2.5}$), and airborne lead for the protection of public health and welfare. In general, if these NAAQS are exceeded in an area more than once a year, the area is considered a "nonattainment area" subject to planning and pollution control requirements that are more stringent than normal requirements.

In addition, the California Air Resources Board (CARB) has established standards for ozone, CO, NO_2, SO_2, sulfates, PM_{10}, airborne lead, hydrogen sulfide, and vinyl chloride at levels designed to protect the most sensitive members of the population, particularly children, the elderly, and people who suffer from lung or heart diseases. CARB carries out control program oversight activities, while local air pollution control districts have primary responsibility for air quality planning and enforcement.

Both state and national air quality standards consist of two parts: an allowable concentration of a pollutant and an averaging time over which the concentration is to be measured. Allowable concentrations are based on the results of studies of the effects of the pollutants on human health, crops and vegetation, and, in some cases, damage to paint and other materials. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposures to a high concentration for a short time (one hour, for instance), or to a relatively lower average concentration over a longer period (eight hours, 24 hours, or one year). For some pollutants there is more than one air quality standard, reflecting both its short-term and long-term effects. Table 8.1-2A presents the state and national ambient air quality standards for selected pollutants. Many of the California ambient air quality standards are more stringent than the federal standards and have shorter averaging periods.

Table 8.1-2A. Ambient air quality standards.

Pollutant	Averaging Time	California Standards Concentration	National Standards Concentration
Ozone	1 hour	0.09 ppm	0.12 ppm
	8 hours	-	0.08 ppm (3-year average of annual 4th-highest daily maximum)
Carbon Monoxide	8 hours	9.0 ppm	9 ppm
	1 hour	20 ppm	35 ppm
Nitrogen Dioxide	Annual Average	-	0.053 ppm
	1 hour	0.25 ppm	-
Sulfur Dioxide	Annual Average	-	80 $\mu g/m^3$ (0.03 ppm)
	24 hours	0.04 ppm (105 $\mu g/m^3$)	365 $\mu g/m^3$ (0.14 ppm)
	3 hours	-	1300 $\mu g/m^3$ (0.5 ppm)
	1 hour	0.25 ppm	-
Suspended Particulate Matter (10 Micron)	Annual Geometric Mean	30 $\mu g/m^3$	-
	24 hours	50 $\mu g/m^3$	150 $\mu g/m^3$
	Annual Arithmetic Mean	-	50 $\mu g/m^3$
Suspended Particulate Matter (2.5 Micron)	Annual Arithmetic Mean	-	15 $\mu g/m^3$ (3-year average)
	24 hours	-	65 $\mu g/m^3$ (3-year average of 98th percentiles)
Sulfates	24 hours	25 $\mu g/m^3$	-
Lead	30 days	1.5 $\mu g/m^3$	-
	Calendar Quarter	-	1.5 $\mu g/m^3$

ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter

USEPA's new NAAQS for ozone and fine particulate matter went into effect on September 16, 1997. For ozone, the previous one-hour standard of 0.12 ppm was replaced by an eight-hour average standard at a level of 0.08 ppm. Compliance with this standard is based on the three-year average of the annual fourth-highest daily maximum eight-hour average concentration measured at each monitor within an area.

Table 8.1-2B. Alameda County air quality data summary.

Alameda County										
OZONE (ppm)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Peak Indicator	0.136	0.129	0.130	0.126	0.118	0.135	0.151	0.149	0.151	0.144
National 1-Hour Design Value	0.130	0.130	0.120	0.120	0.120	0.138	0.138	0.138	0.138	0.139
National 8-Hour Design Value	0.087	0.084	0.082	0.081	0.082	0.087	0.093	0.090	0.089	0.086
Maximum 1-Hour Concentration	0.130	0.140	0.130	0.130	0.129	0.155	0.138	0.114	0.146	0.146
Maximum 8-Hour Concentration	0.105	0.092	0.091	0.102	0.092	0.115	0.112	0.084	0.110	0.116
Days Above State Standard	9	19	16	8	7	21	23	6	22	15
Days Above National 1-Hour Standard	2	1	1	2	2	9	8	0	6	2
Days Above National 8-Hour Standard	4	2	3	4	3	12	10	0	10	6
PM10 (ug/m3)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Maximum 24-Hour Concentration	137	155	99	84	97	52	71	65	63	88
Maximum Annual Geometric Mean	27.4	29.9	25.8	22.3	21.7	19.4	20.4	22.0	20.1	22.6
Days Above State 24-Hour Standard	57	84	30	18	24	6	6	12	12	18
Calculated Days Above Nat'l 24-Hour Standard	0	3	0	0	0	0	0	0	0	0
CARBON MONOXIDE (ppm)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Peak Indicator	6.8	7.0	6.4	5.8	4.8	4.8	4.8	4.4	4.5	4.7
Maximum 1-Hour Concentration	8.0	9.0	7.0	7.0	8.7	5.5	6.9	7.9	6.3	6.4
Maximum 8-Hour Concentration	6.1	6.8	4.6	4.9	5.6	3.8	3.9	3.6	4.6	5.2
Days Above State 8-Hour Standard	0	0	0	0	0	0	0	0	0	0
Days Above Nat.'l 8-Hour Standard	0	0	0	0	0	0	0	0	0	0
NITROGEN DIOXIDE (ppm)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Peak Indicator	0.138	0.133	0.120	0.112	0.092	0.091	0.090	0.089	0.087	0.094
Maximum 1-Hour Concentration	0.130	0.150	0.110	0.110	0.097	0.086	0.088	0.086	0.098	0.112
Maximum Annual Average	0.023	0.024	0.021	0.022	0.022	0.021	0.022	0.020	0.020	0.022
SULFUR DIOXIDE (ppm)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Peak Indicator	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum 24-Hour Concentration	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Sources: California Almanac of Emissions and Air Quality-2001

The NAAQS for particulates were revised in several respects. First, compliance with the current 24-hour PM_{10} standard is now based on the 99th percentile of 24-hour concentrations at each monitor within an area. In addition, two new $PM_{2.5}$ standards were added: a standard of 15 $\mu g/m^3$, based on the three-year average of annual arithmetic means from single or multiple monitors (as available); and a standard of 65 $\mu g/m^3$, based on the three-year average of the 98th percentile of 24-hour average concentrations at each monitor within an area. USEPA is delaying implementation of the new standards for an interim period to allow time to establish $PM_{2.5}$ monitoring networks, designate areas, and develop control strategies. Presently, USEPA has very little data to establish the air quality status of areas with regard to $PM_{2.5}$. Table 8.1-2B delineates a historical summary of air quality data for Alameda county from 1990-1999. Specific monitoring station data used for background is given in Section 8.1.3.

8.1.3 Criteria Pollutants and Air Quality Trends

Existing SLAMS/NAMS ambient air monitoring stations were used to characterize the air quality at the project site. These stations were utilized because of their proximity to the project site and because they record area-wide ambient conditions rather than the localized impacts of any particular facility. All ambient air quality data presented in this section were taken from CARB, BAAQMD, and EPA publications and data sources. Monitoring station location and pollutant data used to establish background air quality for the project area is as follows:

- Fremont Station – Ozone, carbon monoxide, nitrogen dioxide, sulfates, PM_{10}, lead
  Chapel Way Monitoring Site
- Hayward Station – Ozone
  La Mesa Monitoring Site
- San Leandro Station – Ozone and PM_{10}
  County Hospital Monitoring Site
- San Francisco Station – Sulfur dioxide
  Arkansas St. Monitoring Site
- San Jose Station – Sulfates
  4th St. Monitoring Site

8.1.3.1 Ozone

Ozone is generated by a complex series of chemical reactions between precursor organic compounds (POC) and oxides of nitrogen (NO_x) in the presence of ultraviolet radiation. Ambient ozone concentrations follow a seasonal pattern: higher in the summer time and lower in the winter time. At certain times, the general area can provide ideal conditions for the formation of ozone due to the persistent temperature inversions, clear skies, mountain ranges to trap the air mass, and exhaust emissions from motor vehicles and stationary, area, and biogenic sources. Based upon ambient air measurements at stations throughout the area, the San Francisco Bay Area Air Basin is classified as a nonattainment area for ozone for both state and federal air quality standards.

Maximum ozone concentrations at the identified stations usually are recorded during the summer months. Tables 8.1-3a, 8.1-3b, and 8.1-3c show the annual maximum hourly ozone levels recorded at the Fremont, Hayward, and San Leandro monitoring stations, respectively, during the period 1993-2000, as well as the number of days in which the state and federal standards were exceeded. The data show that, on average, the state ozone air quality standard was exceeded several days each year. During the last three (3) monitoring years, only one exceedance of the federal standard was recorded (Fremont station-1999).

Data from these stations over the last 3-4 years indicate that ozone concentrations have been consistently below or at the NAAQS, but above the SAAQS. Only one of the three stations has recorded an exceedance of the NAAQS for ozone in the past three (3) years. Data from the most recent three (3) years of data will be used to establish a background level.

Table 8.1-3a. Ozone levels at the Fremont monitoring station, 1993-2000 (ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	.13	.12	.15	.10	.11	.12	.13	.10
Number of Days Exceeding:								
State Standard (0.09 ppm, 1-hour)	5	4	10	2	2	7	3	2
Federal Standard (0.12 ppm, 1-hour)	1	0	2	0	0	0	1	0

Source: BAAQMD, CARB

Table 8.1-3b. Ozone levels at the Hayward monitoring station, 1993-2000 (ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	.09	.10	.15	.11	.11	.10	.12	.11
Number of Days Exceeding:								
State Standard (0.09 ppm, 1-hour)	0	1	7	2	2	4	4	1
Federal Standard (0.12 ppm, 1-hour)	0	0	2	0	0	0	0	0

Source: BAAQMD, CARB

Table 8.1-3c. Ozone levels at the San Leandro monitoring station, 1993-2000 (ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	.12	.09	.15	.11	.10	.11	.11	.10
Number of Days Exceeding:								
State Standard (0.09 ppm, 1-hour)	3	0	6	2	3	2	3	1
Federal Standard (0.12 ppm, 1-hour)	0	0	3	0	0	0	0	0

Source: BAAQMD, CARB

8.1.3.2 Nitrogen Dioxide

Nitrogen oxides are primarily generated from the combustion of fuels. Nitrogen oxides include nitric oxide (NO) and NO_2. Because NO converts to NO_2 in the atmosphere over time and NO_2 is the more toxic of the two, nitrogen dioxide is the listed criteria pollutant. The control of NO_2 is important because of its role in the formation of ozone.

Based upon regional air quality measurements of NO_2, the San Francisco Bay Area Air Basin is in attainment for NO_2 for both state and federal standards.

Table 8.1-4 shows the maximum one-hour NO_2 levels recorded at the Fremont monitoring station each year from 1993 through 2000, as well as the annual average level for each of those years. During this period there has not been a single violation of either the state one-hour standard or the annual NAAQS of 5.3 pphm.

Table 8.1-4. Nitrogen dioxide levels at the Fremont monitoring station, 1993-2000 (pphm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	10	10	9	9	9	10	11	8
Annual Average (NAAQS = 5.3 pphm)	2.2	2.2	2.1	2.2	2.0	2.0	2.2	1.8
Number of Days Exceeding:								
State Standard (0.25 ppm, 1-hour)	0	0	0	0	0	0	0	0

Source: California Air Resources Board and BAAQMD

8.1.3.3 Carbon Monoxide

CO is a product of inefficient combustion, principally from automobiles and other mobile sources of pollution. In many areas of California, CO emissions from wood-burning stoves and fireplaces can also be measurable contributors. Industrial sources typically contribute less than 10 percent of ambient CO levels. Peak CO levels occur typically during winter months, due to a combination of higher emission rates and calm weather conditions with strong, ground-based inversions. Based upon ambient air quality monitoring, the San Francisco Bay Area Air Basin is classified as being in attainment for CO for state and federal standards.

Table 8.1-5 shows the California and federal air quality standards for CO, and the maximum one-hour and eight-hour average levels recorded at the Fremont monitoring station during the period 1993-2000.

Table 8.1-5. Carbon monoxide levels at the Fremont monitoring station, 1993-2000(ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 8-hour average	3.6	3.9	2.9	3.4	3.0	2.8	3.1	2.4
Highest 1-hour average	7	9	6	6	6	5.1	5.6	3.6
Number of days exceeding:								
State Standard (9.0 ppm, 8-hr)	0	0	0	0	0	0	0	0
State Standard (20 ppm, 1-hr)	0	0	0	0	0	0	0	0
Federal Standard (9 ppm, 8-hr)	0	0	0	0	0	0	0	0
Federal Standard (35 ppm, 1-hr)	0	0	0	0	0	0	0	0

Source: California Air Resources Board and BAAQMD

Trends of maximum eight-hour and one-hour average CO as shown in Table 8.1-5 indicate that maximum ambient CO levels at the Fremont station have been below the state standards for many years, and continue to decline. This same trend is present for the entire BAAQMD as shown in Table 8.1-2B.

8.1.3.4 Sulfur Dioxide

SO_2 is produced when any sulfur-containing fuel is burned. It is also emitted by chemical plants that treat or refine sulfur or sulfur-containing chemicals. Natural gas contains negligible sulfur, while fuel oils contain larger amounts. Peak concentrations of SO_2 occur at different times of the year in different parts of California, depending on local fuel characteristics, weather, and topography. The San Francisco Bay Area Air Basin is considered to be in attainment for SO_2 for purposes of state and federal air quality planning.

Table 8.1-6 presents the state air quality standard for SO_2 and the maximum levels recorded in San Francisco (site of the nearest SO_2 monitor) from 1993 through 2000. The federal annual average standard is 0.03 ppm; during the period shown, the annual average SO_2 levels at San Francisco have been well below the federal standard.

Table 8.1-6. Sulfur dioxide levels in San Francisco, 1993-2000 (ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	.04	.02	.04	.04	.03	.04	.03	.02
Annual Average	.001	.000	.001	.001	.001	.001	.002	.002
Number of Days Exceeding:								
State Standard (0.25 ppm, 1-hr)	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

8.1.3.5 Particulate Sulfates

Particulate suspended sulfates are generated from the oxidation of SO_2 in the atmosphere. A natural source of particulate sulfates in coastal areas comes from sea spray, due to the sulfate content in seawater. The San Francisco Bay Area Air Basin is in attainment with the state standard for sulfates. There is no federal standard for sulfates.

Table 8.1-7 shows the California air quality standard for particulate suspended sulfate and the maximum 24-hour average levels recorded in Fremont from 1993 through 1995 and San Jose from 1996 to 2000. Maximum levels are generally well below the state standard.

Table 8.1-7. Particulate suspended sulfate levels, 1993-2000 ($\mu g/m^3$).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 24-Hour Average	8.4	6.7	6.6	6.3	6.9	3.3	5.4	10.2
Number of Days Exceeding:								
State Standard (25 $\mu g/m^3$, 24-hour)	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

8.1.3.6 Particulates (PM_{10})

Particulates in the air are caused by a combination of wind-blown fugitive dust; particles emitted from combustion sources and manufacturing processes; and organic, sulfate, and nitrate aerosols formed in the air from emitted hydrocarbons, sulfur oxides, and nitrogen oxides. In 1984, CARB adopted standards for PM_{10} and phased out the total suspended particulate (TSP) standards that had been in effect previously. PM_{10} standards were substituted for TSP standards because PM_{10} corresponds to the size range of particulates that can be inhaled into the lungs and therefore is a better measure to use in assessing potential health effects. In 1987, USEPA also replaced national TSP standards with PM_{10} standards. PM_{10} levels in the San Francisco Bay Area Air Basin are in attainment with federal standards but exceed the state standards.

As discussed previously, the NAAQS for particulates were further revised by USEPA with new standards that went into effect on September 16, 1997; two new $PM_{2.5}$ standards were added at that time.

Table 8.1-8a shows the federal and state air quality standards for PM_{10}, maximum levels recorded at the Fremont monitoring station for 1993-2000, and geometric and arithmetic annual averages for the same period. Table 8.1-8b presents the same information for the San Leandro monitoring station (1993 to 1998).

Table 8.1-8a PM_{10} levels at the Fremont monitoring station, 1993-2000 ($\mu g/m^3$).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 24-Hour Average	77	82	52	59	63	63	88	50
Annual Geometric Mean (State Standard = 30 $\mu g/m^3$)	22.3	21.7	19.2	20.5	21.8	20.1	21.9	17.9
Annual Arithmetic Mean (Federal Standard = 50 $\mu g/m^3$)	25.3	24.9	21.9	22.7	23.6	21.8	24.3	18.4
Number of Days Exceeding:								
State Standard (50 $\mu g/m^3$, 24-hour)	3	3	1	1	1	1	2	0
Federal Standard (150 $\mu g/m^3$, 24-hour)	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

Table 8.1-8b PM_{10} levels at the San Leandro monitoring station, 1993-1998 ($\mu g/m^3$).

	1993	1994	1995	1996	1997	1998
Highest 24-Hour Average	51	62	47	59	65	32.4
Annual Geometric Mean (State Standard = 30 $\mu g/m^3$)	18.1	18.7	16.9	19.1	15.9	13.2
Annual Arithmetic Mean (Federal Standard = 50 $\mu g/m^3$)	20.8	21.1	19.5	21.3	17.4	14.0
Number of Days Exceeding:						
State Standard (50 $\mu g/m^3$, 24-hour)	1	1	0	1	1	0
Federal Standard (150 $\mu g/m^3$, 24-hour)	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

8.1.3.7 Airborne Lead

Lead in the air results from the combustion of fuels that contain lead. Twenty-five years ago, motor gasolines contained relatively large amounts of lead compounds used as octane-rating improvers, and ambient lead levels were relatively high. Beginning with the 1975 model year, new automobiles began to be equipped with exhaust catalysts, which were poisoned by the exhaust products of leaded gasoline. Thus, unleaded gasoline became the required fuel for an increasing fraction of new vehicles, and the phaseout of leaded gasoline began. As a result, ambient lead levels decreased dramatically. The San Francisco Bay Area Air Basin is considered an attainment area for state and federal airborne lead levels for air quality planning purposes.

Table 8.1-9 lists the state air quality standard for airborne lead and the levels recorded in Fremont from 1993 through 1999. Maximum quarterly levels are well below the federal standard.

Table 8.1-9. Airborne lead levels at the Fremont monitoring station 1993-1999 ($\mu g/m^3$).

	1993	1994	1995	1996	1997	1998	1999
Highest Quarterly Average	.01	.02	.02	.01	.01	.02	.01
Number of Days Exceeding:							
State Standard (1.5 $\mu g/m^3$, monthly)	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

Figures 8.1-8, 8.1-9, and 8.1-10 show overall air quality trends in the Bay Area AQMD for ozone, carbon monoxide, and PM10 respectively as delineated in the CARB 2001 Almanac of Emissions and Air Quality.

8.1.4 Affected Environment

The USEPA has responsibility for enforcing, on a national basis, the requirements of many of the country's environmental and hazardous waste laws. California is under the jurisdiction of USEPA Region IX, which has its offices in San Francisco. Region IX is responsible for the local administration of USEPA programs for California, Arizona, Nevada, Hawaii, and certain Pacific trust territories. USEPA's activities relative to the California air pollution control program focus principally on reviewing California's submittals for the State Implementation Plan (SIP). The SIP is required by the federal Clean Air Act to demonstrate how all areas of the state will meet the national ambient air quality standards within the federally specified deadlines (42 USC §7409, 7411).

The California Air Resources Board was created in 1968 by the Mulford-Carrell Air Resources Act, through the merger of two other state agencies. CARB's primary responsibilities are to develop, adopt, implement, and enforce the state's motor vehicle pollution control program; to administer and coordinate the state's air pollution research program; to adopt and update as necessary the state's ambient air quality standards; to review the operations of the local air pollution control districts; and to review and coordinate preparation of the SIP for achievement of the federal ambient air quality standards (California Health & Safety Code (H&SC) §39500 et seq.).

When the state's air pollution statutes were reorganized in the mid-1960s, local air pollution control districts (APCDs) were required to be established in each county of the state (H&SC §4000 et seq.). There are three different types of districts: county, regional, and unified. In addition, special air quality management districts (AQMDs), with more comprehensive authority over non-vehicular sources as well as transportation and other regional planning responsibilities, have been established by the Legislature for several regions in California, including the San Francisco Bay Area (H&SC §40200 et seq.).

Air pollution control districts and air quality management districts in California have principal responsibility for developing plans for meeting the state and federal ambient air quality standards; for developing control measures for non-vehicular sources of air pollution necessary to achieve and maintain both state and federal air quality standards; for implementing permit programs established for the construction, modification, and operation of sources of air pollution; for enforcing air pollution statutes and regulations governing non-vehicular sources; and for developing employer-based trip reduction programs.

Each level of government has adopted specific regulations that limit emissions from stationary combustion sources, several of which are applicable to this project. The other agencies having permitting authority for this project are shown in Table 8.1-10. Applicable LORS and compliance with these requirements are discussed in more detail in the following sections. An application for a Determination of Compliance will be filed with the BAAQMD approximately one week after the AFC is filed with the Commission.

Table 8.1-10. Air quality agencies.

Agency	Authority	Contact
USEPA Region IX	oversight of permit issuance, enforcement	Matt Haber, Chief Permits Officer USEPA Region IX 75 Hawthorne Street San Francisco, CA 94105 (415) 744-1254
Bay Area Air Quality Management District	permit issuance, enforcement	William deBoisblanc, Director of Permit Services Bay Area Air Quality Management District 939 Ellis Street San Francisco, CA 94109 (415) 749-4707
California Air Resources Board	regulatory oversight	Mike Tollstrup, Chief Project Assessment Branch, CARB 2020 L St. Sacramento, CA. 95814 (916) 322-6026

8.1.4.1 Laws, Ordinances, Regulations, and Standards

Federal

Prevention of Significant Deterioration Program

Authority: Clean Air Act §160-169A, 42 USC §7470-7491; 40 CFR Parts 51 and 52

Requirements: Requires prevention of significant deterioration (PSD) review and facility permitting for construction of new or modified major stationary sources of air pollution. PSD review applies with respect to attainment pollutants for which ambient concentrations are lower than the corresponding national ambient air quality standards (NAAQS). The following federal requirements apply on a pollutant-by-pollutant basis, depending on facility emission rates.

- Emissions must be controlled using Best Available Control Technology (BACT).
- Air quality impacts in combination with other increment-consuming sources must not exceed maximum allowable incremental increases for SO_2, PM_{10}, and NO_x.
- Air quality impacts of all sources in the area plus ambient pollutant background levels cannot exceed NAAQS.
- Pre- and/or post-construction air quality monitoring may be required.
- The air quality impacts on soils, vegetation, and nearby PSD Class I areas (specific national parks and wilderness areas) must be evaluated. (Note: RCEC is located in a Class II area.)

PSD review jurisdiction has been delegated to the Bay Area Air Quality Management District (BAAQMD) for all pollutants and is discussed further below under local LORS and conformance.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

New Source Review

Authority: Clean Air Act §171-193, 42 USC §7501 et seq.; 40 CFR Parts 51 and 52

Requirement: Requires new source review (NSR) facility permitting for construction or modification of specified stationary sources. New source review applies with respect to nonattainment pollutants for which ambient concentration levels are higher than the corresponding NAAQS. The following federal requirements apply on a pollutant-by-pollutant basis, depending on facility emission rates.

- Emissions must be controlled to the lowest achievable emission rate (LAER).
- Sufficient offsetting emissions reductions must be obtained following the requirements in the regulations to continue reasonable further progress toward attainment of applicable NAAQS.
- The owner or operator of the new facility has demonstrated that major stationary sources owned or operated by the same entity in California are in compliance or on schedule for compliance with applicable emissions limitations in this rule.
- The administrator must find that the implementation plan has been adequately implemented.
- An analysis of alternatives must show that the benefits of the proposed source significantly outweigh any environmental and social costs.

New source review jurisdiction has been delegated to the BAAQMD for all pollutants and is discussed further under local LORS and conformance below.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

Acid Rain Program

Authority: Clean Air Act §401 (Title IV), 42 USC §7651

Requirement: Requires the reduction of the adverse effects of acid deposition through reductions in emissions of sulfur dioxide and nitrogen oxides. BAAQMD has received delegation authority to implement Title IV.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

Title V Operating Permits Program

Authority: Clean Air Act §501 (Title V), 42 USC §7661

Requirements: Establishes comprehensive operating permit program for major stationary sources. BAAQMD has received delegation authority for this program.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

National Standards of Performance for New Stationary Sources

Authority: Clean Air Act §111, 42 USC §7411; 40 CFR Part 60

Requirements: Establishes national standards of performance for new stationary sources. These standards are enforced at the local level with USEPA oversight. Relevant new stationary source performance standards are discussed under local LORS below.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

National Emission Standards for Hazardous Air Pollutants

Authority: Clean Air Act §112, 42 USC §7412

Requirements: Establishes national emission standards for hazardous air pollutants. These standards are enforced at the local level with USEPA oversight and are further discussed under local LORS and conformance below.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

State

Nuisance Regulation

Authority: CA Health & Safety Code §41700

Requirements: Provides that "no person shall discharge from any source whatsoever such quantities of air contaminants or other material which causes injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property."

Administering Agency: CARB and BAAQMD

Toxic "Hot Spots" Act

Authority: H& SC §44300-44384; 17 CCR §93300-93347

Requirements: Requires preparation and periodic updating of inventory of facility emissions of hazardous substances listed by CARB, in accordance with CARB's regulatory guidelines. Risk assessments are to be prepared by selected facilities based upon local priorities and risk scoring criteria.

Administering Agency: BAAQMD and CARB

CEC and CARB Memorandum of Understanding

Authority: CA Pub. Res. Code §25523(a); 20 CCR §1752, 1752.5, 2300-2309 and Div. 2, Chap. 5, Art. 1, Appendix B, Part (k)

Requirements: Provides for the inclusion of requirements in the CEC's decision on an application for certification to assure protection of environmental quality; application is required to include information concerning air quality protection.

Administering Agency: California Energy Commission

Local

Authority: CA Health & Safety Code §40001

Requirements: Prohibit emissions and other discharges (such as smoke and odors) from specific sources of air pollution in excess of specified levels.

Administering Agency: BAAQMD, with CARB oversight.

8.1.4.2 Conformance of Facility

As addressed in this section, RCEC is designed, and will be constructed and operated, in accordance with all relevant federal, state, and local requirements and policies concerning protection of air quality.

Federal and Bay Area Air Quality Management District Prevention of Significant Deterioration Program

USEPA has promulgated PSD regulations for areas that are in compliance with national ambient air quality standards (40 CFR 52.21). The PSD program allows new sources of air pollution to be constructed, or existing sources to be modified, while preserving the existing ambient air quality levels, protecting public health and welfare, and protecting Class I areas (e.g., specific national parks and wilderness areas). USEPA has delegated the authority to implement the PSD program to various California air pollution control districts, including the BAAQMD where the RCEC is located (40 CFR 52.21(u)).

The five principal elements of the federal PSD program are:

- Applicability
- Best available control technology
- Pre-construction monitoring
- Increments analysis
- Air quality impact analysis

The PSD requirements apply on a pollutant-specific basis to any project that is a new major stationary source or a major modification to an existing stationary source. (These terms are defined in federal regulations.) (40 CFR 52.21) The determination of applicability is based on evaluating the emissions changes associated with the proposed project in addition to all other emissions changes at the same location since the applicable PSD baseline dates (40 CFR 52.21).

Under the BAAQMD PSD program (Regulation 2, Rule 2), best available control technology (BACT) must be applied when a new or modified source shows emission increases in excess of 10 pounds per highest day of precursor organic compounds (POC), nonprecursor organic compounds (NPOC), NO_x, SO_2, PM_{10}, or CO. The BAAQMD program also dictates that a permit for a project will be denied if specified emissions thresholds are exceeded unless air dispersion modeling shows that ambient air quality standards will not be violated and the applicable PSD increments, as defined in the PSD rule, will not be exceeded. The BAAQMD PSD emission threshold levels for requiring modeling are shown in Table 8.1-11. The PSD modeling requirements apply to all facilities with cumulative increases in emissions that exceed the levels shown in Table 8.1-11 on a pollutant-specific basis since the applicable PSD baseline date.

Table 8.1-11. BAAQMD PSD significant emission threshold levels.

Pollutant	Threshold Level
PM_{10}	15 tpy
NO_x	40 tpy
SO_2	40 tpy
POC	40 tpy
CO	100 tpy

The BAAQMD PSD program applies, on a pollutant-specific basis, only to a new major stationary source or to a major modification of an existing major stationary source that meets the following criteria:

- A new facility that will emit 100 tons per year (tpy) or more, and is one of the 28 PSD source categories in the federal Clean Air Act or any new facility that will emit 250 tpy or more; or
- A facility that emits 100 tpy or more with net emissions increases since the applicable PSD baseline date that exceed the threshold levels shown in Table 8.1-11.

Federal New Source Performance Standards

The Standards of Performance for New Stationary Sources are source-specific federal regulations, limiting the allowable emissions of criteria pollutants (i.e., those that have a national ambient air quality standard). These regulations apply to certain sources depending on the equipment size, process rate, and/or the date of construction, modification, or preconstruction of the affected facility. Recordkeeping, reporting, and monitoring requirements are usually necessary for the regulated pollutants from each subject source; the reports must be regularly submitted to the reviewing agency (40 CFR 60.4). As with the PSD program, this program has been delegated by USEPA to the BAAQMD. A summary of the BAAQMD New Source Performance Standards applicable to the project is provided in Section 8.1.4.2.9.

National Emissions Standards for Hazardous Air Pollutants

The National Emissions Standards for Hazardous Air Pollutants (NESHAPs) are either source-specific or pollutant-specific regulations, limiting the allowable emissions of hazardous air pollutants from the affected sources (40 CFR 61). Unlike criteria air pollutants, hazardous air pollutants do not have a national ambient air quality standard but have been identified by USEPA as causing or contributing to the adverse health effects of air pollution.

Administration of the hazardous air pollutants program has been delegated to the BAAQMD and is described in Section 8.1.4.2.10 (40 CFR 61.04).

Federal Clean Air Act Amendments of 1990

In November 1990, substantial revisions and updates to the federal Clean Air Act were signed into law. This complex enactment addresses a number of areas that could be relevant to RCEC, such as State Implementation Plan requirements for nonattainment areas that set new compliance deadlines and annual progress increments, more extensive permitting requirements, new USEPA mandates and deadlines for developing rules to control air toxic emissions, and acid deposition control. Following is a summary of the new provisions applicable to this project.

Title IV - Acid Deposition Control

This title requires the reduction of emissions of acidic compounds and their precursors (42 USC §7651 et seq.). The principal source of these compounds is the combustion of fossil fuels. Other requirements include monitoring and recordkeeping for emissions of SO_2 and NO_x and for opacity and volumetric flow.

Title V - Operating Permits

This title establishes a comprehensive operating permit program for major stationary sources (42 USC §7661 et seq.). Under the Title V program, a single permit that includes a listing of all the stationary sources, applicable regulations, requirements, and compliance determination is required.

The BAAQMD's Major Facility Review Program (Regulation 2, Rule 6) has been approved by USEPA and includes the acid rain program. Consequently, the BAAQMD has received delegation to implement the Title IV and V programs. The BAAQMD Title IV and V permit programs applicable to this project are summarized below.

California Clean Air Act

AB 2595, the California Clean Air Act (Act), was enacted by the California Legislature and became law in January 1989. The Act requires the local air pollution control districts to attain and maintain both the federal and state ambient air quality standards at the "earliest practicable date." The Act contains several milestones for local districts and the California Air Resources Board. In 1993, the BAAQMD submitted to the Air Resources Board an air quality plan defining the program for meeting the required emission reduction milestones in the Bay Area. Several updates to the original plan have also been submitted.

Air quality plans must demonstrate attainment of the state ambient air quality standards and must result in a five percent annual reduction in emissions of nonattainment pollutants (ozone, CO, NO_x, SO_2, and their precursors) in a given district (H&SC §40914). A local district may adopt additional stationary source control measures or transportation control measures, revise existing source-specific or new source review rules, or expand its vehicle inspection and maintenance program (H&SC §40918) as part of the plan. District air quality plans specify the development and adoption of more stringent regulations to achieve the requirements of the Act. The applicable regulations that will apply to RCEC are included in the discussion of BAAQMD prohibitory rules in Section 8.1.4.2.8.

BAAQMD New Source Review Requirements

BAAQMD Regulation 2, Rule 2, New Source Review, requires that a pre-construction review be conducted for all proposed new or modified sources of air pollution. New Source Review contains three principal elements:

- Best available control technology (BACT)
- Emissions offsets
- Air quality impact analysis

BACT is required for all new sources or modifications of existing sources if emission increases caused by the project exceed 10 pounds per highest day of any criteria air pollutant. The district rule also contains separate BACT thresholds for numerous "non-criteria" pollutants, such as lead and various sulfur compounds.

The BAAQMD regulation further requires that for new or modified sources emitting in excess of 50 tons per year of POCs or NO_x, the total project emissions must be offset (i.e., an emission reduction comparable to the emission increase attributable to the source must be achieved at the project site or at another location). To ensure that there is no net increase in regional emissions as a result of new or modified sources, offsets at a ratio of 1.15 to 1.0 must be provided. For facilities emitting more than 15 but less than 50 tons per year of POCs or NO_x, offsets are provided by the District from the Small Facility Banking account at a ratio of 1.0 to 1.0.

In addition, a Major Facility (100 tpy facility) is required to offset net emissions increases from a project, on a pollutant-specific basis, in excess of 1 tpy of PM_{10} and SO_2 that have occurred or will occur after April 5, 1991.

For the BAAQMD, the air quality impact analysis is the same as the PSD requirement: the project must not cause a violation or interfere with the maintenance of any ambient air quality standards or applicable increments.

Finally, the district may impose appropriate monitoring requirements to ensure compliance.

District Regulation 2, Rule 3 specifies procedures for review and standards for approval of Authorities to Construct power plants within the District. The applicant must obtain a Determination of Compliance and an Authority to Construct from the District prior to commencing construction. An application for a Determination of Compliance and an Authority to Construct is expected to be filed with the BAAQMD within one week of the filing of the AFC with the CEC. As the USEPA has delegated permitting authority to the BAAQMD, no application to the USEPA is required for this project.

Risk Management Policy

The District has developed a procedure for reviewing permit applications for projects that will emit compounds that may result in health impacts. The procedure requires comparing the potential emissions of toxic air contaminants from the project to specific levels, and requires the preparation of a written risk screening analysis if the levels are exceeded. The screening analysis includes estimates of the maximum hourly and annual concentrations of the toxic air contaminants, calculations of cancer risk, and comparison of maximum modeled concentrations with appropriate non-cancer threshold levels. The use of best available control technology for toxic air contaminant emissions (T-BACT) is required if the incremental cancer risk from the project is projected to be between 1 and 10 in 1 million.

Other BAAQMD Regulatory Requirements

As required by the federal Clean Air Act and the California Clean Air Act, plans that demonstrate attainment must be developed for those areas that have not attained the national and state air quality standards (42 USC §7401; H&SC §40912). As part of its plan, the BAAQMD has developed regulations limiting emissions from specific sources. These regulations are collectively known as "prohibitory rules," because they prohibit the construction or operation of a source of pollution that would violate specific emission limits.

The general prohibitory rules of the BAAQMD applicable to the RCEC are as follows:

Regulation 1-301 - Public Nuisance

Prohibits emissions in quantities that adversely affect public health, other businesses, or property.

Regulation 6 - Particulate Matter and Visible Emissions

Limits the visible emissions from the project to no darker than No. 1 when compared to a Ringelmann Chart for a period or periods aggregating more than 3 minutes in any hour. Opacity is limited to no greater than 20 percent from any source for a period or periods aggregating 3 minutes in any hour. Particulate emission concentrations cannot exceed 0.15 grains per dry standard cubic foot of exhaust gas volume.

Regulation 7 - Odorous Substances

Limits emission concentrations of dimethylsulfide, ammonia, mercaptan, phenols, and trimethylamine. This regulation becomes applicable upon confirmation of 10 or more odor complaints from the public within a 90-day period. Once the rule becomes applicable, it remains in effect for one year and can be re-triggered with the receipt of 5 or more odor complaints within a 90-day period.

Regulation 9, Rule 1 - Sulfur Dioxide

Limits stationary source emissions of sulfur dioxide to less than 300 ppm. In addition, the rule restricts sulfur dioxide emissions that will result in ground-level concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes, 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours.

Regulation 9, Rule 2 - Hydrogen Sulfide

Limits the emission of hydrogen sulfide during any 24-hour period in such quantities that result in ground-level hydrogen sulfide concentrations in excess of 0.06 ppm averaged over 3 consecutive minutes or 0.03 ppm averaged over any 60 consecutive minutes.

Regulation 9, Rule 3 - Nitrogen Oxides From Heat Transfer Operations

Limits emissions of nitrogen oxides from new or modified heat transfer operations to less than 125 ppm.

Regulation 9, Rule 9 - Nitrogen Oxides from Stationary Gas Turbines

Limits emissions of nitrogen oxides from gas turbines during baseload operations to less than 9 ppmv corrected to 15 percent oxygen.

Regulation 11, Rule 10 - Hexavalent Chromium Emissions From Cooling Towers

Limits hexavalent chromium emissions from cooling towers by eliminating the use of chromium-based chemicals.

BAAQMD New Source Performance Standards

Regulation 10 (40 CFR 60 subpart GG) - Standards of Performance for Stationary Gas Turbines. The BAAQMD has adopted by reference the federal New Source Performance Standard (NSPS) for stationary gas turbines. This regulation requires monitoring of sulfur and nitrogen in the fuel; limits emissions of NO_x and SO_2 emissions; requires source testing of emissions; requires emissions monitoring; and requires recordkeeping for the collected data.

BAAQMD Hazardous Air Pollutants

As noted, the BAAQMD is enforcing the federal NESHAP regulations. None of the NESHAPs apply to the proposed project.

BAAQMD Title IV and Title V Programs

BAAQMD Regulation 2, Rule 6 - Major Facility Review

This rule implements the operating permit requirements of Title V of the federal Clean Air Act. The rule applies to major facilities, Phase II acid rain facilities, subject solid waste incinerator facilities, and any facility listed by USEPA as requiring a Title V permit. As a Phase II acid rain facility, RCEC will be required to submit a permit application to undergo a major facility review within 12 months of commencement of facility operation.

The BAAQMD has adopted by reference the federal Title IV (Acid Rain) Regulation and is now responsible for implementing the program through the Title V operating permit program. Under Title IV, a project must comply with maximum operating emissions levels for SO_2 and NO_x and is required to install and operate continuous monitoring systems for SO_2, NO_x, and CO_2 emissions. Extensive recordkeeping and reporting requirements are also part of the acid rain program.

A summary of the demonstration of compliance with applicable LORS is given at the end of this chapter in Table 8.1-37.

8.1.5 Environmental Consequences

8.1.5.1 Overview of the Analytical Approach to Estimating Facility Impacts

The emissions sources at the RCEC include two gas turbines with heat recovery steam generators equipped with supplemental burners (duct burners), and a wet, mechanical-draft cooling tower, plus minor auxiliary equipment (emergency generator and fire pump engine). The actual operation of the turbines will range between 70 percent and 100 percent of their maximum rated output. Supplemental firing will be provided by the duct burners as needed to achieve the required power generation level. Steam injection into the combustion turbines (power augmentation, or PAG) will also be used to increase power output under certain conditions. Emission control systems will be fully operational during all operations except during startups and shutdowns. Maximum annual emissions are based on operation of the RCEC at maximum firing rates and envelope the expected maximum number of startups that may occur in a year. Each turbine startup will result in transient emission rates until steady-state operation for the gas turbine and emission control systems is achieved.

Ambient air quality impact analyses for the site have been conducted to satisfy the CEC requirements for criteria pollutants (NO_2, CO, PM_{10}, and SO_2), noncriteria pollutants, and construction impacts have been addressed on a pollutant-specific basis. It should be noted that the operational scenarios having the highest emissions rates do not necessarily produce the highest ambient impacts. The following sections describe the emission sources that have been evaluated for RCEC, the ambient impact analyses results, and the evaluation of facility compliance with the applicable air quality regulations, including BAAQMD Regulation 2 (Permits), and Rule 2 (New Source Review). Rule 2 includes both the District's NSR and PSD requirements.

Facility Emissions

The proposed project will be a new source. As discussed in Section 2, the new equipment will consist of two Westinghouse 501F combustion turbines (or equivalent), rated at 200 MW (nominal net, at site design conditions); two heat recovery steam generators (HRSGs) equipped with duct burners rated at 200 MMBtu/hr; a 235 MW condensing steam turbine-generator; and a 10-cell cooling tower. Incidental equipment will include a 300 bhp Diesel fire pump and a 600 kW natural gas fired emergency generator. Natural gas will be the only fuel consumed during operation of RCEC. There will be no distillate fuel oil firing at RCEC except for the Diesel fire pump. Typical specifications for the natural gas fuel are shown in Table 8.1-12.

Natural gas combustion results in the formation of NO_x, SO_2, unburned hydrocarbons (POC), PM_{10}, and CO. Because natural gas is a clean burning fuel, there will be minimal formation of combustion PM_{10} and SO_2. The combustion turbines will be equipped with dry low-NO_x combustors that minimize the formation of NO_x and CO. To further reduce NO_x emissions, selective catalytic reduction (SCR) control systems will be utilized. Similarly, the duct burners will also be equipped with a low-NO_x burner design that minimizes NO_x formation.

Table 8.1-12. Typical chemical characteristics and heating value of natural gas.

Constituent	Mole %
Nitrogen	0.815
CO_2	0.516
Methane	95.619
Ethane	2.647
Propane	0.300
I-Butane	0.033
N-Butane	0.043
I-Pentane	0.011
N-Pentane	0.008
C 6+	0.008
HHV	23,171 Btu/lbm 1,022 Btu/lb

Various noncriteria pollutants will also be emitted by the facility, including ammonia (NH_3), which is used as a reactant by the SCR system to control NO_x, and sulfate (or secondary particulate matter) due to the oxidation of the SO_2 emitted by the facility. Emissions of all of the criteria and noncriteria pollutants have been characterized and quantified in this application.

Criteria Pollutant Emissions

The gas turbines, duct burners, and IC engine emission rates have been estimated from vendor data, RCEC design criteria, and established emission calculation procedures. The emission rates for the combustion turbines alone, the combustion turbines with duct burners and power augmentation in operation, and the IC engines are shown in Tables 8.1-13, 8.1-14, 8.1-15 and 8.1-16, respectively.

Table 8.1-13. Maximum short term pollutant emission rates—each gas turbine[a].

Pollutant	ppmvd @ 15% O_2	lb/MMBtu	lb/hr
NO_x	2.5[b]	0.0096	19.1
CO	6.00[b]	0.0143	28.3
POC	1.00[c]	0.0014[c]	2.5[c]
PM_{10}[d]	-	0.0045	9.0
SO_2[e]	0.120	0.0007	1.40

Basis:
[a]Emission rates shown reflect the highest value with no power augmentation, and no duct burners at any operating load except startup and shutdown.
[b]RCEC design criteria.
[c]Pounds per hour provided by vendor; ppm and lb/MMBtu calculated from lb/hr.
[d]100 percent of particulate matter emissions assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half as those terms are used in USEPA Method 5.
[e]Based on maximum fuel sulfur content of 4 ppmv.

Table 8.1-14. Maximum short term pollutant emission rates—each turbine with duct burner and power augmentation.

Pollutant	ppmvd @ 15% O_2	lb/MMBtu	lb/hr
NO_x	2.5[a]	0.0106	21.4
CO	6.0[a]	0.0157	31.7
POC	1.0	0.0015	2.8[b]
PM_{10}[c]	-	0.0059	12.0
SO_2[d]	0.12	0.0007	1.50

Basis:
[a]RCEC design criteria.
[b]Pounds per hour provided by vendor; ppm and lb/MMBtu calculated from lb/hr.
[c]100 percent of particulate matter emissions assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half as those terms are used in USEPA Method 5.
[d]Based on maximum fuel sulfur content of 4 ppmv.

Table 8.1-15. Maximum pollutant emission rates—emergency generator set (600 Kw).

Pollutant	g/bhp-hr	lb/hr	tons/yr
NO_x	1.0	1.773	0.18
CO	1.7	3.015	0.30
POC	0.8	1.419	0.142
PM_{10}	0.000353	0.006	0.0001
SO_2	neg	0.00386	0.00039

Notes:
Emission rates shown reflect the highest value at any operating load per vendor guarantee.
Tons/yr based on max operation hours of 200 hrs/yr.
100 percent of particulate matter emissions were assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half as those terms are used in USEPA Method 5. EPA AP-42, Table 3.2-2.
SO2 emissions based on maximum gas sulfur content of 4 ppm.

Table 8.1-16. Maximum pollutant emission rates—fire pump engine.

Pollutant	g/bhp-hr	lb/hr	tons/yr
NO_x	5.89	3.9	0.06
CO	3.55	2.35	0.0353
POC	0.73	0.48	0.0072
PM_{10}	0.0867	0.1275	0.0019
SO_2	neg	0.106	0.0016

Notes:
Emission rates shown reflect the highest value at any operating load per vendor guarantee.
Tons/yr based on max operation of 30 hrs/yr.
100 percent of particulate matter emissions were assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half as those terms are used in USEPA Method 5.
SO2 based on maximum fuel sulfur content of 0.05% wt.

The maximum firing rates, daily and annual fuel consumption rates, and operating restrictions define the allowable operations that determine the maximum potential hourly, daily, and annual emissions for each pollutant. These allowable operations are typically referred to as "the operating envelope" for a facility.

The maximum heat input rates (fuel consumption rates) for the gas turbines, and gas turbines with duct burners, and the IC engines are shown in Table 8.1-17.

Table 8.1-17. Maximum device heat input rates (HHV) (MMBtu).

Period	Gas Turbines w/ Duct Burners[a]	Gas Turbines w/o Duct Burners[b]	Emergency Generator Set	Emergency Fire Pump
Per Hour	2138.4	1979.4	~6.44	~2.11
Per Day	Note C	Note C	~6.44	~2.11
Per Year	Note C	Note C	~1288	~422

Notes:
[a] Based on maximum heat input for full load operation at 94 deg. F plus duct burner with power augmentation.
[b] Based on maximum heat input for full load turbine operation at 34 deg. F.
[c] Daily and annual heat input rates are highly variable due to the wide capability of the turbines and duct burners to operate at various loads on a daily and annual basis.

Natural gas @ 1022 btu/scf (HHV), #2 diesel fuel @ 137,000 btu/gal (EPA AP-42), see App 8.1A, Table 8.1A-9 for approximate fuel use calculations.

Maximum emission rates expected to occur during a startup or shutdown are shown in Table 8.1-18. PM_{10} and SO_2 emissions have not been included in this table because emissions of these pollutants will be lower during a startup period than during baseload facility operation.

Table 8.1-18. Maximum facility startup emission rates[a].

	NO_x	CO	POC
Cold Start, lb/hour	80	838	16
Cold Start, lb/start[b]	240	2,514	48
Hot Start, lbs/start[c]	80	902	16

[a]Estimated based on vendor data and source test data. See Appendix 8.1A, Table 8.1A-1.
[b]Maximum of three hours per cold start.
[c]Maximum of one hour per hot start.

The analysis of maximum facility emission levels was based on the pollutant emission factors shown in Tables 8.1-13, 8.1-14, 8.1-15, and 8.1-16; the RCEC operating envelope shown in Table 8.1-17; the RCEC startup emission rates shown in Table 8.1-18; and the ambient conditions that result in the highest emission rates. The maximum annual, daily, and hourly emissions for RCEC are shown in Table 8.1-19. Detailed emission calculations appear in Appendix 8.1A, Table 8.1A-2. Emissions from the cooling tower were calculated from the maximum cooling water TDS level (see Table 8.1A-6).

Noncriteria Pollutant Emissions

Noncriteria pollutants are compounds that have been identified as pollutants that pose a significant health hazard. Nine of these pollutants are regulated under the federal New Source Review program; they are lead, asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds.[1] In addition to these nine compounds, the federal Clean Air Act lists 189 substances as potential hazardous air pollutants (Clean Air Act Sec. 112(b)(1)). The BAAQMD has also published a list of compounds it defines as potential toxic air contaminants (Toxics Policy, May 1991;

[1] These pollutants are regulated under federal and state air quality programs; however, they are evaluated as noncriteria pollutants by the California Energy Commission.

Rule2-1-316). Any pollutant that may be emitted from RCEC and is on the federal New Source Review list, the federal Clean Air Act list, and/or the District toxic air contaminant list has been evaluated as part of the AFC. Emission factors were determined by reviewing the available technical data, determining the products of combustion, and/or using material balance calculations.

Table 8.1-19. Emissions from new equipment[a].

	NO_x	SO_2	CO	POC	PM_{10}
Maximum Hourly Emissions, lb/hr					
Turbines and Duct Burners	101.4	2.9	933.7	18.8	21.0
Cooling Tower	-	-	-	-	0.7
Emergency Generator[c]	0	0	3.0	1.4	0
Fire Pump Engine[c]	3.9	0.1	0	0	0
Total Project, pounds per hour[d]	105.3	3.0	936.7	20.2	21.7
Maximum Daily Emissions, lb/day					
Turbines and Duct Burners[b]	1441.8	67.6	8019.2	232.9	510.0
Cooling Tower	-	-	-	-	16.4
Emergency Generator[c]	0	0	3.0	1.4	0
Fire Pump Engine[c]	3.9	0.1	0	0	0
Total Project, pounds per day[d]	1,445.7	67.7	8022.2	234.3	526.4
Maximum Annual Emissions, tpy					
Turbines and Duct Burners	134.6	12.4	610	28.4	83.4
Cooling Tower	-	-	-	-	3
Emergency Generator	0.18	<0.1	0	0.142	0
Fire Pump Engine	0.06	<0.1	0.2	0.007	0.002
Total Project, tons per year[d]	134.6	12.4	610.2	28.5	86.3

Table 8.1-19. (continued).

Notes:
*Maximum annual NO_x emissions limit is based upon a 2.0 ppm, emission limit, seasonal annual site conditions and seasonal turbine performance profiles.
[a]See Appendix 8.1A, Table 8.1A-2 for calculations.
[b]Includes startup emissions.
[c]Emergency generator and Diesel fire pump engine will not be tested on the same day. Hourly and daily emissions reflect the higher of the two units' emissions.
[d]Numbers may not add directly due to rounding.

Noncriteria pollutant emission factors recommended by the BAAQMD staff were used for the analysis of emissions from the gas turbines. The recommended factors were taken from data compiled by the Ventura County APCD and from the California Air Toxics Emission Factors (CATEF) database. Noncriteria pollutant emissions from the cooling tower were calculated from an analysis of the proposed water quality as delivered from the plant water treatment system (worst case front end RO permeate).

The noncriteria pollutants that may be emitted from RCEC, and their respective emission factors, are shown in Table 8.1-20. Appendix 8.1A, Tables 8.1A-4, 8.1A-7, and 8.1A-8 provides the detailed emission calculations for noncriteria pollutants.

Air Quality Impact Analysis

Air Quality Modeling Methodology

An assessment of impacts from RCEC on ambient air quality has been conducted using USEPA-approved air quality dispersion models. These models are based on various mathematical descriptions of atmospheric diffusion and dispersion processes in which a pollutant source impact can be calculated over a given area.

The impact analysis was used to determine the worst-case ground-level impacts of RCEC. It should be noted that the operational scenarios having the highest emissions rates do not necessarily produce the highest ambient impacts. The results were compared with established state and federal ambient air quality standards and PSD significance levels. If the standards are not exceeded then it is assumed that, in the operation of the facility, no exceedances are expected under any conditions. In accordance with the air quality impact analysis guidelines developed by USEPA (40 CFR Part 51, Appendix W: *Guideline on Air Quality Models) and CARB (Reference Document for California Statewide Modeling Guideline*, April 1989), the ground-level impact analysis includes the following assessments:

- Impacts in simple, intermediate, and complex terrain,
- Aerodynamic effects (downwash) due to nearby building(s) and structures, and
- Impacts from inversion breakup (fumigation).

Table 8.1-20. Noncriteria pollutant emissions for the RCEC.

Pollutant	Emission Factor (lb/MMscf)	Emissions lb/hr	Emissions ton/yr
Gas Turbines (with Duct Burners) (each):			
Acetaldehyde	6.86×10^{-2}	0.15	0.59
Acrolein	6.43×10^{-3}	0.01	0.06
Ammonia	-[a]	15.8	65.39
Benzene	1.36×10^{-2}	0.03	0.12
1,3-Butadiene	1.27×10^{-4}	0.000276	0.0011
Ethylbenzene	1.79×10^{-2}	0.04	0.15
Formaldehyde	1.10×10^{-1}	0.24	0.94
Hexane	2.59×10^{-1}	0.56	2.22
Naphthalene	1.66×10^{-3}	0.0036	0.0142
Polycyclic Aromatics	2.23×10^{-3}	0.00143	0.00565
Propylene	7.70×10^{-1}	1.67	6.59
Propylene Oxide	4.78×10^{-2}	0.10	0.41
Toluene	7.10×10^{-2}	0.15	0.61
Xylene	2.61×10^{-2}	0.06	0.22
Cooling Tower:	**mg/l**		
Ammonia	4.0	0.00137	0.006
Arsenic	0	0	0
Cadmium	0	0	0
Chromium III	0	0	0
Copper	0	0	0
Lead	0	0	0
Mercury	0	0	0
Nickel	0	0	0
Silver	0	0	0
Zinc	0	0	0

[a]Ammonia emissions calculated from ammonia slip rate. See Appendix 8.1A, Table 8.1A-4.
Cooling tower data based on worst case front end RO permeate quality.

Simple, intermediate and complex terrain impacts were assessed for all meteorological conditions that would limit the amount of final plume rise. Plume impaction on elevated terrain, such as on the slope of a nearby hill, can cause high ground-level concentrations, especially under stable atmospheric conditions. Another dispersion condition that can cause high ground-level pollutant concentrations is caused by building downwash. Building downwash can occur when wind speeds are high and a building or structure is in close proximity to the emission stack. This can result in building wake effects where the plume is drawn down toward the ground by the lower pressure region that exists in the lee side (downwind) of the building or structure.

Fumigation conditions occur when the plume is emitted into a low lying layer of stable air (inversion) that then becomes unstable, resulting in a rapid mixing of pollutants towards the ground. The low mixing height that results from this condition allows little diffusion of the stack plume before it is carried downwind to the ground. Although fumigation conditions rarely last as long as an hour, relatively high ground-level concentrations may be reached during that period. Fumigation tends to occur under clear skies and light winds. Such conditions are more prevalent in the summer.

The basic model equation used in this analysis assumes that the concentrations of emissions within a plume can be characterized by a Gaussian distribution about the centerline of the plume (see Figure 8.1-11). Concentrations at any location downwind of a point source such as a stack can be determined from the following equation:

$$C(x,y,z,H) = \left(\frac{Q}{2\pi\sigma_y\sigma_z u}\right) * \left(e^{-1/2(y/\sigma_y)^2}\right) * \left[\left\{e^{-1/2(z-H/\sigma_z)^2}\right\} + \left\{e^{-1/2(z+H/\sigma_z)^2}\right\}\right]$$

where:

C	=	the concentration in the air of the substance or pollutant in question
Q	=	the pollutant emission rate
$\sigma_y \sigma_z$	=	the horizontal and vertical dispersion coefficients, respectively, at downwind distance x
u	=	the wind speed at the height of the plume center
x,y,z	=	the variables that define the 3-dimensional Cartesian coordinate system used; the downwind, crosswind, and vertical distances from the base of the stack (see Figure 8.1-10)
H	=	the height of the plume above the stack base (the sum of the height of the stack and the vertical distance that the plume rises due to the momentum and/or buoyancy of the plume)

Gaussian dispersion models are approved by USEPA for regulatory use and are based on conservative assumptions (i.e., the models tend to overpredict actual impacts by assuming steady state conditions, no pollutant loss through conservation of mass, no chemical reactions, etc.). The USEPA models were used to determine if ambient air quality standards would be exceeded, and whether a more accurate and sophisticated modeling procedure would be warranted to make the impact determination. The following sections describe:

- Screening modeling procedures
- Refined air quality impact analysis
- Existing ambient pollutant concentrations and preconstruction monitoring

- Results of the ambient air quality modeling analyses
- PSD increment consumption

The screening and refined air quality impact analyses were performed using the Industrial Source Complex, Short-Term Model ISCST3 (Version 00101). ISCST3 is a Gaussian dispersion model capable of assessing impacts from a variety of source types in areas of simple, intermediate, and complex terrain. The model can account for settling and dry deposition of particulates; area, line, and volume source types; downwash effects, and gradual plume rise as a function of downwind distance. The model is capable of estimating concentrations for a wide range of averaging times (from one hour to one year).

Inputs required by the ISCST3 model include the following:

- Model options
- Meteorological data
- Source data
- Receptor data

Model options refer to user selections that account for conditions specific to the area being modeled or to the emissions source that needs to be examined. Examples of model options include use of site-specific vertical profiles of wind speed and temperature; consideration of stack and building wake effects; and time-dependent exponential decay of pollutants. The model supplies recommended default options for the user. Except where explicitly stated, such as for building downwash, as described in more detail below, default values were used. A number of these default values are required for USEPA and local District approval of model results and are listed below:

- Rural dispersion coefficients
- Gradual plume rise
- Stack tip downwash
- Buoyancy induced dispersion
- Calm processing
- Default rural wind profile exponents = 0.07, 0.07, 0.10, 0.15, 0.35, 0.55
- Default vertical temperature gradients = 0.02, 0.035
- 20 meter anemometer height (Union City)

ISCST3 uses hourly meteorological data to characterize plume dispersion. The representativeness of the data is dependent on the proximity of the meteorological monitoring site to the area under consideration; the complexity of the terrain, the exposure of the meteorological monitoring site, and the period of time during which the data are collected. The meteorological data set used in this analysis was determined by the BAAQMD staff to be representative of meteorological conditions at the RCEC site and to meet the requirements of the USEPA "On-Site Meteorological Program Guidance for Regulatory Model Applications" (EPA-450/4-87-013, August 1995). The data were collected by the BAAQMD during 1990-1994 at its Union City station approximately 4.2 miles southeast of the project site.

The required emission source data inputs to ISCST3 include source locations, source elevations, stack heights, stack diameters, stack exit temperatures and velocities, and emission rates. The source locations are specified for a Cartesian (x,y) coordinate system where x and y are distances east and north in meters, respectively. The Cartesian coordinate system used is the Universal Transverse Mercator Projection (UTM). The stack height that can be used in the model is limited by federal and BAAQMD Good Engineering Practice (GEP) stack height restrictions, discussed in more detail below. In addition, ISCST3 requires nearby building dimension data to calculate the impacts of building downwash.

For the purposes of modeling, a stack height beyond what is required by Good Engineering Practices is not allowed (BAAQMD Regulation 2-2-418). However, this requirement does not place a limit on the actual constructed height of a stack. GEP as used in modeling analyses is the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, or wakes that may be created by the source itself, nearby structures, or nearby terrain obstacles. In addition, the GEP modeling restriction assures that any required regulatory control measure is not compromised by the effect of that portion of the stack that exceeds the GEP. The USEPA guidance ("Guideline for Determination of Good Engineering Practice Stack Height," Revised 6/85) for determining GEP stack height is as follows:

$$H_g = H + 1.5L$$

where

H_g = Good Engineering Practice stack height, measured from the ground-level elevation at the base of the stack

H = height of nearby structure(s) measured from the ground-level elevation at the base of the stack

L = lesser dimension, height or maximum projected width, of nearby structure(s)

In using this equation, the guidance document indicates that both the height and width of the structure are determined from the frontal area of the structure, projected onto a plane perpendicular to the direction of the wind.

For the turbine/HRSG stacks, the nearby (influencing) structures are the HRSGs, which are approximately 100 feet (30.5 m) high and 135 feet (41.15 m) long. Thus H = 100 ft and L = 135 feet, and H_g = 100 ft + (1.5 * 100 ft) = 250 ft, and the proposed stack height of 145 feet does not exceed GEP stack height.

For regulatory applications, a building is considered sufficiently close to a stack to cause wake effects when the downwind distance between the stack and the nearest part of the building is less than or equal to five times the lesser of the height or the projected width of the building.

For the buildings analyzed as downwash structures, the building dimensions were obtained from digital RCEC site plans. The building dimensions were analyzed using the Building Profile Input Program (BPIP) to calculate 36 wind-direction-specific building heights and projected building widths for use in building wake calculations. The building dimensions used in the GEP analysis are shown in Appendix 8.1B, Tables 8.1B-1A, 8.1B-1B, and Figure 8.1B-1. The four-sided architectural enclosure around the HRSGs and HRSG stacks was modeled as a solid structure.

Screening Procedures

To ensure the impacts analyzed were for maximum emission levels and worst-case dispersion conditions, a screening procedure was used to determine the inputs to the impact modeling. The screening procedure analyzed the turbine operating conditions that would result in the maximum impacts on a pollutant-specific basis. The operating conditions examined in this screening analysis, along with their exhaust and emission characteristics, are shown in Appendix 8.1A, Table 8.1A-3a and 8.1A-3b. These operating conditions represent maximum and minimum turbine loads (100 percent and 70 percent) at maximum and minimum ambient operating temperatures (94 deg F, 59 deg F, and 34 deg F).

The operating conditions were screened for worst-case ambient impact using USEPA's ISCST3 model and five (5) years of meteorological data collected at Union City, as described above. The results of the screening procedure are presented in Appendix 8.1B, Table 8.1B-2. The screening analysis showed that short term impacts (excluding 3-hr SO_2) under Case 12 (turbine operating at 70 percent load without power augmentation and duct burning) were the highest for each pollutant and averaging period. The stack parameters for this turbine operating condition were then used in the refined modeling analyses to evaluate the modeled impacts of the entire project for each pollutant and short term averaging period. Case 14 (full load w/duct burners and power augmentation at 59 deg F) per the screening modeling showed the highest impacts for all pollutants for annual averages as well as the high for the 3-hour SO_2 impacts.

The screening analysis included simple, intermediate, and complex terrain. Terrain features were taken from USGS DEM data and 7.5 minute quadrangle maps of the area. For the screening analysis, a coarse Cartesian grid of receptors spaced at 180 meters was used with a finer downwash grid, spaced at 30 meters, around the RCEC fenceline. The coarse grid extended over five kilometers from RCEC in all directions; the downwash grid extended to between 400 and 500 meters from the fenceline.

Refined Air Quality Impact Analysis

The operating conditions and emission rates used to model RCEC are summarized in Table 8.1-21. As discussed above, the turbine stack parameters for Cases 12 and 14 were used in modeling the impacts for each pollutant and averaging period. The complete modeling input for each pollutant and averaging period is shown in Appendix 8.1B, Table 8.1B-3.

The model receptor grids were derived from three-second DEM data. Initially, a 180-meter coarse grid was extended to five kilometers from RCEC in all directions. A 30 meter resolution downwash receptor grid was used within approximately 0.5 km of the site.

Thirty-meter refined receptor grids were used in areas where the coarse grid analyses indicated modeled maxima for each site plan would be located. A map showing the layout of each modeling grid around the site plan is presented in Figure 8.1-12.

Receptors for the refined modeling analysis were from USGS DEM data for four 7.5-minute quadrangles and included San Leandro, Hayward, Redwood Point, and Newark. The coarse grid contained a total of approximately 23339 receptors while each of the refined grids contained approximately 1100 receptors.

Under BAAQMD Regulation 2-1-128.4, the cooling tower is not exempt from District permitting requirements even though it will not be used for the evaporative cooling of process water. Therefore the evaluation of compliance with District requirements includes the cooling tower for both emissions calculation and modeling purposes. For the CEC's review, the cooling tower emissions have also been included.

Table 8.1-21. ISCST3 model input data: source characteristics for refined modeling (emissions in grams per second).

Unit	NO_x	SO_2	CO	PM_{10}
One-Hour Average:				
Turbine/Duct Burner 1	1.591	0.113	2.356	N/A
Turbine/Duct Burner 2	1.591	0.113	2.356	N/A
Emergency Generator	-	-	0.38	N/A
Fire Pump	0.49	0.0134	-	N/A
Cooling Tower (10 cells)	N/A	N/A	N/A	N/A
Three-Hour Average:				
Turbine/Duct Burner 1	N/A	0.189	N/A	N/A
Turbine/Duct Burner 2	N/A	0.189	N/A	N/A
Emergency Generator	N/A	-	N/A	N/A
Fire Pump	N/A	0.0045	N/A	N/A
Cooling Tower (10 cells)	N/A	N/A	N/A	N/A
Eight-Hour Average:				
Turbine/Duct Burner 1	N/A	N/A	41.07	N/A
Turbine/Duct Burner 2	N/A	N/A	41.07	N/A
Emergency Generator	N/A	N/A	0.037	N/A
Fire Pump	N/A	N/A	-	N/A
Cooling Tower (10 cells)	N/A	N/A	N/A	N/A
24-Hour Average:				
Turbine/Duct Burner 1	N/A	0.113	N/A	1.134
Turbine/Duct Burner 2	N/A	0.113	N/A	1.134
Emergency Generator	N/A	-	N/A	-
Fire Pump	N/A	0.000556	N/A	0.00067
Cooling Tower (10 cells)	N/A	N/A	N/A	0.0086
Annual Average:				
Turbine/Duct Burner 1	1.927	0.178	N/A	1.20
Turbine/Duct Burner 2	1.927	0.178	N/A	1.20
Emergency Generator	0.0051	0.000011	N/A	0.0000018
Fire Pump	0.00168	0.0000457	N/A	0.000055
Cooling Tower (10 cells)	N/A	N/A	N/A	0.0086

Specialized Modeling Analyses

Fumigation Modeling

Fumigation occurs when a plume that was originally emitted into a stable layer is mixed rapidly to ground-level when unstable air below the plume reaches plume level. Fumigation can cause very high ground-level concentrations for short time periods, typically less than one hour. Two situations were addressed according to BAAQMD *Permit Modeling Guidance (August 1999)*:

- Type 1: Break-up of the nocturnal radiation inversion by solar warming of the earth surface (inversion breakup), which occurs in the morning after sunrise and
- Type 3: Shoreline fumigation caused by advection of pollutants from a stable marine environment to an unstable inland environment. This is required for stacks within 3 kilometers of the shoreline of a large body of water (the turbines are located 1.8 kilometers from the shore of the San Francisco Bay).

Both types of fumigation were modeled with the USEPA model SCREEN3 (version 96043). As required by BAAQMD *Permit Modeling Guidance*, SCREEN3 was modified for shoreline fumigation to include thermal internal boundary layer (TIBL) factors of 2 to 6, inclusive (SCREEN3 as written only evaluates a TIBL factor of 6). This is important for stacks located some distance from the shoreline as is the situation with the RCEC site (where maximum impacts occurred for a TIBL factor of 3 and greater factors gave no fumigation impacts since the plume was below the TIBL). Only emissions from the HRSG stacks would be affected by fumigation. Maximum 1-hour shoreline and inversion breakup fumigation impacts were calculated to be 4.421 and 1.608 ug/m^3, respectively, for turbine emissions of 1 g/s/turbine for Case 12 conditions. These concentrations are less than the maximum 1-hour ISCST3 concentration of 5.927 ug/m^3 for one turbine at 1 g/s from the screening analysis for the same turbine condition. Therefore, maximum fumigation concentrations are less than maximum concentrations under more typical dispersion conditions and the effects of fumigation can be ignored (page 4-33, *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (October 1992), USEPA*). In the main body of text, shoreline fumigation concentrations are compared to maximum ISCST3 facility impacts for the 1-hour criteria pollutants for completeness.

Turbine Startup

Facility impacts were also modeled during the startup of one turbine to evaluate short-term impacts under startup conditions. Emission rates used for this scenario were based on an engineering analysis of available data, which included source test data from startups of the gas turbine at the Crockett Cogeneration Project. A summary of the data evaluated in developing these emission rates was shown in Appendix 8.1A, Table 8.1A-1A and 8.1A-1B. At the request of the Energy Commission staff, turbine exhaust parameters for the minimum operating load point (70 percent) were used to characterize turbine exhaust during startup. Startup impacts were evaluated for both the one- and three-hour averaging periods using ISCST3. Emission rates and stack parameters used in the startup modeling analysis are shown in Table 8.1-22.

Ozone Limiting

With approval from the BAAQMD staff, one-hour and annual NO_2 impacts were modeled using ISC3_OLM (Industrial Source Complex, Version 3, Ozone Limiting Method) Model (version 96113). While this version of ISCST3 is not based on the latest model ISCST3 update, this modeling analysis does not include any features (such as area sources or pit retention) that were affected by recent model updates. Both versions of ISCST3 were run without the ozone-limiting feature to verify that the modeled results would not be affected by using the OLM version of the model.

Table 8.1-22. Emission rates and stack parameters used in modeling analysis for startup emissions impacts.

Parameter	Value
Turbine stack temperature	349.7 deg. K
Turbine exhaust velocity	14.2 m/s
One-hour average impacts	
NO_x emission rate	10.08 g/s
SO_2 emission rate	0.189 g/s
CO emission rate	113.7 g/s
PM_{10} emission rate	N/A
Three-hour average impacts	
NO_x emission rate	N/A
SO_2 emission rate	0.189 g/s
CO emission rate	N/A
PM_{10} emission rate	N/A

ISC3_OLM uses hourly ozone data to perform ozone-limiting calculations on individual plumes on an hour-by-hour basis. Hourly ozone data from the San Leandro monitoring site for 1990-1994, which is concurrent with the Union City met data for the same years was used in the OLM analysis.

Missing hours in the ozone data set were filled in using linear interpolation if the period of missing data was 2 hours or less. If the data were missing for 3 or more hours, an average of the ozone data during the corresponding time periods during the rest of the same month was used to fill in the missing hours.

Turbine Commissioning

There are two high emissions scenarios possible during commissioning. The first would be the period prior to SCR system installation, when the combustor is being tuned. Under this scenario, NO_x emissions would be higher than normal because the NO_x emissions control system would not be functioning and because the combustor would not be tuned for optimum performance. CO emissions would also be higher than normal because combustor performance would not be optimized. The second high emissions scenario would occur when the combustor had been tuned but the SCR installation was not complete, and other parts of the turbine operating system were being checked out. Since the combustor would be tuned but the NO_X control system installation would not be complete, NO_x levels would again be higher than normal.

Preconstruction Monitoring

To ensure that the impacts from RCEC will not cause or contribute to a violation of an ambient air quality standard or an exceedance of a PSD increment, an analysis of the existing air quality in the area of RCEC is necessary. BAAQMD rules require preconstruction ambient air quality monitoring data for the purposes of establishing background pollutant concentrations in the impact area (Regulation 2-2-414.3). However, a facility may be exempted from this requirement if the predicted air quality impacts of the facility do not exceed the *de minimis* levels listed in Table 8.1-23.

Table 8.1-23. BAAQMD PSD preconstruction monitoring exemption levels .

Pollutant	Averaging Period	*De minimis* Level
CO	8-hr average	575 $\mu g/m^3$
PM_{10}	24-hr average	10 $\mu g/m^3$
NO_2	annual average	14 $\mu g/m^3$
SO_2	24-hr average	13 $\mu g/m^3$

A facility may, with the District's approval, rely on air quality monitoring data collected at District monitoring stations to satisfy the requirement for preconstruction monitoring. In such a case, in accordance with Section 2.4 of the USEPA PSD guideline, the last three years of ambient monitoring data may be used if they are representative of the area's air quality where the maximum impacts occur due to the proposed source.

Results of the Ambient Air Quality Modeling Analyses

The maximum facility impacts calculated from each of the modeling analyses described above are summarized in Table 8.1-24 below. The results of the fumigation modeling analysis are summarized in Appendix 8.1B, Table 8.1B-4.

Table 8.1-24. Summary of results from refined modeling analyses.

Pollutant	Averaging Time	Modeled Concentration (μg/m³)		
		ISCST3	Fumigation	Startup
NO_x	1-hour	169.0[b]	34.6	68.9
	Annual	0.36	N/A	N/A
SO_2	1-hour	20.15	1.73	2.03
	3-hour	3.67	c	1.46
	24-hour	0.35	c	N/A
	Annual	0.02	N/A	N/A
CO	1-hour	1230.6	39.87	841.0
	8-hour	230.1	c	N/A
PM_{10}[a]	24-hour	3.78	c	N/A
	Annual	0.22	N/A	N/A

Notes:
[a] Including cooling tower.
[b]Worst-case one-hour NO_x impacts are dominated by the Diesel fire pump and emergency generator. The Diesel fire pump will be operated for testing for up to 30 minutes for each test and for a maximum of 30 hours per year. The emergency generator will be operated for testing purposes for up to one hour per week, and not on the same day the Diesel fire pump engine is tested. Worst-case hourly average NO_2 impacts during other periods will be only 18.9 μg/m³.
[c]Since the estimated 1-hour shoreline fumigation concentration is less than the maximum 1-hour concentration modeled using ISCST3, the effects of fumigation may be ignored (EPA-454/R-92-019, Section 4.5.3).

Preconstruction monitoring is not required because the maximum impacts did not exceed *de minimis* levels, as shown in Table 8.1-25.

Impacts During Turbine Commissioning

As discussed above, there are two potential scenarios under which NO_x impacts could be higher than under other operating conditions already evaluated. As discussed below, CO emissions are less than emissions evaluated elsewhere, so these emissons were not considered here.

Scenario 1

Under this scenario, NO_x emissions can be conservatively estimated to be twice the guaranteed turbine-out level of 25 ppmvd @ 15 percent O2, or 50 ppm. If operation under this condition were to continue for one hour, maximum hourly NO_x emissions at full load would be (50 ppm/2.5 ppm) * 19.1 lbs/hr = 382.0 lbs/hr. Similarly, CO can be estimated at twice the highest expected turbine-out level of 10 ppm, or 20 ppm. Maximum hourly CO emissions under this scenario would thus be (20 ppm/6 ppm) * 28.3 lb/hr, or 94.3 lb/hr.

Table 8.1-25. Evaluation of preconstruction monitoring requirements.

Pollutant	Averaging Time	Exemption Concentration (μg/m³)	Maximum Modeled Concentration (μg/m³)	Monitoring Required?
NO_x	annual	14	0.36	no
SO_2	24-hr	13	0.35	no
CO	8-hr	575	230.1	no
PM_{10}[a]	24-hr	10	3.78	no

[a]Including cooling tower.

Impacts During Turbine Commissioning

As discussed above, there are two potential scenarios under which NO_x impacts could be higher than under other operating conditions already evaluated. As discussed below, CO emissions are less than emissions evaluated elsewhere, so these emissons were not considered here.

Scenario 1

Under this scenario, NO_x emissions can be conservatively estimated to be twice the guaranteed turbine-out level of 25 ppmvd @ 15 percent O2, or 50 ppm. If operation under this condition were to continue for one hour, maximum hourly NO_x emissions at full load would be (50 ppm/2.5 ppm) * 19.1 lbs/hr = 382.0 lbs/hr. Similarly, CO can be estimated at twice the highest expected turbine-out level of 10 ppm, or 20 ppm. Maximum hourly CO emissions under this scenario would thus be (20 ppm/6 ppm) * 28.3 lb/hr, or 94.3 lb/hr.

Scenario 2

Under these lower load conditions, NO_x emissions could be as high as 100 ppm @ 15 percent O_2. Based on the transient nature of the loads, the average fuel consumption would be expected to be equivalent to half the full load flow rate, or 233.8 MMBtu/hr. Worst-case hourly NO_x emissions under this scenario would be (100 ppm/2.5 ppm) * 9.55 lbs/hr = 382.0 lbs/hr. CO emissions under these conditions would be expected to be the same as those calculated for Scenario 1.

As the maximum hourly emissions under each scenario are expected to be the same, the maximum modeled NO_2 and CO impact will occur under the turbine operating conditions that are least favorable for dispersion. As shown in the turbine screening analysis, these conditions are expected to occur under hot (94 degrees F) temperature conditions without chilling (Case 12).

An ISC_OLM modeling analysis using a NO_x emission rate of 48.132 g/s (382.0 lb/hr) and the appropriate stack parameters indicates that the maximum modeled one-hour NO_2 impact during commissioning is 121 μg/m³. This is lower than the maximum modeled one-hour NO_2 impact from the facility as a whole, as shown in Table 8.1-19. With the maximum background NO_2 one-hour concentration of 207 μg/m³, the maximum total impact would be 328 μg/m³, which is well below the state one-hour NO_2 standard of 470 μg/m³. Modeling of turbine commissioning for CO emissions was not done, as the CO startup emissions of 902 lb/hr under the same load case (Case 12) were evaluated elsewhere and would produce higher impacts since the emissions are also higher.

Ambient Air Quality Impacts

To determine a project's air quality impacts, the modeled concentrations are added to the maximum background ambient air concentrations and then compared to the applicable ambient air quality standards. The modeled concentrations have already been presented in earlier tables. The maximum background ambient concentrations are listed in the following text and tables.

The BAAQMD monitors ambient air quality concentrations at several sites within the regional vicinity of the proposed plant site.

Table 8.1-26 presents the maximum established background concentrations used in the impacts analysis as derived from data collected at the following monitoring sites. Data on the specific monitoring sites is as follows:

Fremont-Chapel Way Station: ID# 6000336

- Ozone 1976-Present
- Carbon Monoxide 1971–Present
- Nitrogen Dioxide 1974–Present
- PM10 1989–Present
- Lead 1993–1999

Hayward-La Mesa Station: ID# 6000337

- Ozone 1977–Present

San Leandro-County Hospital Station: ID# 6000343

- Ozone 1990–Present
- PM10 1990–1998

San Francisco-Arkansas Street Station: ID# 9000306

- Sulfur Dioxide 1986–Present

Maximum ground-level impacts due to operation of RCEC are shown together with the ambient air quality standards in Table 8.1-27. Using the conservative assumptions described earlier, the results indicate that RCEC will not cause or contribute to violations of any state or federal air quality standards, with the exception of the state PM_{10} standard. For this pollutant, existing concentrations already exceed the state standard.

Table 8.1-26. Maximum background concentrations (1998-2000).

Pollutant	Averaging Time	1998	1999	2000
Fremont-Chapel Way:				
NO_2 pphm	1-Hour	10	11	8
	Annual	2.0	2.2	1.8
PM_{10} ug/m3	24-Hour	63	88	50
	Annual (AAM)[a]	21.8	24.3	18.4
	Annual (AGM)[b]	20.1	21.9	17.9
CO ppm	1-Hour	5.1	5.6	3.6
	8-Hour	2.8	3.1	2.4
Fremont-Chapel Way, San Leandro-County Hospital, Hayward-La Mesa:				
Ozone ppm	Max 1-Hour	.12	.13	.11
	3 Station Max 1-Hour Avg	.11	.12	.10
San Francisco-Arkansas St.:				
SO_2 ppm	1-Hour	.04	.03	.02
	24-hour	.005	.007	.006
	Annual	.001	.002	.002

Notes:
[a]Annual Arithmetic Mean
[b]Annual Geometric Mean

Table 8.1-27. Modeled maximum project impacts.

Pollutant	Averaging Time	Maximum Facility Impact (μg/m³)	Background (μg/m³)	Total Impact (μg/m³)	State Standard (μg/m³)	Federal Standard (μg/m³)
NO_2	1-hour	169.0[d]	206.8	376	470	-
	Annual	0.36	41.5	42	-	100
SO_2	1-hour	20.15	104.8	125	650	-
	3-hour	3.67	52	56	-	1300
	24-hour	0.35	18.4	19	109	365
	Annual	0.02	5.3	5.3	-	80
CO	1-hour	1230.6	6440	7671	23,000	40,000
	8-hour	230.1	3617	3847	10,000	10,000
PM_{10}[a]	24-hour	3.78	88	92	50	150
	Annual[b]	0.22	24.3	24.5	30	-
	Annual[c]	0.22	21.9	22.1	-	50

Notes:
[a]Including cooling tower
[b]Annual Arithmetic Mean
[c]Annual Geometric Mean
[d]Worst-case one-hour NO_x impacts are dominated by the Diesel fire pump and emergency generator, which will be operated for testing purposes for up to one hour per week. Worst-case hourly average NO_2 impacts during other periods will be only 18.9 μg/m³

PSD Increment Consumption

The Prevention of Significant Deterioration (PSD) program was established to allow emission increases (increments of consumption) that do not result in significant deterioration of ambient air quality in areas where criteria pollutants have not exceeded the National Ambient Air Quality Standards (NAAQS). For the purposes of determining applicability of the PSD program requirements, the following regulatory procedure is used.

- RCEC emissions are evaluated to determine whether the potential increase in emissions will be significant. Because this facility is a new major facility, the level of emissions that requires an analysis of ambient impacts is determined on a pollutant-specific basis. The emissions increases are those that will result from the proposed new equipment. For new facilities that include large gas turbines with fired HRSGs, USEPA considers a potential increase of 100 tons per year of any of the criteria pollutants to be significant. In this specific case, RCEC is considered a new major source. Potential emissions increases are compared with the levels considered significant for new sources in Table 8.1-28.

Table 8.1-28. Comparison of emissions increase with PSD significance emissions levels.

Pollutant	Emissions (tons per year)	Significant Emission Levels (tons per year)	Significant?
NO_x	134.6	40	yes
SO_2	12.4	40	no
POC	28.5	40	no
CO	610.2	100	yes
PM_{10}[a]	86.3	15	no

[a]Including cooling tower.

- If an ambient impact analysis is required, the analysis is first used to determine if the impact levels are significant. The determination of significance is based on whether the impacts exceed established significance levels (BAAQMD Rule 2.2-233) shown in Table 8.1.29. If the significance levels are not exceeded, no further analysis is required.

Table 8.1-29. BAAQMD PSD levels of significance.

Pollutant	Averaging Time	Significant Impact Levels	Maximum Allowable Increments
NO_2	1-Hour	19 μg/m^3	N/A[a]
	Annual	1 μg/m^3	25 μg/m^3
SO_2	3-hour	25 μg/m^3	512 μg/m^3
	24-Hour	5 μg/m^3	91 μg/m^3
	Annual	1 μg/m^3	20 μg/m^3
CO	1-Hour	2000 μg/m^3	N/A
	8-Hour	500 μg/m^3	N/A
PM_{10}	24-Hour	5 μg/m^3	30 μg/m^3
	Annual	1 μg/m^3	17 μg/m^3

[a]The significance level for 1-hour average NO_2 ia a BAAQMD level only.

- If the significance levels are exceeded, an analysis is required to demonstrate that the allowable increments will not be exceeded, on a pollutant-specific basis. Increments are the maximum increases in concentration that are allowed to occur above the baseline concentration. These PSD increments are also shown in Table 8.1-29.

Table 8.1-28 shows that RCEC will be a major new source of NO_x and CO. Emissions of SO_2, PM_{10} and POC from RCEC will be below the 100 ton per year major new source threshold. However, since RCEC is considered major for at least one criteria pollutant, PSD review is required for the entire facility.

The maximum modeled impacts from RCEC are compared with the significance levels in Table 8.1-30 below. These comparisons show that RCEC exceeds the BAAQMD 1-hour average NO_2 significance level. Since no federal NO_2 standards or PSD increments exist for one-hour NO_2 concentrations, no multi-source modeling analyses were performed.

Table 8.1-30. Comparison of maximum modeled impacts and PSD significance thresholds.

Pollutant	Averaging Time	Maximum Modeled Impacts ($\mu g/m^3$)	Significance Threshold ($\mu g/m^3$)	Significant?
NO_2	1-Hour	169	19	yes
	Annual	0.36	1	no
SO_2	3-Hour	3.67	25	no
	24-Hour	0.35	5	no
	Annual	0.02	1	no
CO	1-Hour	1230.6	2000	no
	8-Hour	230.1	500	no
PM_{10}[a]	24-Hour	3.78	5	no
	Annual	0.22	1	no

[a]Including cooling tower.

8.1.5.2 Screening Health Risk Assessment

The screening health risk assessment (SHRA) was conducted to determine expected impacts on public health of the noncriteria pollutant emissions from the facility. The SHRA was conducted in accordance with the CAPCOA Air Toxics "Hot Spots' Program Revised 1992, Risk Assessment Guidelines" (October 1993) and the Bay Area Air Quality Management District "Risk Management Procedure" Policy (May 1991). The SHRA estimated the offsite cancer risk at the maximum impact receptor (MIR) location. If impacts at the MIR are below the significance thresholds with respect to cancer risk and acute and chronic health effects, then the impacts at all other identified receptors will also be insignificant. The CARB/OEHHA Health Risk Assessment computer program was used to evaluate multipathway exposure to toxic substances. Because of the conservatism (overprediction) built into the established risk analysis methodology, the actual risks will be lower than those calculated.

A health risk assessment requires the following information:

- Unit risk factors (or carcinogenic potency values) for any carcinogenic substances that may be emitted
- Noncancer Reference Exposure levels (RELs) for determining non-carcinogenic health impacts
- Annual average and maximum one-hour emission rates for each substance of concern
- The modeled maximum offsite concentration of each of the pollutants emitted

Pollutant-specific unit risk factors are the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 μg/m3 over a 70-year lifetime. The SHRA uses unit risk factors specified by the California Office of Environmental Health Hazard Assessment (OEHHA). The cancer risk for each pollutant emitted is the product of the unit risk factor and the modeled concentration. All of the pollutant cancer risks are assumed to be additive.

An evaluation of the potential noncancer health effects from long-term (chronic) and short-term (acute) exposures has also been included in the SHRA. Many of the carcinogenic compounds are also associated with noncancer health effects and are therefore included in the determination of both cancer and noncancer effects. RELs are used as indicators of potential adverse health effects. RELs are generally based on the most sensitive adverse health effect reported and are designed to protect the most sensitive individuals. However, exceeding the REL does not automatically indicate a health impact. The OEHHA reference exposure levels were used to determine any adverse health effects from noncarcinogenic compounds. A hazard index for each noncancer pollutant is then determined by the ratio of the pollutant annual average concentration to its respective REL for a chronic evaluation. Each of the individual indices are summed to determine the overall hazard index for the project. Because noncancer compounds do not target the same system or organ, this sum is considered conservative. The same procedure is used for the acute evaluation.

RCEC SHRA results are compared with the established risk management procedures for the determination of acceptability. The established risk management criteria include those listed below.

- If the potential increased cancer risk is less than one in one million, the facility risk is considered not significant.
- If the potential increased cancer risk is greater than one in one million but less than ten in a million and Toxics-Best Available Control Technology (TBACT) has been applied to reduce risks, the facility risk is considered acceptable.
- If the potential increased cancer risk is greater than ten in one million and there are mitigating circumstances that, in the judgment of a regulatory agency, outweigh the risk, the risk is considered acceptable.
- For noncancer effects, total hazard indices of one or less are considered not significant.
- For a hazard index greater than one, OEHHA and the reviewing agency conduct a more refined review of the analysis and determine whether the impact is acceptable.

The SHRA includes the noncriteria pollutants listed above in Table 8.1-20. The receptor grid described earlier for criteria pollutant modeling was used for the SHRA. Receptors were also placed at each sensitive receptor identified in Appendix 8.1D, Table 8.1D-1 (Parts 1 and 2) and shown in Figure 8.9-2.

The SHRA results for RCEC are presented in Table 8.1-31, and the detailed calculations are provided in Appendix 8.1D.

Table 8.1-31. Screening health risk assessment results.

Cancer Risk at Maximum Impact Receptor	0.174 in one million
Total Cancer Burden	0.043
Acute Inhalation Hazard Index	<0.246
Chronic Inhalation Hazard Index	<0.0216
Chronic Noninhalation Exposure	NoValue Calculated

The screening HRA results indicate that the acute and chronic hazard indices are well below 1.0, and are therefore not significant. The maximum chronic noninhalation exposure was not established due to the lack of REL data for the specified substances and is therefore considered insignificant. The cancer burden is also well below 1.0. The cancer risk to a maximally exposed individual at the maximum impact receptor location is 0.174 in one million, well below the 1 in one million level. The screening HRA results indicate that, overall, RCEC will not pose a significant health risk.

8.1.5.3 Visibility Screening Analysis

CALPUFF Modeling System

A screening mode of the CALPUFF modeling system was run for the proposed project in order to calculate potential impacts to Point Reyes National Seashore and Pinnacles National Monument, both managed by the National Park Service. The modeling analysis focused on the potential visibility impacts to protected areas in the vicinity of the project.

The modeling followed screening guidance as provided by the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report. The modeling procedures also incorporate comments provided by the Federal Land Managers' Air Quality Related Values workgroup (FLAG) Phase I report (December 2000).

The screening mode of the CALPUFF modeling system requires hourly, single station meteorological data as input, both surface and upper air. Based on the guidance contained in the IWAQM Phase 2 Summary Report, CALPUFF was used in a screening mode, which required five years of single station meteorology. Five years of surface and upper air data were obtained for San Francisco surface and Oakland upper air (1986-1990). The surface data was in SAMSON format.

The PCRAMMET meteorological preprocessor, as recommended by the IWAQM Phase 2 Report, was used to process the surface, precipitation, and upper air data. PCRAMMET requires complete data sets of the following variables: wind speed, wind direction, temperature, ceiling height, opaque cloud cover or total cloud cover, surface pressure, relative humidity, and precipitation type. The five years of upper air data includes twice-daily mixing heights.

PCRAMMET was run with wet deposition options as required in the Phase 2 Report. As such, the following domain averaged variables are required and were based on values expected in the modeling region:

- Precipitation data
- Minimum Obukhov length = 2 meters
- Surface roughness length = 0.25 meters (at both measurement and application site)
- Noon time albedo = 0.15
- Bowen ratio = 0.1
- Fraction of net radiation absorbed by ground = 0.15
- Anthropogenic heat flux = 57 W/m^2

Five years of data was preprocessed with PCRAMMET, which was then used as input into CALPUFF.

CALPUFF also requires domain averaged background ozone (O_3) and ammonia (NH_3) concentrations for the Mesopuff II chemistry algorithm. For O_3, a domain-averaged value of 4 ppb was used, which was based on background O_3 data collected in the project region by the Bay Area Air Quality Monitoring District. For NH_3, a domain average value of 10.0 ppb was selected and was based on guidance in the IWAQM Phase 2 Report.

CALPUFF Model Options

A CALPUFF control file was generated that included IWAQM recommended defaults for the model options. This included rural dispersion coefficients, default wind speed profile exponents, and default vertical potential temperature gradient. Model options are listed in the CALPUFF model output, which is included on compact disk. A brief summary of the options used in the modeling analysis are listed below:

- Number of X grid cells = 2
- Number of Y grid cells = 2
- Number of vertical layers = 2
- Grid spacing = 210 km
- Cell face heights = 0 and 5000 meters
- Minimum mixing height = 50 meters
- Maximum mixing height = 5000 meters (based on observational data)
- Minimum wind speed allowed for non-calm conditions = 0.5 m/s
- Vertical distribution used in the near field = gaussian
- Terrain adjustment method = partial plume path adjustment
- No puff splitting allowed
- Chemical mechanism = Mesopuff II
- Wet and dry removal modeled
- Dispersion coefficients = PG dispersion coefficients
- PG sigma-y and z not adjusted for roughness
- Partial plume penetration of elevated inversion allowed
- Lateral turbulence not used

The computational grid extended 50 kilometers beyond the furthest receptor point.

Receptors were placed in three polar receptor rings surrounding the proposed modification. The radius was set equal to the distance from the source to the Point Reyes National Seashore, and similarly for Pinnacles National Monument. The receptors were spaced at one-degree intervals (360 receptors per receptor ring). The closest receptor ring was placed at a distance where it extends through the portion of the Class I area located closest to the proposed project. The middle receptor ring was placed at a distance where it extends through the central portion of the Class I area. The farthest receptor ring was placed at a distance where it extends through the most distant portion of the Class I area. A single elevation value was assigned to all receptors on a given ring. The selected elevation value was based on the average elevation of the arc length that extended into the Class I Area.

Following the IWAQM screening method, the maximum concentration for each pollutant, for each distance averaging time modeled was selected for comparison with the appropriate AQRV.

To assess visibility impacts at Point Reyes and Pinnacles, Flag Phase I report guidance was followed to determine the background visual range on a season by season basis. The allowable level of acceptable change (LAC) to extinction is 5 percent.

Emissions

As stated earlier, the combustion sources at the proposed project will utilize advanced NO_x control technology and natural gas fuel to achieve very low emission rates. Emissions from the project include NO_x, SO_2, and PM_{10}, all of which have the potential to interfere with visibility. Emissions used in the ISCST3 modeling analysis of visibility impacts are the same as those used for the criteria pollutant modeling analysis. The parameters modeled for the visibility impacts assume that the particulate nitrate (NO_3-) is in the form of ammonium nitrate (NH_4NO_3) and that particulate sulfate (SO_4) is in the form of ammonium sulfate ($(NH_4)2SO_4$). The visibility calculation is based on the ambient concentrations of NH_4NO_3, $(NH_4)2SO_4$, and PM_{10} along with a monthly relative humidity adjustment factor.

Impacts

The maximum 24-hour visibility impact was generated by taking the maximum 24-hour average modeled concentration at each receptor, regardless of the season in which it occurred, and assigning it to represent the visibility impact at Point Reyes or Pinnacles.

To calculate extinction coefficients, the following general equation was used:

$$b_{ext} = b_{SN} * f(RH) + b_{dry}$$

where:

b_{ext} = particle scattering coefficient
b_{SN} = $3[((NH_4)2SO_4) + (NH_4NO_3)]$
b_{dry} = b_{Coarse}

The quantities in brackets are the masses expressed in $\mu g/m^3$ and can further be broken down into the following equations:

b_{NO3} = $3[1.29(NO_3)f(RH)]$
b_{SO4} = $3[1.375(SO_4)f(RH)]$
b_{fine} = $0.6[PM_{10}]$

Using the above equations to calculate the extinction coefficients and correcting for f(RH) except for b_{fine}, which is not corrected), Table 8.1-32 summarizes the maximum extinction coefficients for each year for each pollutant and the total extinction.

Table 8.1-32. Maximum modeled impacts in protected areas.

Class I Area	b_{NO3} (Mm-1)	b_{SO4} (Mm-1)	b_{fine} (Mm-1)	24-hour Average Visibility Impact (Mm-1)	Percent Change in Extinction
Point Reyes	0.502	0.018	0.10	0.619	3.67%
Pinnacles	0.293	0.014	0.057	0.364	2.20%

Thus, during operation of the proposed project, potential visibility impacts to Point Reyes National Seashore and Pinnacles National Monument will be less than the 5 percent level of acceptable change.

8.1.5.4 Construction Impacts Analysis

Emissions due to the construction phase of the project have been estimated, including an assessment of emissions from vehicle and equipment exhaust and the fugitive dust generated from material handling. A dispersion modeling analysis was conducted based on these emissions. A detailed analysis of the emissions and ambient impacts is included in Appendix 8.1E. With the exception of the maximum modeled one-hour NO_2 and 24-hour PM_{10} concentrations, the results of the analysis indicate that the maximum construction impacts will be below the state and federal standards for all the criteria pollutants emitted. Exclusion of the background values results in construction impacts which will not exceed state and federal air quality standards. The best available emission control techniques will be used. The RCEC construction site impacts are not unusual in comparison to most construction sites; construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause violations of air quality standards.

8.1.6 Consistency with Laws, Ordinances, Regulations and Standards

8.1.6.1 Consistency with Federal Requirements

The Bay Area Air Quality Management District (District) has been delegated authority by the USEPA to implement and enforce most federal requirements that are applicable to the RCEC, including the new source performance standards and PSD review for all pollutants. Compliance with the District regulations ensures compliance and consistency with the corresponding federal requirements as well. RCEC will also be required to comply with the Federal Acid Rain requirements (Title IV). Since the District has received delegation for implementing Title IV through its Title V permit program, the RCEC will secure a District Title V permit that imposes the necessary requirements for compliance with the Title IV Acid Rain provisions.

8.1.6.2 Consistency with State Requirements

State law sets up local air pollution control districts and air quality management districts with the principal responsibility for regulating emissions from stationary sources. As discussed above, the RCEC is under the local jurisdiction of the District, and compliance with District regulations will ensure compliance with state air quality requirements.

8.1.6.3 Consistency with Local Requirements: Bay Area Air Quality Management District (District)

The District has been delegated responsibility for implementing local, state, and federal air quality regulations in the nine counties surrounding the Bay Area. The RCEC is subject to District regulations that apply to new sources of emissions, to the prohibitory regulations that specify emission standards for individual equipment categories, and to the requirements for evaluation of impacts from toxic air pollutants. The following sections include the evaluation of facility compliance with the applicable District requirements.

Under the regulations that govern new sources of emissions, the RCEC is required to secure a preconstruction Determination of Compliance from the District (Regulation 2, Rule 3), as well as demonstrate continued compliance with regulatory limits when RCEC becomes operational. The preconstruction review includes demonstrating that RCEC will use best available control technology (BACT) and will provide any necessary emission offsets.

Applicable BACT levels are shown in Table 8.1-33, along with anticipated potential facility emissions. BAAQMD Rule 2-2-301 requires the RCEC to apply BACT for emissions of NO_x, POC, SO_x, CO and

PM_{10} (criteria pollutants) in excess of 10.0 pounds per highest day. Rule 2.2-301.2 imposes BACT for emissions of lead, asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds when emitted in excess of specified amounts. RCEC will not emit any of these latter pollutants in detectable quantities; therefore, Rule 2-2-301.2 is not applicable to RCEC. As shown in the table, BACT is required for NO_x, POC, SO_2, CO, and PM_{10}. The calculation of facility emissions was discussed in AFC Section 8.1.5.1.

Table 8.1-33. Facility Best Available Control Technology (BACT) requirements.

Pollutant	Applicability Level	Facility Emission Level (lbs/day)	BACT Required
Criteria Pollutants: District Regulation 2-2-301.1			
POC	10 lbs/day	234.3	yes
NPOC	10 lbs/day	-	no
NO_x	10 lbs/day	1445.7	yes
SO_2	10 lbs/day	67.7	yes
PM_{10}	10 lbs/day	526.4[a]	yes
CO	10 lbs/day	8022.2	yes
Noncriteria Pollutants: District Regulation 2-2-301.2			
Lead	3.2 lbs/day	Neg	no
Asbestos	0.04 lbs/day	Neg	no
Beryllium	0.002 lbs/day	Neg	no
Mercury	0.5 lbs/day	Neg	no
Fluorides	16 lbs/day	Neg	no
Sulfuric Acid Mist	38 lbs/day	Neg	no
Hydrogen Sulfide	55 lbs/day	Neg	no
Total Reduced Sulfur	55 lbs/day	Neg	no
Reduced Sulfur Compounds	55 lbs/day	Neg	no

[a]Including cooling tower.

BACT for the applicable pollutants was determined by reviewing the District BACT Guidelines Manual, the South Coast Air Quality Management District BACT Guidelines Manual, the most RCECent Compilation of California BACT Determinations, CAPCOA (2nd Ed., November 1993) and USEPA's BACT/LAER Clearinghouse. A summary of the review is provided in Appendix 8.1F. For the gas turbines and duct burners, the District considers BACT to be the most stringent level of demonstrated emission control that is feasible. RCEC will use the BACT measures discussed below.

As a BACT measure, RCEC will limit the fuels burned at RCEC to natural gas, a clean burning fuel. Liquid fuels will not be fired at RCEC except in the emergency Diesel fire pump. Burning of liquid fuels in the gas turbine combustors, duct burners, and emergency generator would result in greater criteria pollutant emissions than if the units burned only gaseous fuels. This measure acts to minimize the formation of all criteria air pollutants.

BACT for NO_x emissions will be the use of low NO_x emitting equipment and add-on controls. RCEC has selected a gas turbine equipped with dry, low NO_x combustors. The gas turbine dry, low NO_x combustors will generate a maximum of 25 ppmvd NO_x, corrected to 15 percent O_2 at loads and above 70 % of base load. In addition, RCEC will use a selective catalytic reduction (SCR) system to further reduce NO_x emissions to 2.5 ppmvd NO_x, corrected to 15 percent O_2 (3-hour average). The District BACT guidelines indicate that BACT from large gas turbines (>23 MMBtu/hr heat input) is an exhaust concentration not to exceed 5 ppmvd NO_x, corrected to 15 percent O_2; therefore, RCEC will meet the necessary BACT requirements for NO_x. The duct burner will also be exhausted to the SCR system; therefore, BACT for the duct burner is also the stringent 2.5 ppmvd NO_x level, corrected to 15 percent O_2. The District BACT Guideline determination for NO_x from gas turbines is shown in Appendix 8.1F.

BACT for CO emissions will be achieved by use of gas turbines equipped with dry, low NO_x combustors and the use of duct burners with similarly low CO production characteristics. Dry, low NO_x combustors emit low levels of combustion CO while still maintaining low NO_x formation. RCEC has specified a CO limit of 6 ppmvd, corrected to 15 percent O_2, for all load conditions down to approximately 70% of base load, or 1,700 MMBtu/hr heat release in each combustion turbine. The duct burner CO emission rate is 0.10 pounds CO per million Btu heat input. While the District has previously determined that BACT for gas turbines is 6 ppm CO, corrected to 15 percent oxygen, recent source test and CEM data from the Crockett Cogeneration Facility, which utilizes an oxidation catalyst to control CO emissions, show that the 6 ppm level cannot be achieved without excursions above that limit under certain operating conditions. The District BACT guidelines indicate that BACT from large gas turbines (>23 MMBtu/hr heat input) is 10 ppmvd CO, corrected to 15 percent O_2. CO emissions from the RCEC HRSG stacks will meet the District BACT requirements. The CO emission rate from the gas turbines and duct burners, as measured at the HRSG exhaust stacks, will not exceed 6 ppmvd, corrected to 15 percent O_2 during base load, durct firing, and power augmentation operations. CO emissions will be higher during turbine startups. A review of recent BACT determinations for CO from gas turbines is provided in Appendix 8.1F.

BACT for POC emissions will be achieved by use of the gas turbine dry, low NO_x combustors and the use of duct burners with similarly low POC production characteristics. As in the case of CO emission formation, dry, low NO_x combustors use air to fuel ratios that result in low combustion POC while still maintaining low NO_x levels. The duct burner POC emission rate is 0.02 lbs/MMBtu heat input. BACT for POC emissions from combustion devices has historically been the use of best combustion practices. With the use of the dry, low NO_x combustors and advanced duct burner design, POC emissions leaving the HRSG stacks will not exceed 1.0 ppmvd, corrected to 15 percent oxygen. This level of emissions meets the BACT requirements for POC without the use of a CO catalyst.

BACT for PM_{10} is best combustion practices and the use of gaseous fuels. As mentioned, use of clean burning natural gas fuel will result in minimal particulate emissions.

SO_2 emissions will be kept at a minimum by firing natural gas.

Emissions Offsetting

In addition to the BACT requirements, District regulation 2-2-302 requires RCEC to provide full emission offsets (Emissions Reduction Credits, or ERCs) when emissions exceed specified levels on a pollutant-specific basis. As shown in Table 8.1-34, RCEC will be required to provide emission offsets for NO_x and POC emissions.

Table 8.1-34. BAAQMD offset requirements and RCEC emissions.

Pollutant	Applicable Facility Size	Emission Increase	RCEC Emission Rate	Regulation	Offsets Required
POC	50 tpy	Any increase	28.5 tpy	2-2-302	yes
NO_x	50 tpy	Any increase	134.6 tpy	2-2-302	yes
PM_{10}	100 tpy	1 tpy Net increase	86.3 tpy[a]	2-2-303	no
SO_2	100 tpy	1 tpy Net increase	12.4 tpy	2-2-303	no

[a]Including cooling tower.

Section 2-302 requires POC and NO_x emission reduction credits to be provided at an offset ratio of 1.15:1. Because both POC and NO_x contribute to the Bay Area Basin ozone levels, Section 2-302.1 allows emission reduction credits of NO_x to be used to offset increased emissions of POC, at the required offset ratio of 1.15:1; likewise, Section 2-302.2 allows the use of POC emission reduction credits for NO_x emissions, at the 1.15:1 offset ratio.

Section 2-303 requires emissions offsets for emissions increases at facilities that emit more than 100 tpy of SO_2 and PM_{10}. As facility emissions of SO_2 and PM_{10} will be below 100 tpy, SO_2 and PM_{10} offsets are not required.

Sections 2-304 and 2-305 impose emissions offset requirements, or require project denial, if SO_2, NO_2, PM_{10}, or CO air quality modeling results indicate emissions will interfere with the attainment or maintenance of the applicable ambient air quality standards or will exceed PSD increments. For many of the pollutants and averaging periods, District regulations do not require RCEC to conduct these analyses, since the modeled impacts of the proposed facility are not significant under District rules. However, modeling for these pollutants has been conducted to satisfy CEC requirements. The modeling analyses show that facility emissions will not interfere with the attainment or maintenance of the applicable air quality standards.

Emissions offset requirements for NO_x and POC are shown in Table 8.1-35 below. Sufficient offsets have been purchased by Calpine/Bechtel. The information in the Appendix includes:

- Ownership of emission offset sources
- Emission reduction credits granted by the District that have been determined to meet the District's requirements for bankable offsets.

Table 8.1-35. Facility offset requirements.

Pollutant	Emissions (tons/yr)	Required Offset Ratio	Required Offsets (tons/yr)
NO_x	134.6	1.15:1.0	154.8
POC	28.5	1.0:1.0	28.5

A current listing of deposits in the offset bank is included in Appendix 8.1G. Calpine/Bechtel has been in contact with the owners of facilities that have registered emission reduction credits in the offset bank, and will submit to the CEC a confidential list of potential suppliers, as well as dates of contact and persons contacted, under separate cover. Because of the highly competitive nature of the offset market, confidential treatment of this contact list is being sought at this stage of the negotiations with the various owners.

As discussed in AFC Section 5.1.2, Regulatory Setting, the BAAQMD PSD program requirements apply on a pollutant-specific basis to:

- A new major facility that will emit 100 tpy or more, if it is one of the PSD source categories in the federal Clean Air Act, or a new facility that will emit 250 tpy or more; or
- A facility that emits 100 tpy or more, with net emissions increases since the applicable PSD baseline date that exceed the modeling threshold levels shown in Table 8.1-36.

Table 8.1-36. BAAQMD PSD requirements applicable to 100 tpy fossil fuel fired power plants.

Pollutant	PSD Facility Applicability Level	Modeling Threshold Level	Facility Emissions	Modeling Required	Applicable District Regulation
NO_x	100 tpy	100 tpy	134.6 tpy	yes	2-2-304.2
SO_2	100 tpy	100 tpy	12.4 tpy	no	2-2-304.2
PM_{10}[a]	100 tpy	100 tpy	86.3 tpy	no	2-2-304.3
CO	100 tpy	100 tpy	610.2 tpy	yes	2-2-305.1
POC	100 tpy	not required	-	-	-

[a]All particulate matter from RCEC is assumed to be emitted as PM_{10}. Includes cooling tower.

RCEC is a new major source as defined by BAAQMD regulations. Therefore, it is subject to the USEPA and District PSD regulations. The District modeling threshold requirements and their applicability to RCEC are shown in Table 8.1-37. The required modeling analysis was carried out and the results presented in Section 8.1.5.1.2.

As discussed below, the specific District Regulation 2, Rule 2 criteria for conducting modeling analyses have been met.

Rule 2-2-414.1 requires that the modeling be conducted with appropriate meteorological and topographic data necessary to estimate impacts. The RCEC modeling analyses used District-approved U.S. Geological Service topographic data for the surrounding area and District-approved weather data gathered from the Union City meteorological monitoring station approximately 4.2 miles southeast from the project site. As discussed above, the meteorological data meet the requirements of USEPA guidance.

Rule 2-2-304 and 2-2-412.2 require a demonstration that emission increases subject to the PSD program not interfere with the attainment or maintenance of any State or national ambient air quality standards for each applicable pollutant, unless adequate emissions offsets are provided. As shown in Table 8.1-30, RCEC will exceed only the BAAQMD PSD one-hour significance level for NO_2. There are no corresponding federal significance levels. In addition, offsets will be provided for increases in NO_x and POC emissions. Therefore, project impacts on state and federal ambient air quality standards are not considered significant. Additionally, the modeling analysis results do not show an exceedance of State or national ambient air quality standards, with the exception of the state 24-hour average PM_{10} standard, which is already being exceeded. The modeling analysis is discussed in detail in Section 8.1.5.1.2.

For an application that triggers PSD modeling requirements, Rules 2-2-211 and 2-2-413.3 require that ambient monitoring data be gathered for one year preceding the submittal of a complete application, or a District-approved representative time period. However, if the air quality impacts of RCEC do not exceed the specified *de minimis* levels on a pollutant-specific basis, RCEC is exempted from the preconstruction monitoring requirement. The air quality impacts of RCEC's NO_x, CO, SO_2 and PM_{10} emissions were below their respective *de minimis* levels, as shown in Table 8.1-23, and therefore the exemption applies to the proposed project. The District-operated ambient monitoring stations in San Leandro, Hayward, Fremont, and San Francisco are representative of existing air quality in the vicinity of the project, and were used to determine existing ambient concentrations.

Rule 2-2-308 requires applicants to demonstrate that emissions from a project located within 10 km (6.2 miles) of a Class I area will not cause or contribute to the exceedance of any national ambient air quality standard or any applicable Class I PSD increment. Because the nearest Class I areas, Point Reyes

National Seashore and Pinnacles National Park, are over 80 km from RCEC, this section is not applicable to the proposed facility.

Rule 2-2-417 requires an applicant for a permit subject to a PSD air quality analysis to provide additional analysis of the impact of the facility on visibility, soils and vegetation. The visibility analysis is provided in Section 8.1.5.3. The soils and vegetation analyses are provided in Sections 8.9, 8.2 and 8.4 of the AFC.

Rule 2-2-306 is also not applicable to RCEC. This section requires modeling analyses for specific noncriteria pollutants (lead, asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur and reduced sulfur compounds) if they are emitted in significant quantities and if the facility emits more than 100 tons per year of any criteria pollutant. As RCEC will not emit significant quantities of the specific noncriteria pollutants, a noncriteria pollutant modeling analysis under this section is not required. However, a screening health risk assessment has been conducted for potential emissions of toxic air contaminants. The analysis methodology and results are discussed in Section 8.1.5.2.

Rule 2-2-418 requires the use of Good Engineering Practices (GEP) stack height. Conformance with the GEP stack height requirement was demonstrated in the modeling analysis conducted for RCEC.

Regulation 2, Rule 6, Major Facility Review (Title V permit program), applies to facilities that emit greater than 100 tons per year on a pollutant-specific basis. Under the Title V permit program, RCEC will be required to file an application for an operating permit within 12 months of facility startup. The Phase II acid rain requirements will also apply to RCEC. As a Phase II Acid Rain facility, RCEC will be required to provide sufficient allowances for every ton of SO_2 emitted during a calendar year. RCEC will obtain any necessary allowances on the current open trade market. RCEC will also be required to install and operate continuous monitoring systems; District enforcement of its rules will ensure installation of these systems.

The general prohibitory rules of the District applicable to RCEC and the determination of compliance follow.

Regulation 1-301 addresses Public Nuisance. RCEC will emit insignificant quantities of odorous or visible substances; therefore, RCEC will comply with this regulation.

Regulation 6 pertains to particulate matter and visible emissions. Any visible emissions from the project will not be darker than No. 1 when compared to a Ringlemann Chart for any period(s) aggregating 3 minutes in any hour. Because RCEC will burn clean fuels, the opacity standard of not greater than 20 percent for a period or periods aggregating 3 minutes in any hour and the particulate emission concentrations limit of 0.15 grains per standard cubic feet of exhaust gas volume will not be exceeded.

Regulation 7, Odorous Substances, is not applicable to RCEC. Gas turbine operations do not result in odor complaints.

Regulation 9, Rule 1, Sulfur Dioxide, specifies an emission standard of less than 300 ppm SO_2. Because of the insignificant quantities of sulfur in natural gas, this limit will be achieved. In addition, the ambient air quality modeling analysis discussed in Section 8.1.5.1.2 shows that ground-level concentrations of SO_2 from RCEC will not result in ground-level concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes or 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours.

Regulation 9, Rule 2, pertains to hydrogen sulfide. RCEC is not expected to emit H_2S.

Regulation 9, Rule 3, Nitrogen Oxides From Heat Transfer Operations, imposes a NO_x limit of 125 ppm. RCEC will easily comply with this rule.

Regulation 9, Rule 9, limits the emissions of nitrogen oxides from gas turbines during baseload operations to less than 9 ppmv corrected to 15 percent O_2. RCEC's NO_x level of 2.5 ppmvd, corrected to 15 percent O_2, will satisfy the requirements of this rule. In addition, the continuous emission monitoring (CEM) system that RCEC will install will also satisfy the monitoring and recordkeeping requirements of this rule.

Regulation 9, Rule 10, limits hexavalent chromium emissions from cooling towers. Chemicals containing hexavalent chromium will not be used in the RCEC cooling tower; therefore, rule requirements will be met.

District Regulation 10 (40 CFR 60 subpart GG) adopts by reference the federal New Source Performance Standard (NSPS) for stationary gas turbines. This regulation requires monitoring of fuel; imposes limits on the emissions of NO_x and SO_2; and requires source testing of stack emissions, process monitoring, and data collection and recordkeeping. All of the BACT limits imposed on RCEC will be more stringent than the requirements of the NSPS emission limits. Monitoring and recordkeeping requirements for BACT will be more stringent than the requirements in this rule. RCEC will comply with the NSPS regulation.

A summary of the demonstration of compliance with applicable LORS is provided in Table 8.1-37.

A complete application for an "Authority to Construct" will be filed with the BAAQMD within 10 working days of the RCEC AFC filing.

8.1.7 Cumulative Air Quality Impacts Analysis

An analysis of potential cumulative air quality impacts that may result from RCEC and other reasonably foreseeable projects is generally required only when project impacts are significant.

To ensure that potential cumulative impacts of RCEC and other nearby projects are adequately considered, a cumulative impacts analysis will be conducted in accordance with the protocol included as Appendix 8.1H. This procedure is similar to that which will be used to evaluate increment consumption for the project.

Table 8.1-37 Laws, ordinances, regulations, standards (LORS), and permits for protection of air quality.

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
Federal					
Clean Air Act (CAA) §160-169A and implementing regulations, Title 42 United States Code (USC) §7470-7491 (42 USC 7470-7491), Title 40 Code of Federal Regulations (CFR) Parts 51 & 52 (40 CFR 51 & 52). (Prevention of Significant Deterioration Program)	Requires prevention of significant deterioration (PSD) review and facility permitting for construction of new or modified major stationary sources of air pollution. PSD review applies to pollutants for which ambient concentrations are lower than NAAQS.	BAAQMD with USEPA oversight	After project review, issues Authority to Construct (ATC) with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.1, Tables 8.1-19,25,28, Appendix 8.1D
CAA §171-193, 42 USC §7501 et seq. (New Source Review)	Requires new source review (NSR) facility permitting for construction or modification of specified stationary sources. NSR applies to pollutants for which ambient concentration levels are higher than NAAQS.	BAAQMD with USEPA oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.6, Tables 8.1-19,25,28, Appendix 8.1F
CAA §401 (Title IV), 42 USC §7651 (Acid Rain Program)	Requires reductions in NO_x and SO_2 emissions.	BAAQMD with USEPA oversight	Issues Acid Rain permit after review of application.	Application to be made within 12 months of start of facility operation.	8.1.4.2.4
CAA §501 (Title V), 42 USC §7661 (Federal Operating Permits Program)	Establishes comprehensive permit program for major stationary sources.	BAAQMD with USEPA oversight	Issues Title V permit after review of application.	Application to be made within 12 months of start of facility operation.	8.1.4.2.4
CAA §111, 42 USC §7411, 40 CFR Part 60 (New Source Performance Standards - NSPS)	Establishes national standards of performance for new stationary sources.	BAAQMD with USEPA oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.2, Tables 8.1-13-16
CAA §112, 42 USC §7412, 40 CFR Part 63 (National Emission Standards for Hazardous Air Pollutants - NESHAPs)	Establishes national emission standards for hazardous air pollutants.	BAAQMD with USEPA oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.3, Table 8.1-18
State					
California Health & Safety Code (H&SC) §41700 (Nuisance Regulation)	Outlaws discharge of such quantities of air contaminants that cause injury, detriment, nuisance, or annoyance.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.2 Table 8.1-27

Table 8.1-37 (continued).

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
H&SC §44300-44384; California Code of Regulations (CCR) §93300-93347 (Toxic "Hot Spots" Act)	Requires preparation and biennial updating of facility emission inventory of hazardous substances; risk assessments.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Screening HRA submitted before start of construction.	8.1.5.2, 8.1.4.1.2, Table 8.1-31, Appendices 8.1A, 8.1C, 8.1D
California Public Resources Code §25523(a); 20 CCR §1752, 2300-2309 (CEC & CARB Memorandum of Understanding)	Requires that CEC's decision on AFC include requirements to assure protection of environmental quality; AFC required to address air quality protection.	CEC	After project review, issues Final Determination of Compliance (FDOC) with conditions limiting emissions.	CEC approval of AFC, i.e., FDOC, to be obtained before start of construction.	8.1.4.1.2, Appendix 8.1E
Local					
BAAQMD Regulation 1 §301(Public Nuisance)	Prohibits emissions in quantities that adversely affect public health, other businesses, or property.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 2 (Permits), Rule 2 (New Source Review)	NSR and PSD: Requires that pRCEConstruction review be conducted for all proposed new or modified sources of air pollution, including BACT, emissions offsets, and air quality impact analysis.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1, 8.1.5.2, 8.1.5.3, 8.1.5.4 8.1.6.3, 8.1.4.2.6, Tables 8.1- 27-37, Appendices 8.1C, 8.1D, 8.1E, 8.1F, 8.1G
BAAQMD Regulation 2, Rule 6 (Major Facility Review)	Implements operating permits requirements of CAA Title V and acid rain regulations of CAA Title IV.	BAAQMD	Issues Title V permit after review of application.	Application to be made within 12 months of start of facility operation.	8.1.6.1, 8.1.4.2.4, 8.1.4.2.11
BAAQMD Regulation 6 (Particulate Matter and Visible Emissions)	Limits visible emissions to no darker than Ringelmann No. 1 for periods greater than 3 minutes in any hour; limits PM emissions to #0.15 gr/dscf.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 7 (Odorous Substances)	Limits emissions of dimethylsulfide, ammonia, mercaptan, phenols, and trimethylamine; becomes applicable upon confirmation of 10 or more odor complaints with 90 days.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.6.3, 8.1.4.2.3, Table 8.1-20
BAAQMD Regulation 9, Rule 1 (Sulfur Dioxide)	Limits SO_2 emissions to <300 ppm; also limits SO_2 emissions resulting in ground level concentrations of specified level and duration.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.6.3, 8.1.4.2.8, Tables 8.1- 13-16

BAAQMD Regulation 9, Rule 2 (Hydrogen Sulfide)	Limits H_2S emissions during any 24-hour period that result in ground level H_2S concentrations exceeding specified levels and durations.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 9, Rule 3 (Heat Transfer Operation NO_x Emissions Limits)	Limits NO_x emissions from new heat transfer operations $250 MMBtu/hr maximum to <125 ppm.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8

Table 8.1-37 (continued).

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
BAAQMD Regulation 9, Rule 9 (Nitrogen Oxides from Stationary Gas Turbines)	Limits NO_x emissions during baseload operations to 9 ppmv @ 15 percent exhaust oxygen (15 ppmv if SCR is not used).	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 10 (40 CFR 60 Subpart GG) (Standards of Performance for Stationary Gas Turbines)	Requires monitoring of fuel, other operating parameters; limits NO_x and SO_2 emissions, requires source testing, emissions monitoring, and RCECordkeeping.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 11, (Hazardous Pollutants)	Implements federal NESHAP regulations.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.3, Table 8.1-20

8.1.8 Mitigation

While the BAAQMD regulations require facility emissions offsets to be provided on an annual average basis, the CEC's policy is to require mitigation of short-term impacts as well. The CEC asks that adequate offsets be provided to mitigate annual emissions calculated based on reasonable worst-case daily emissions. Maximum worst-case daily emissions are based on expected operation of RCEC, including the cooling tower, as presented in Table 8.1-19.

Maximum daily emisisons impacts are calculated based on the following assumptions regarding operation of RCEC:

- One turbine has one hot startup (one hour) and 23 hours of full load operation.
- The second turbine has one cold startup (three hours) and 21 hours of full load operation.
- Each duct burner operates for 16 hours.
- Fire pump or emergency generator operates for one hour.
- Cooling tower operates for 24 hours.

Mitigation for annual emissions will be provided through the purchase of offsets. As discussed in Section 8.1.5.3, sufficient offsets to fulfill this requirement have already been purchased by Clapine/Bechtel. The applicant owns the offset credits required and has included a list in Appendix 8.1G (filed separately under a request for confidentiality). The applicant is also offsetting No_x with POCs at a 1:1 ratio.

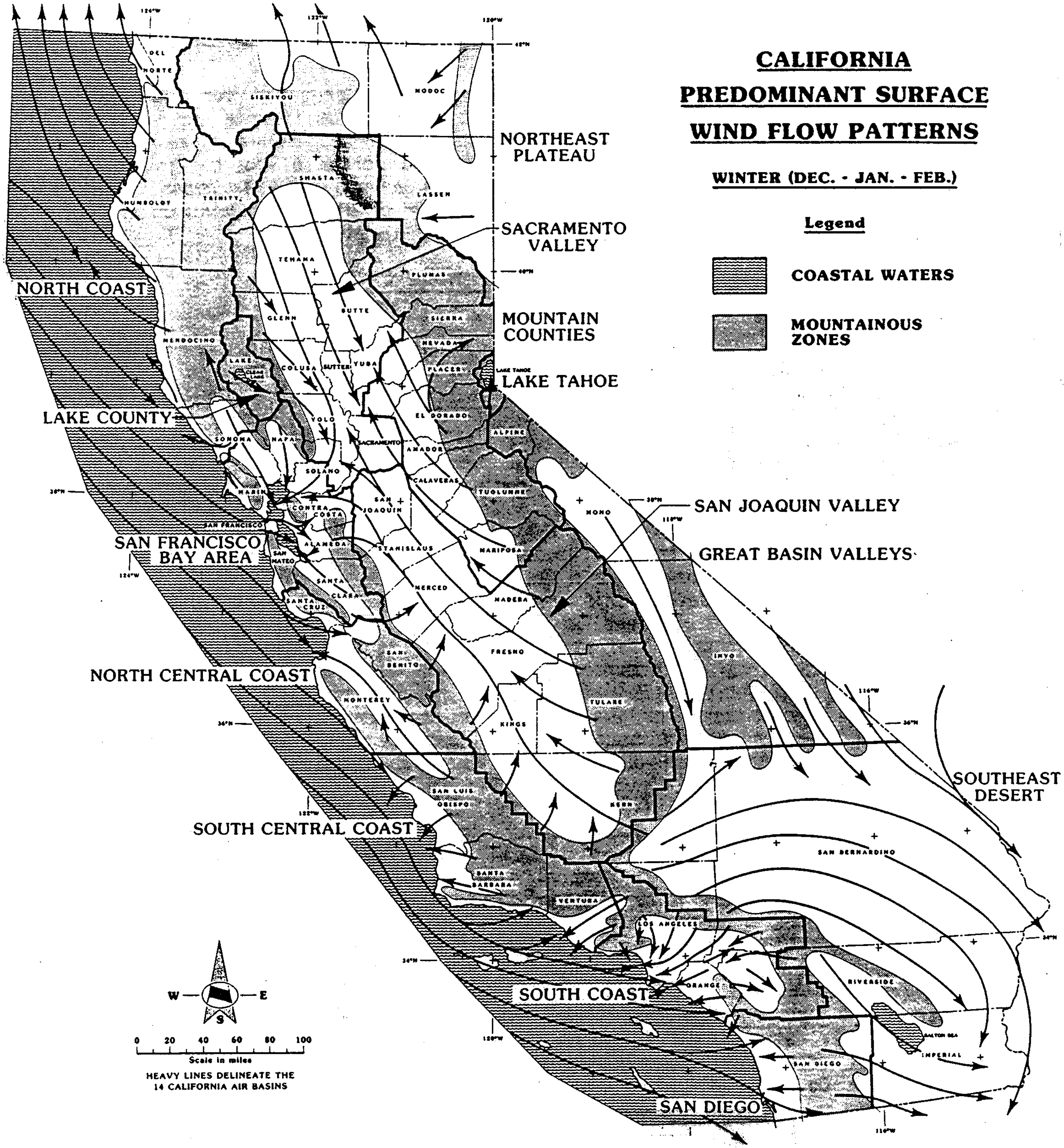


Figure 8.1-2. California predominant surface wind flow patterns, winter.

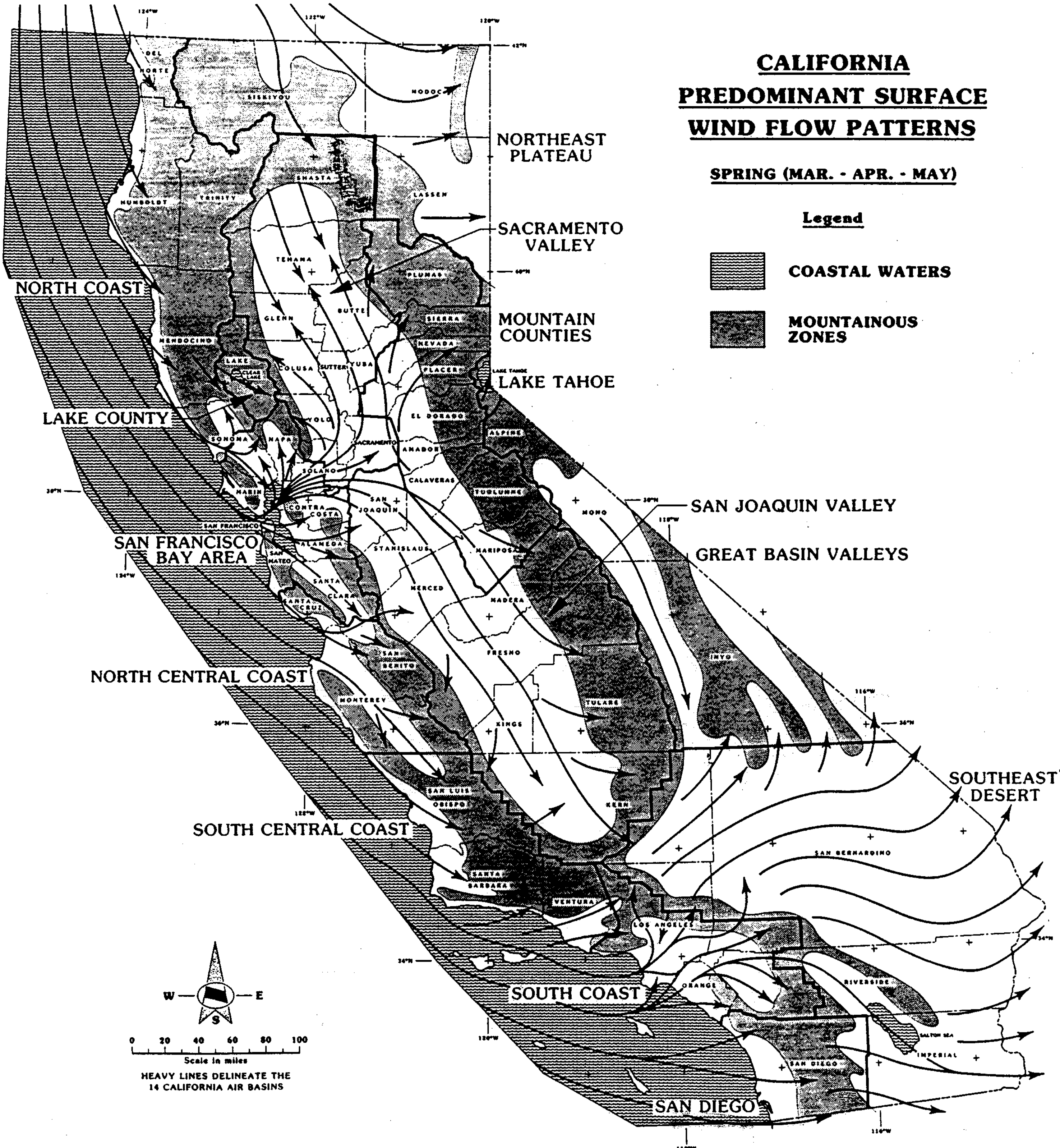


Figure 8.1-3. California predominant surface wind flow patterns, spring.

Russell City Energy Center AFC

May 2001

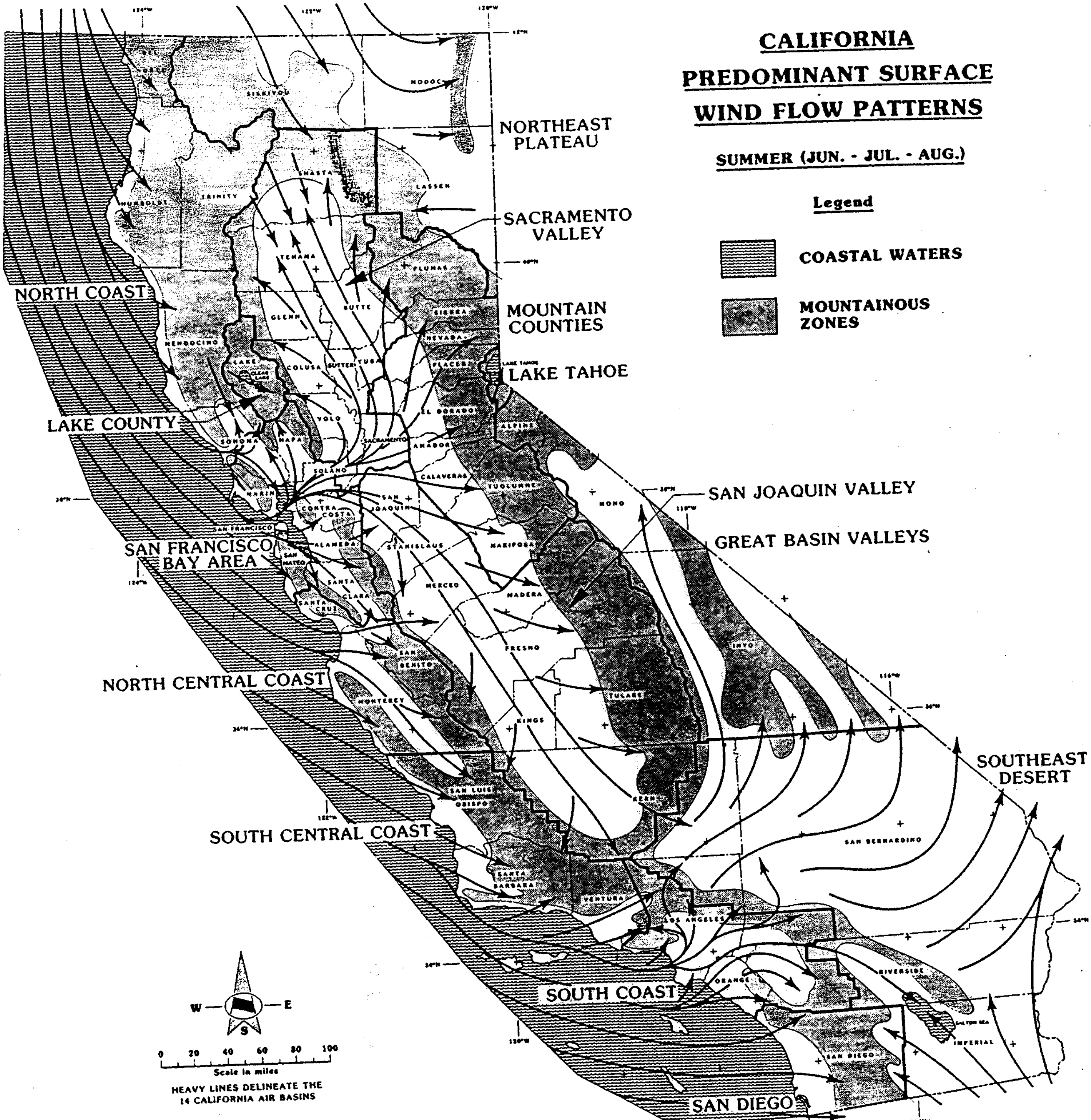


Figure 8.1-4. California predominant surface wind flow patterns, summer.

Russell City Energy Center AFC

May 2001

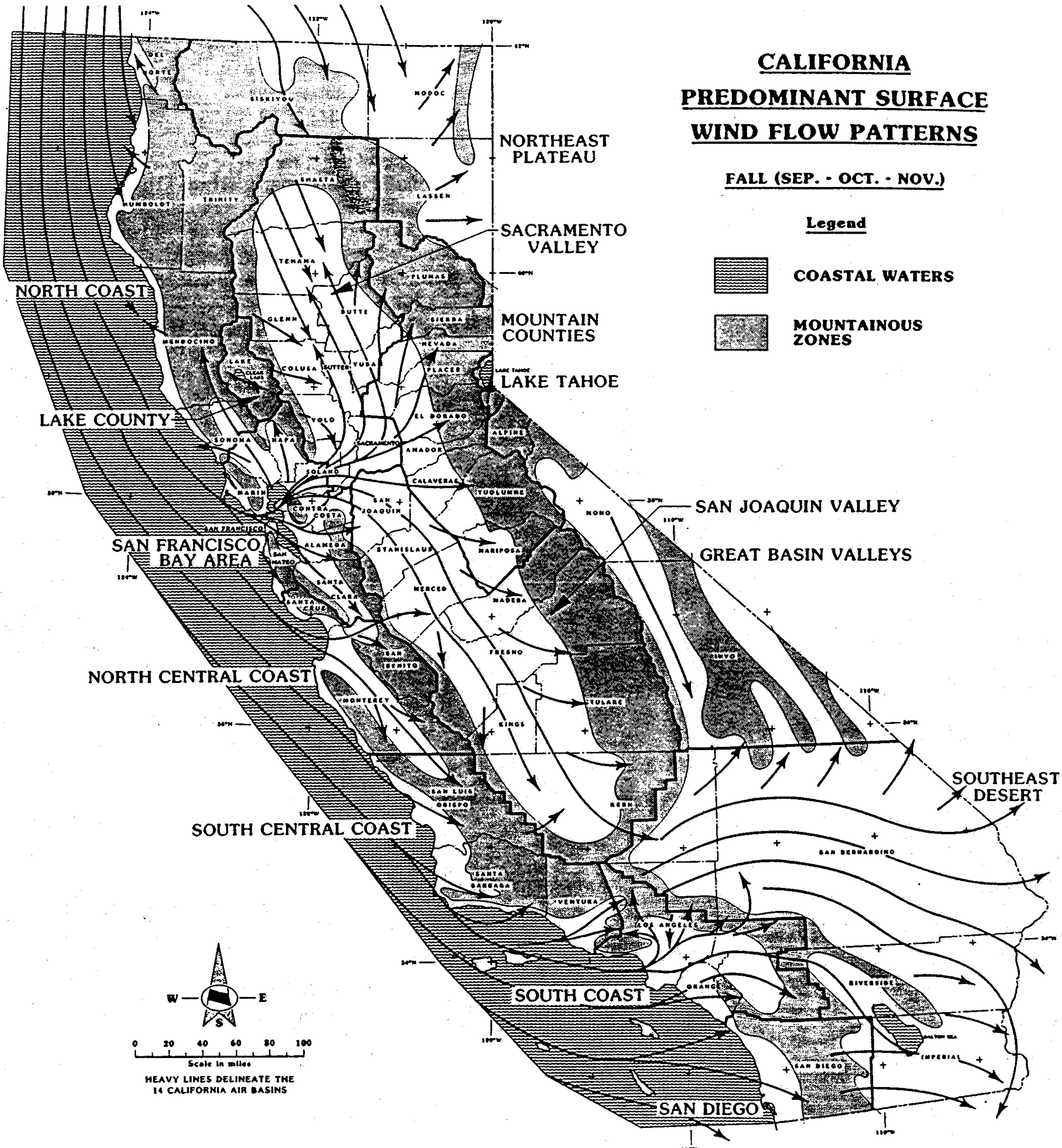


Figure 8.1-5. California predominant surface wind flow patterns, fall.

Russell City Energy Center AFC

May 2001

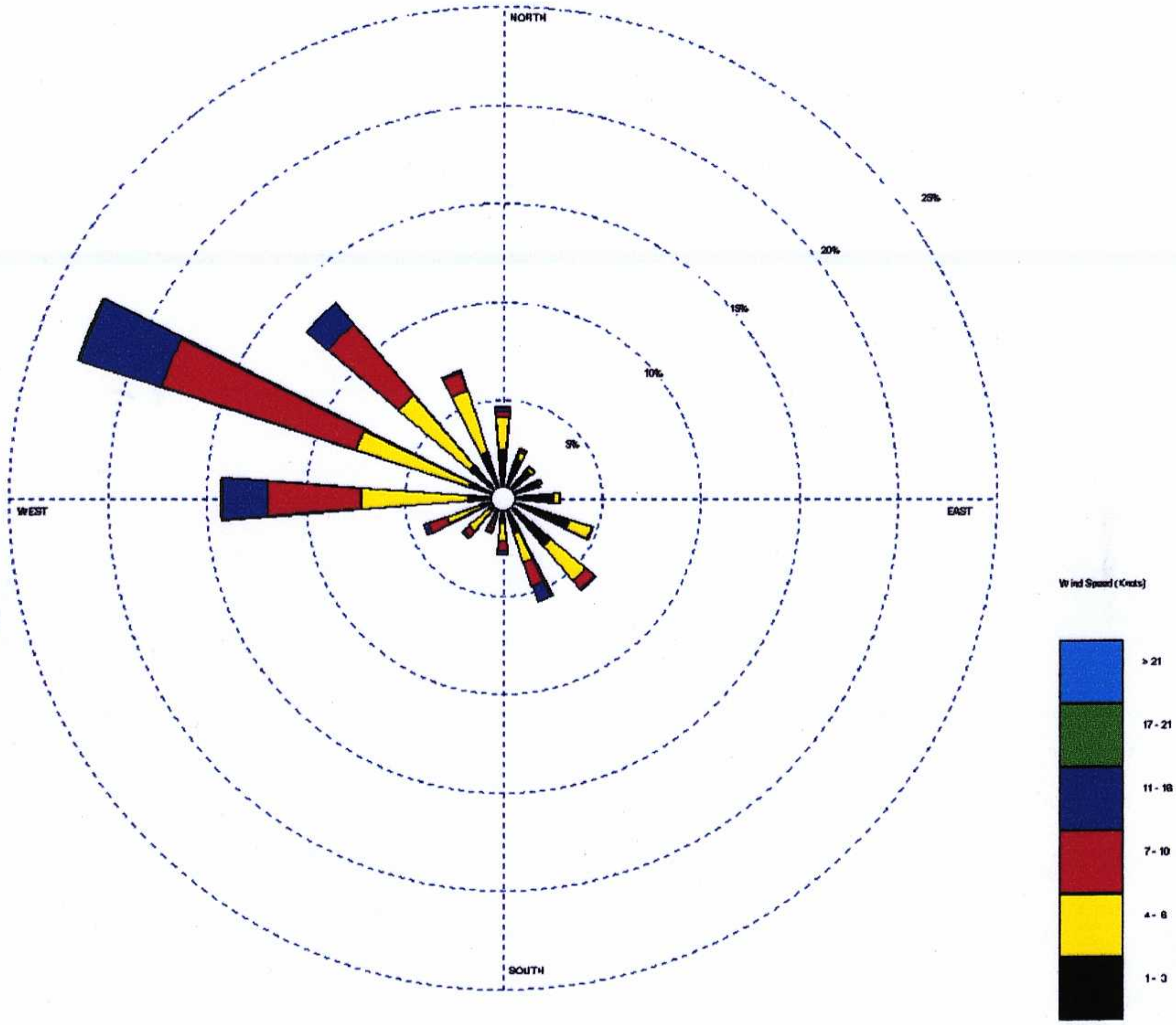


Figure 8.1-6a. Union City wind rose (1990-1994), annual.

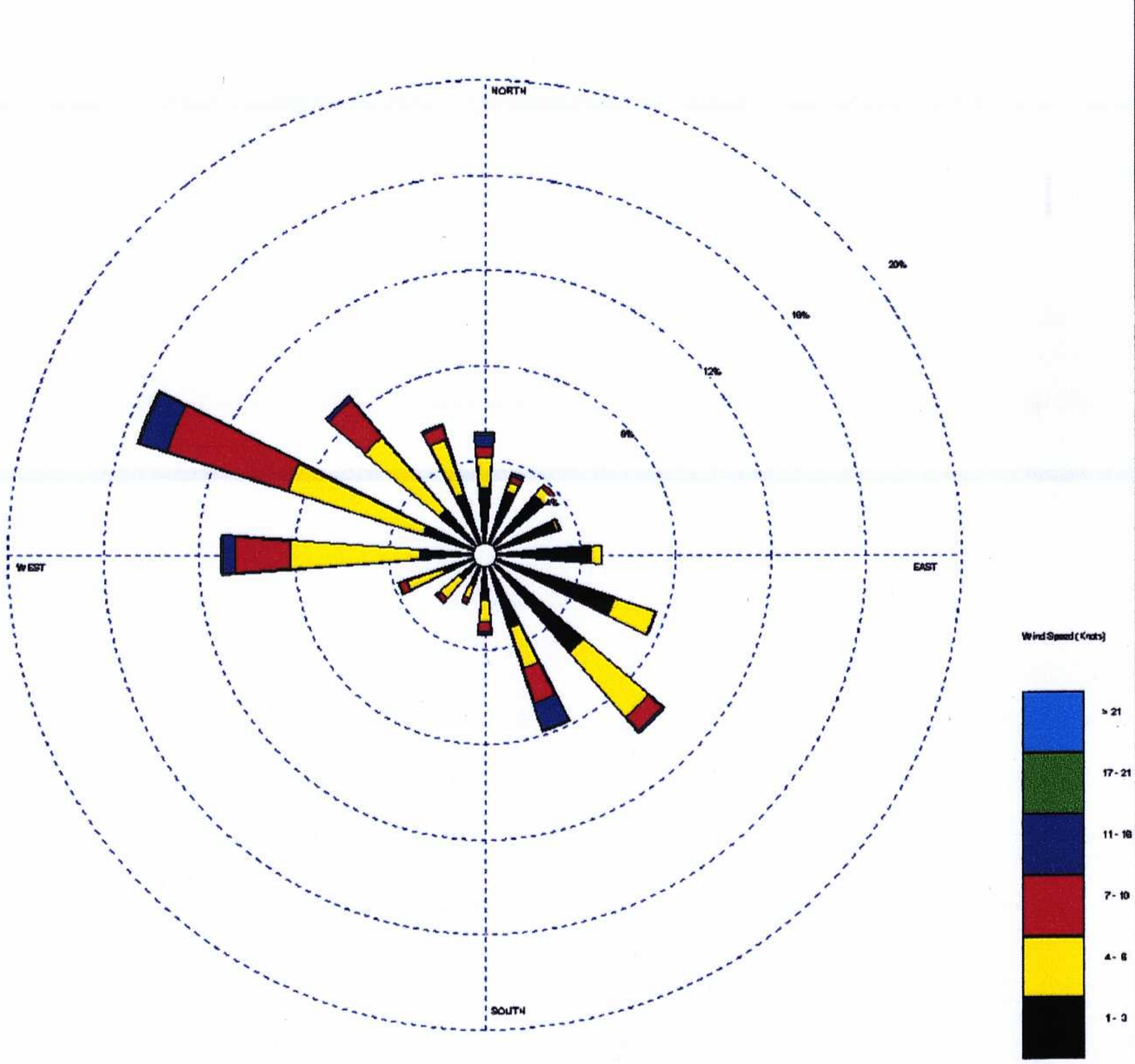


Figure 8.1-6b. Union City wind rose (1990-1994), quarterly fall.

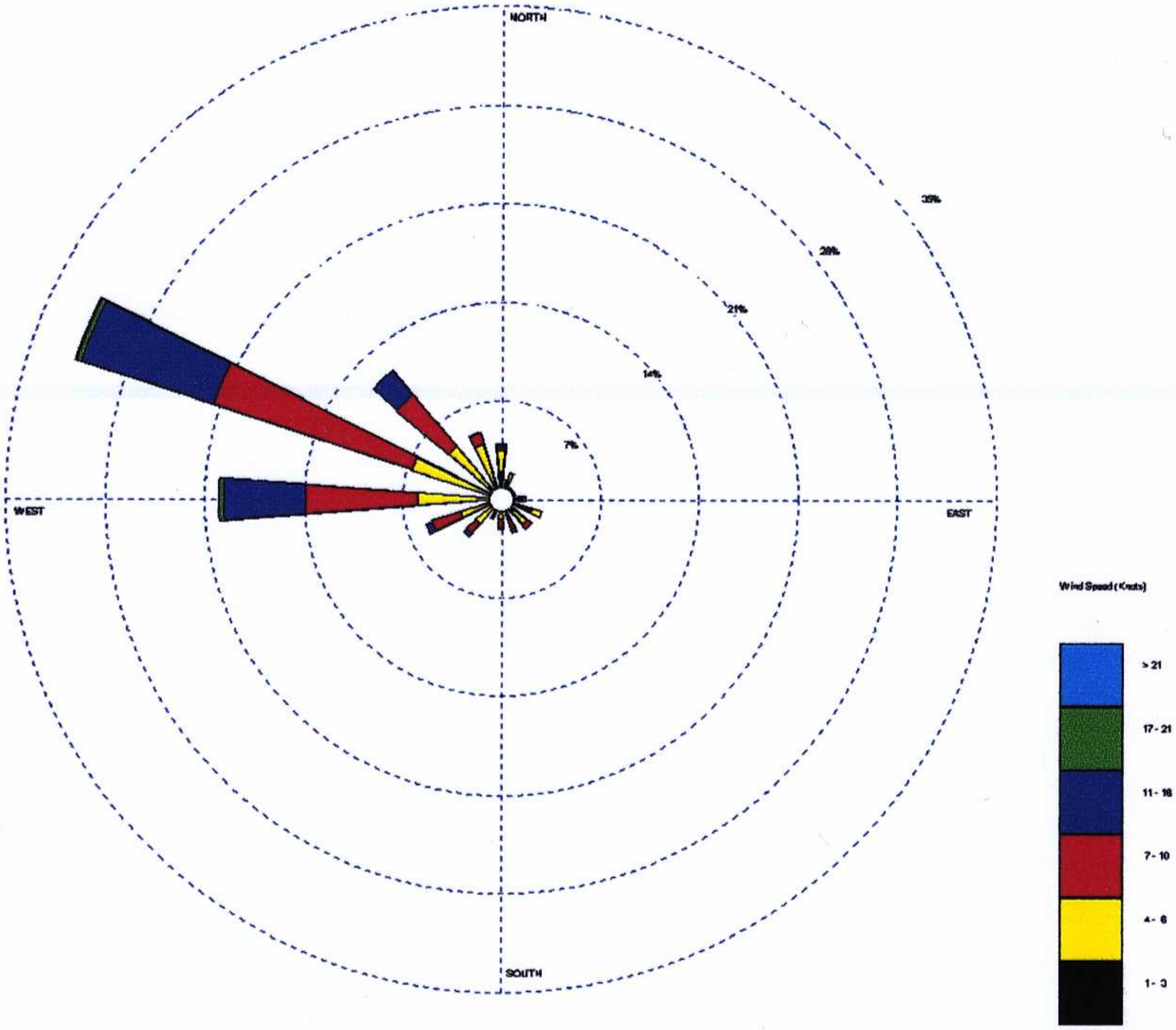


Figure 8.1-6c. Union City wind rose (1990-1994), quarterly spring.

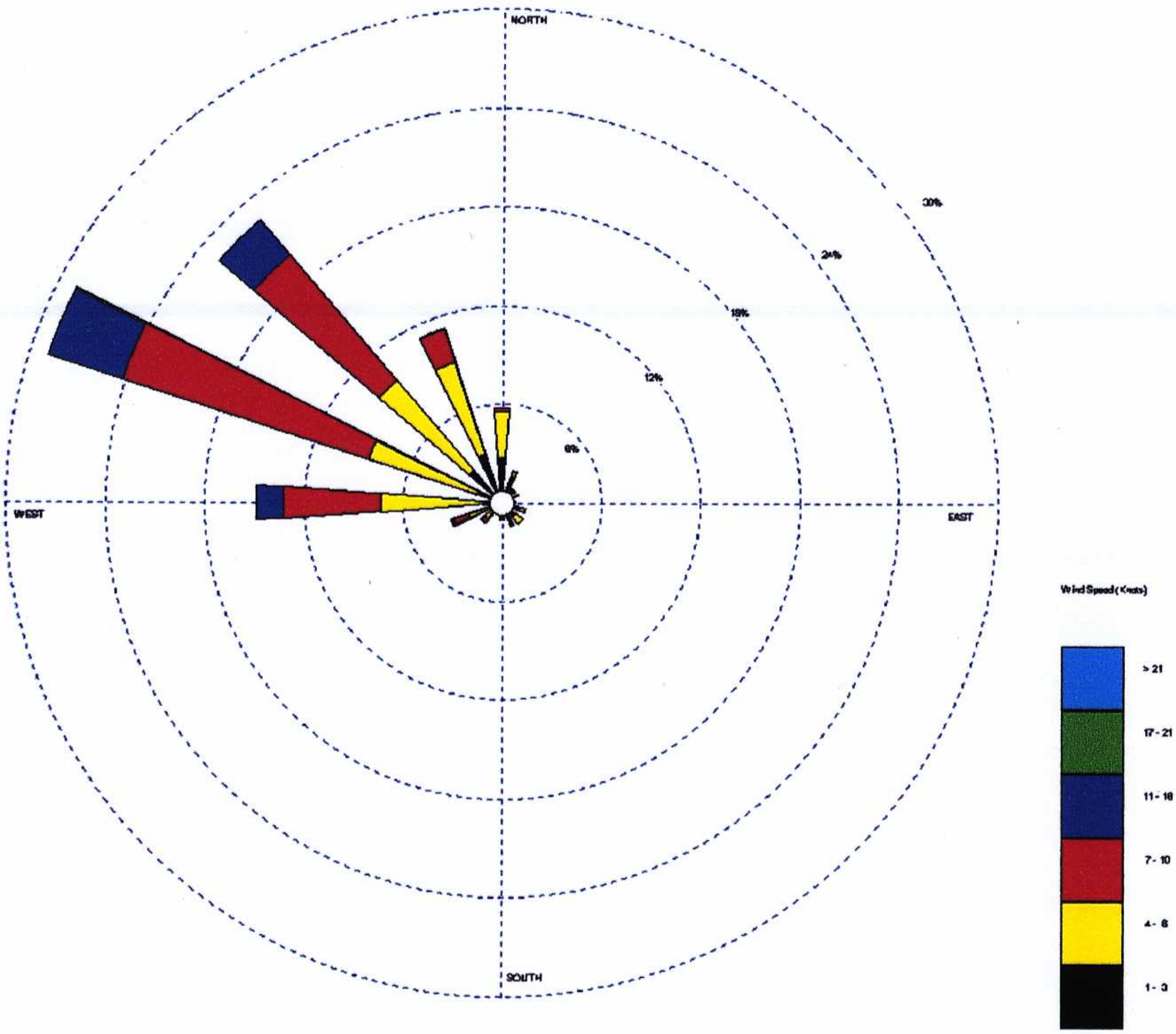


Figure 8.1-6d. Union City wind rose (1990-1994), quarterly summer.

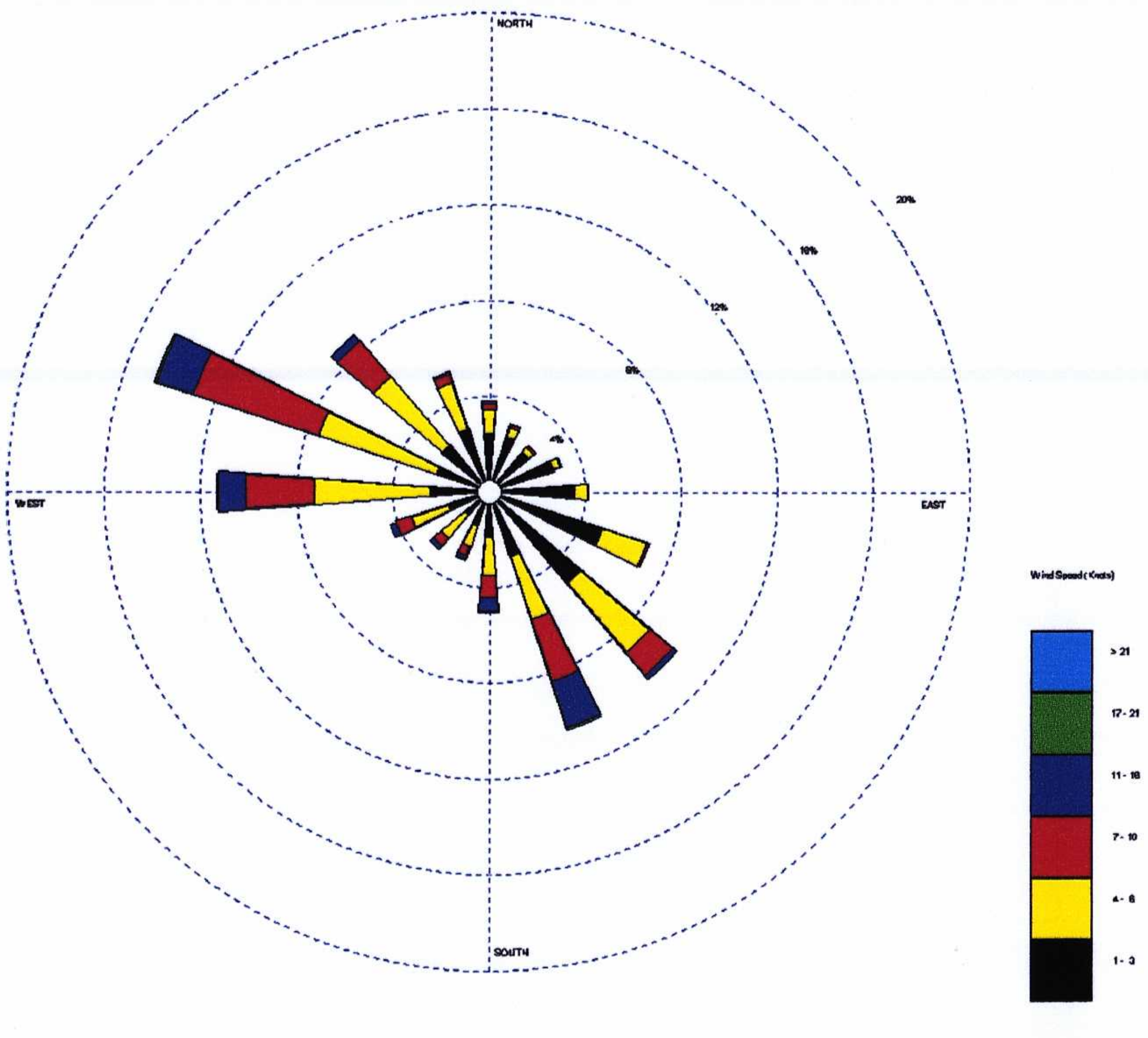


Figure 8.1-6e. Union City wind rose (1990-1994), quarterly winter.

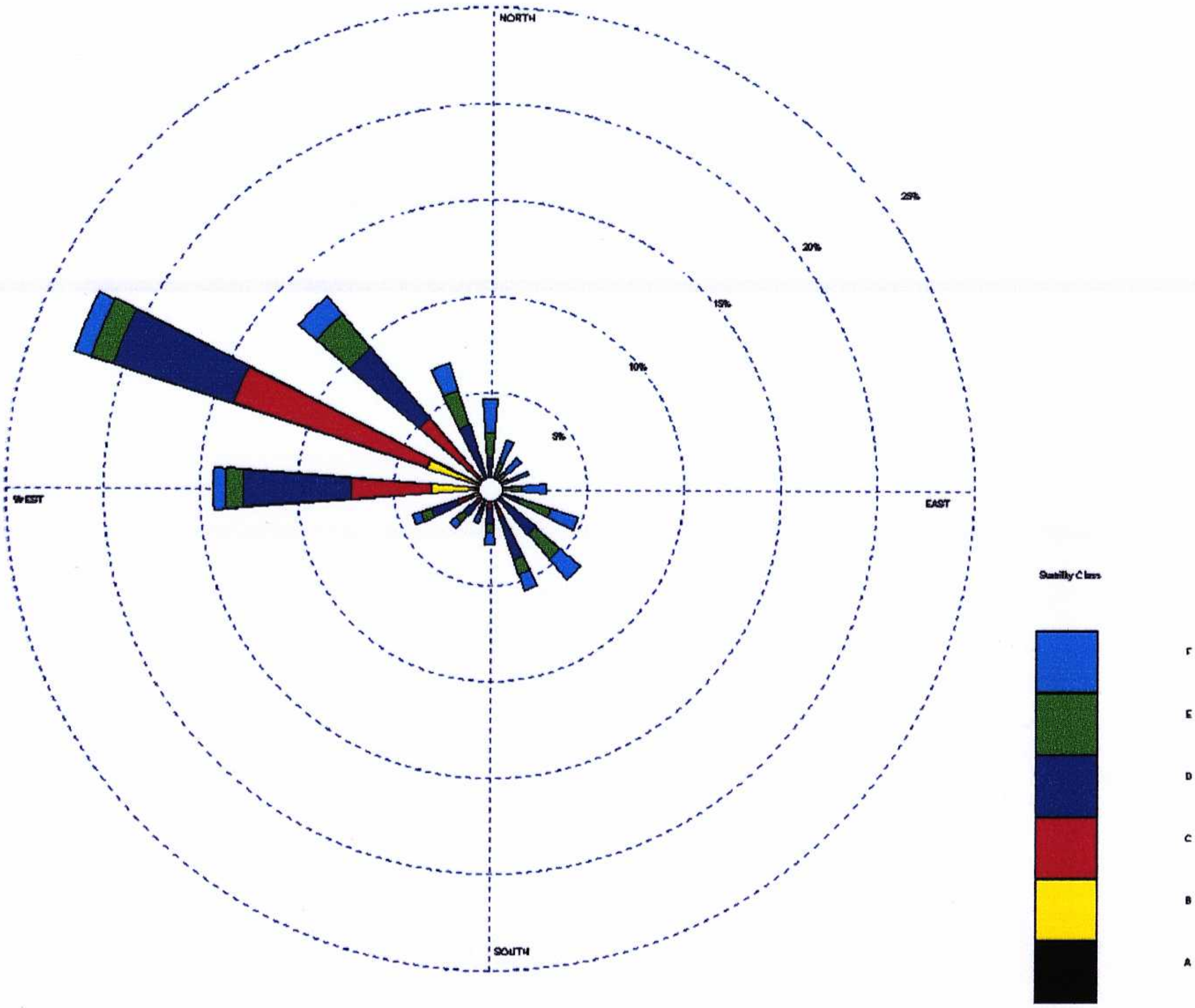


Figure 8.1-6f. Union City stability rose (1990-1994), annual.

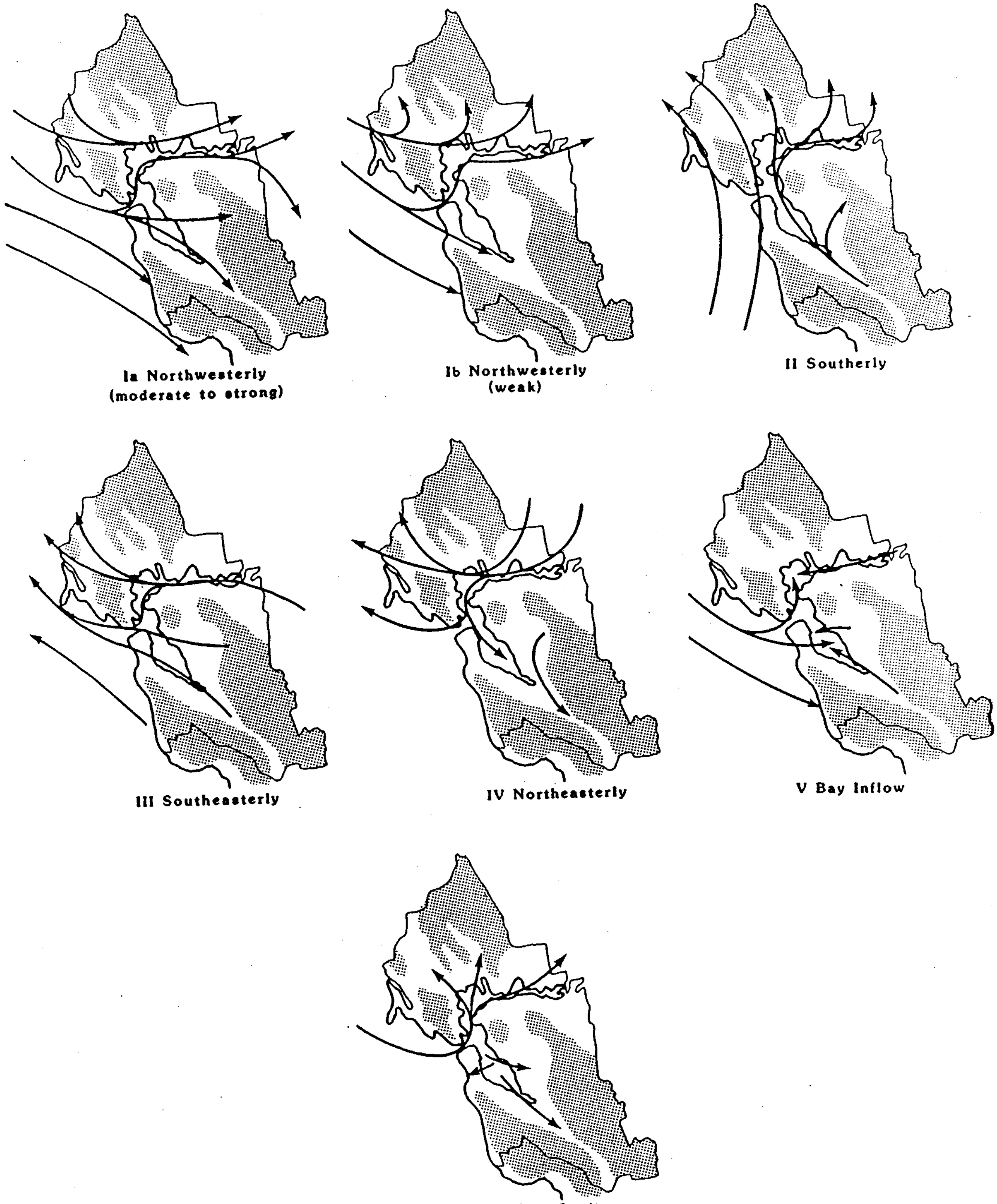


Figure 8.1-7. Bay Area air flow pattern types.

Russell City Energy Center AFC

May 2001

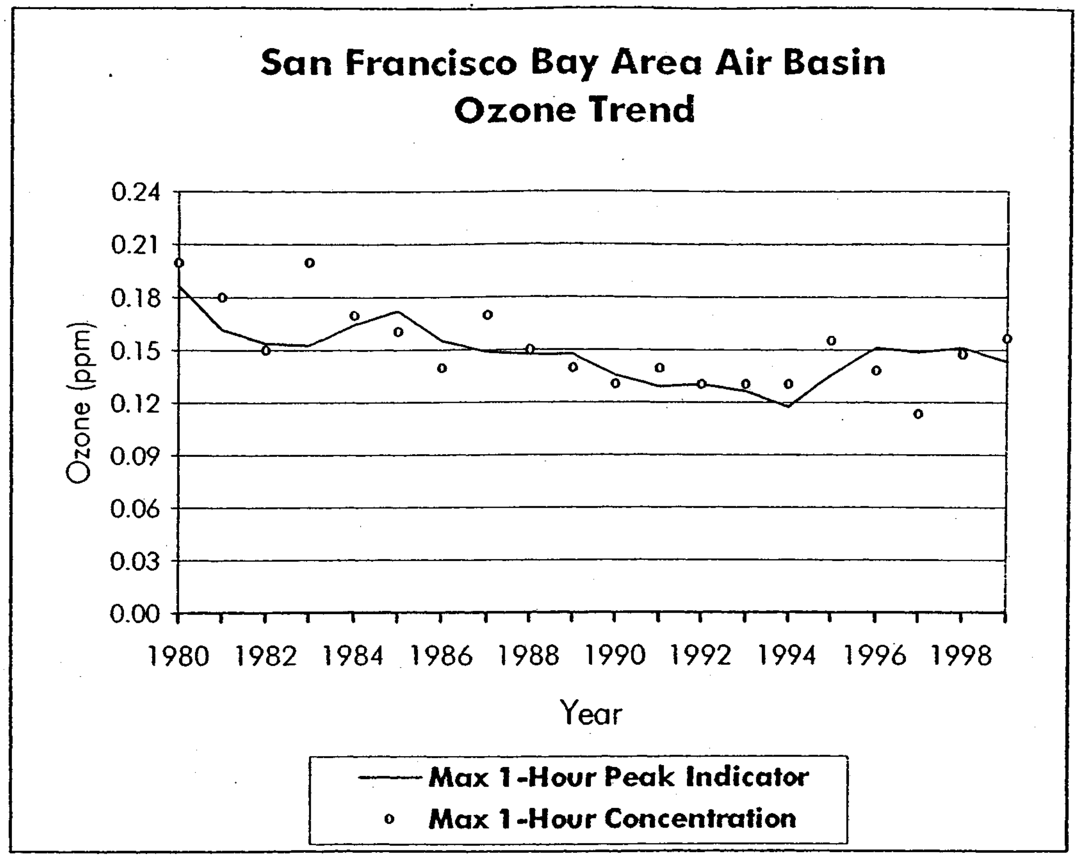


Figure 8.1-8. San Francisco Bay Area air basin ozone trend.

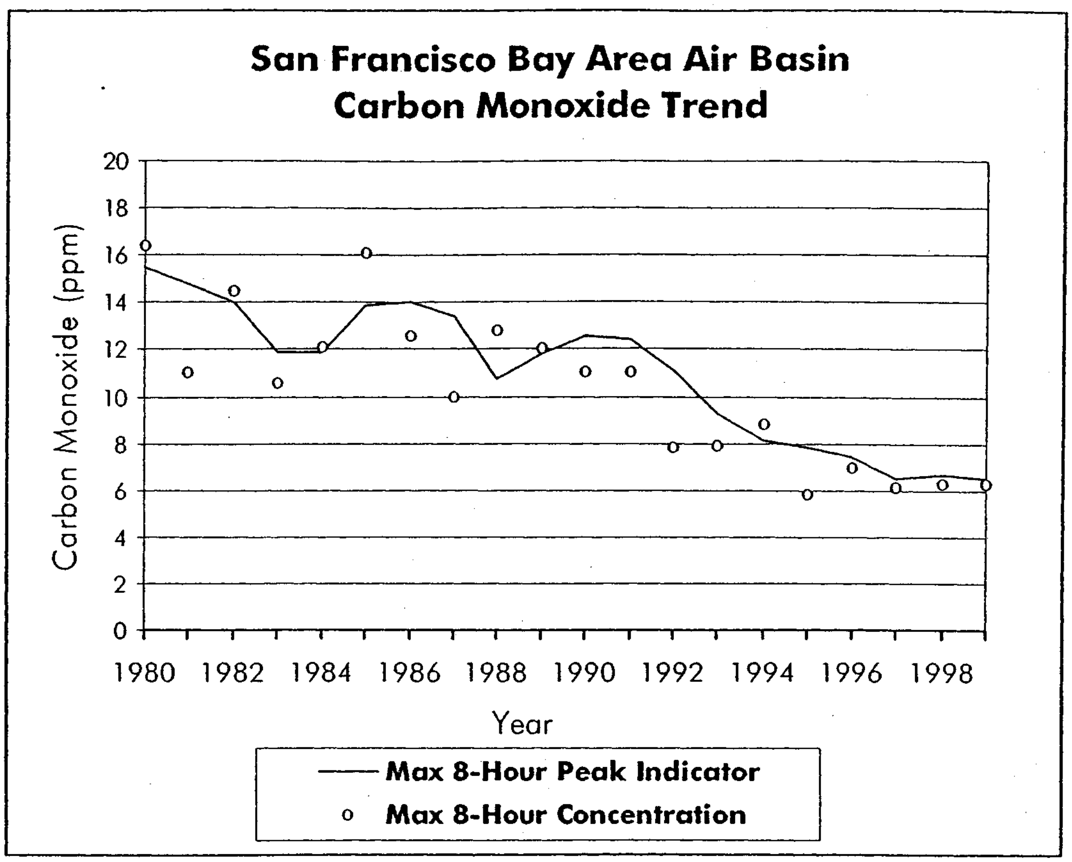


Figure 8.1-9. San Francisco Bay Area air basin carbon monoxide trend.

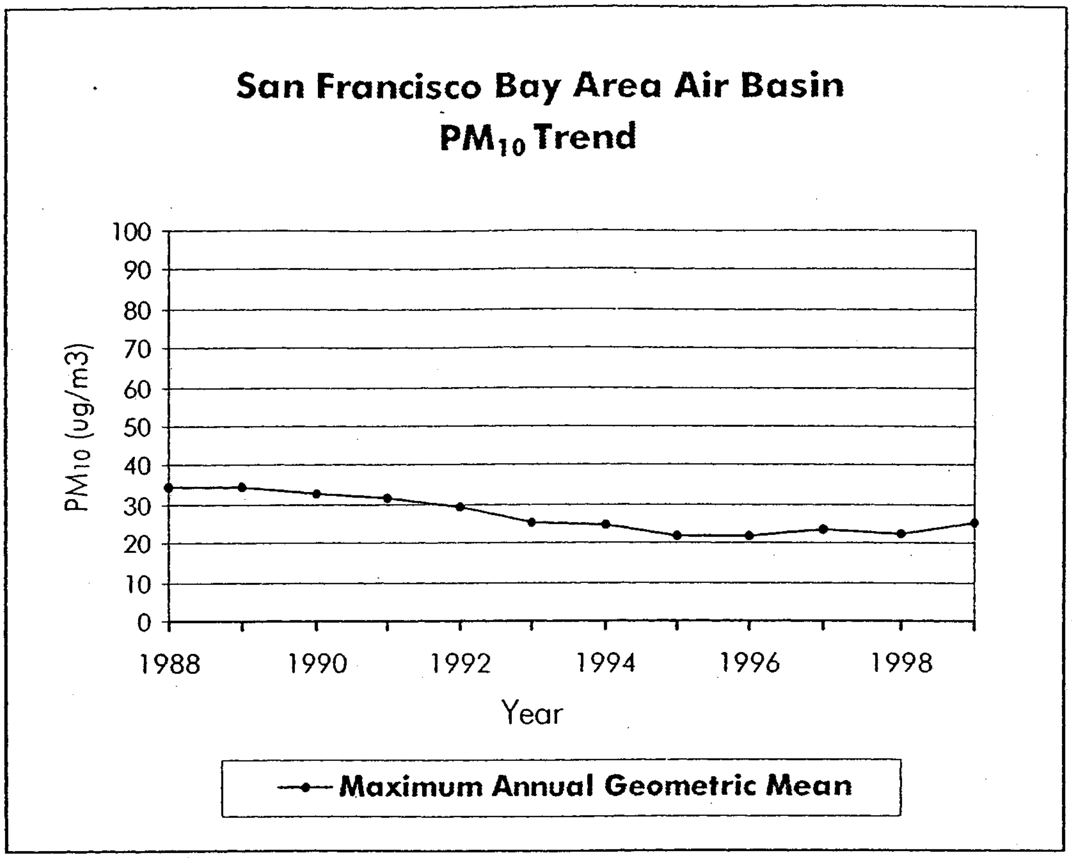
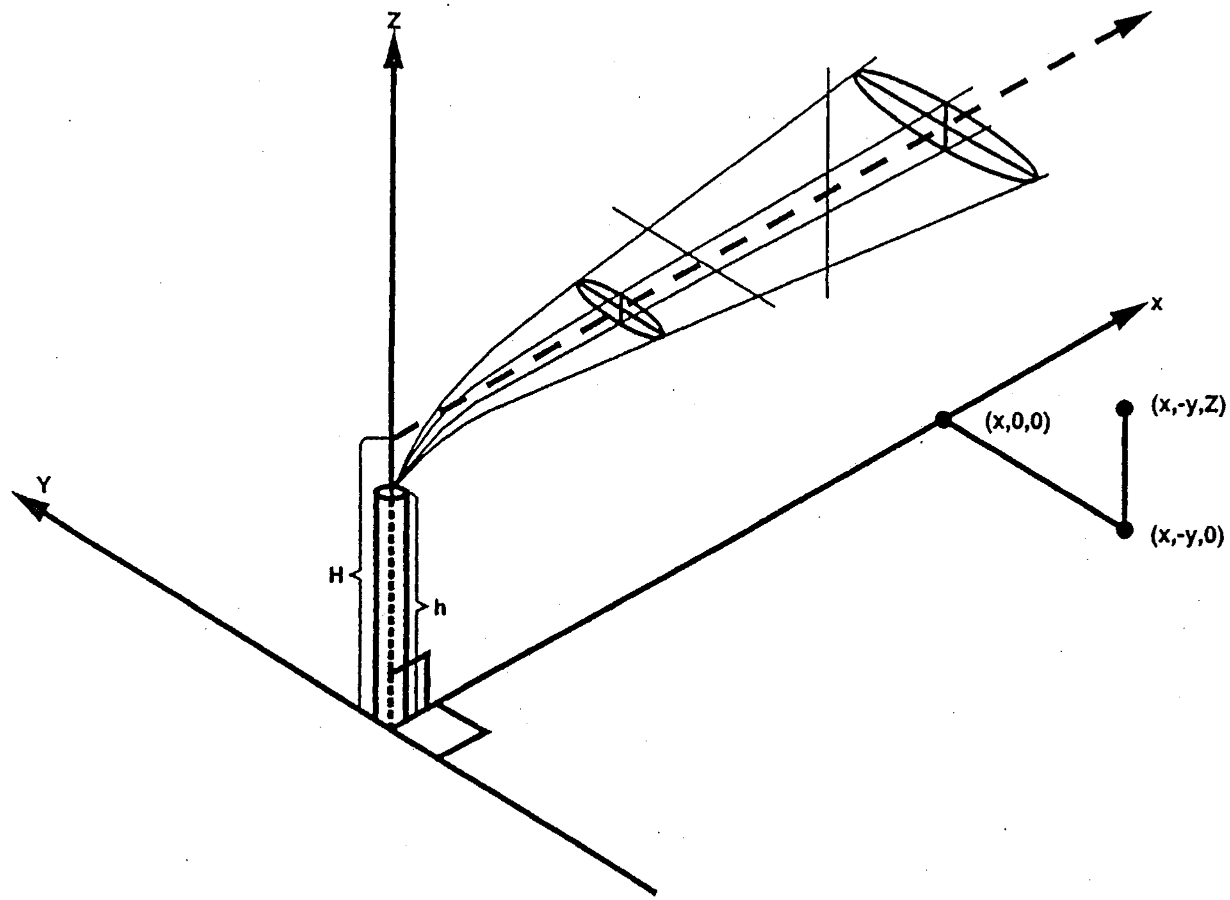


Figure 8.1-10. San Francisco Bay Area air basin PM_{10} trend.



Coordinate system showing Gaussian distributions in the horizontal and vertical.

Figure 8.1-11. Coordinate systems showing Gaussian distributions.

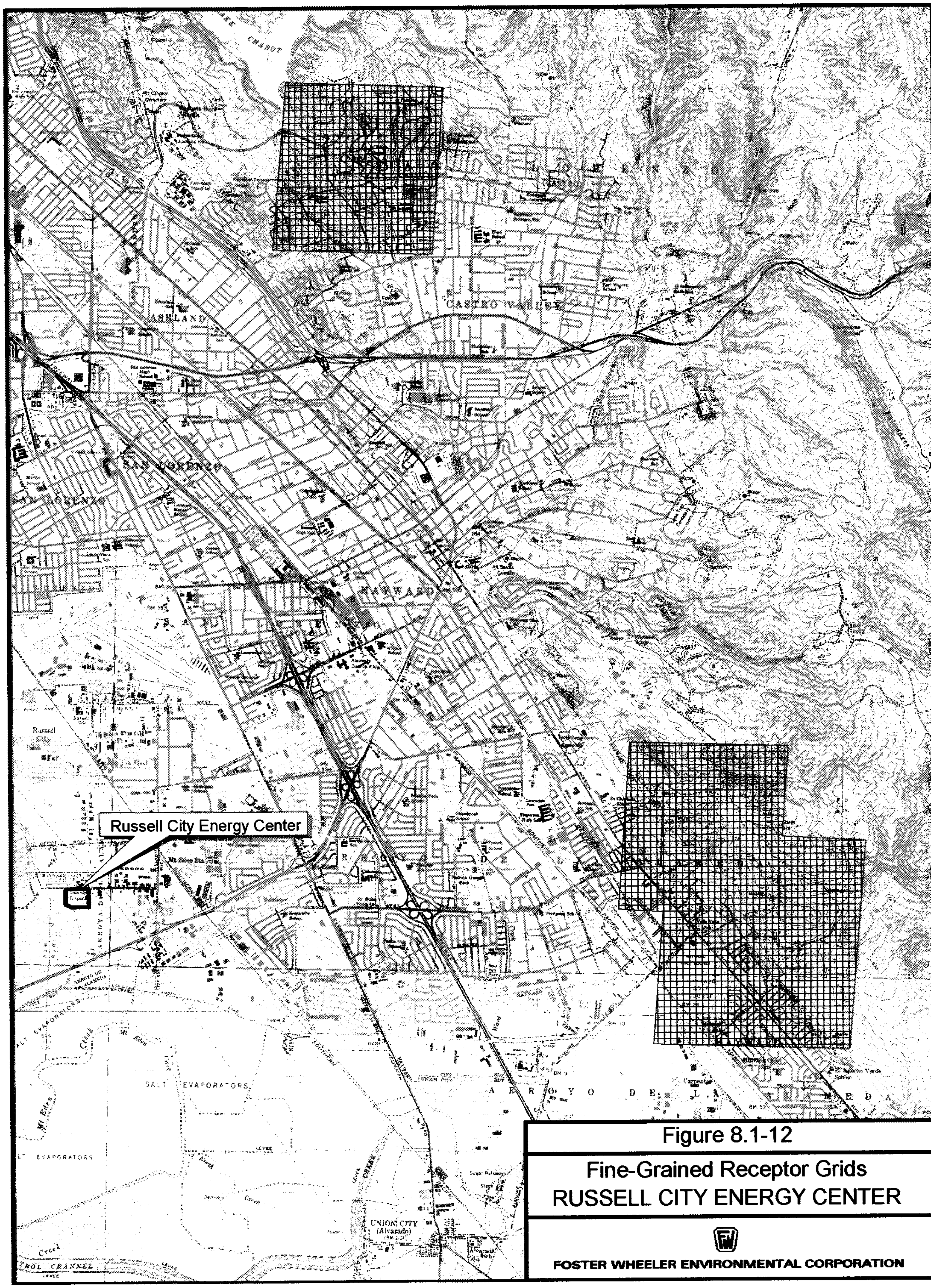


Figure 8.1-12

Fine-Grained Receptor Grids
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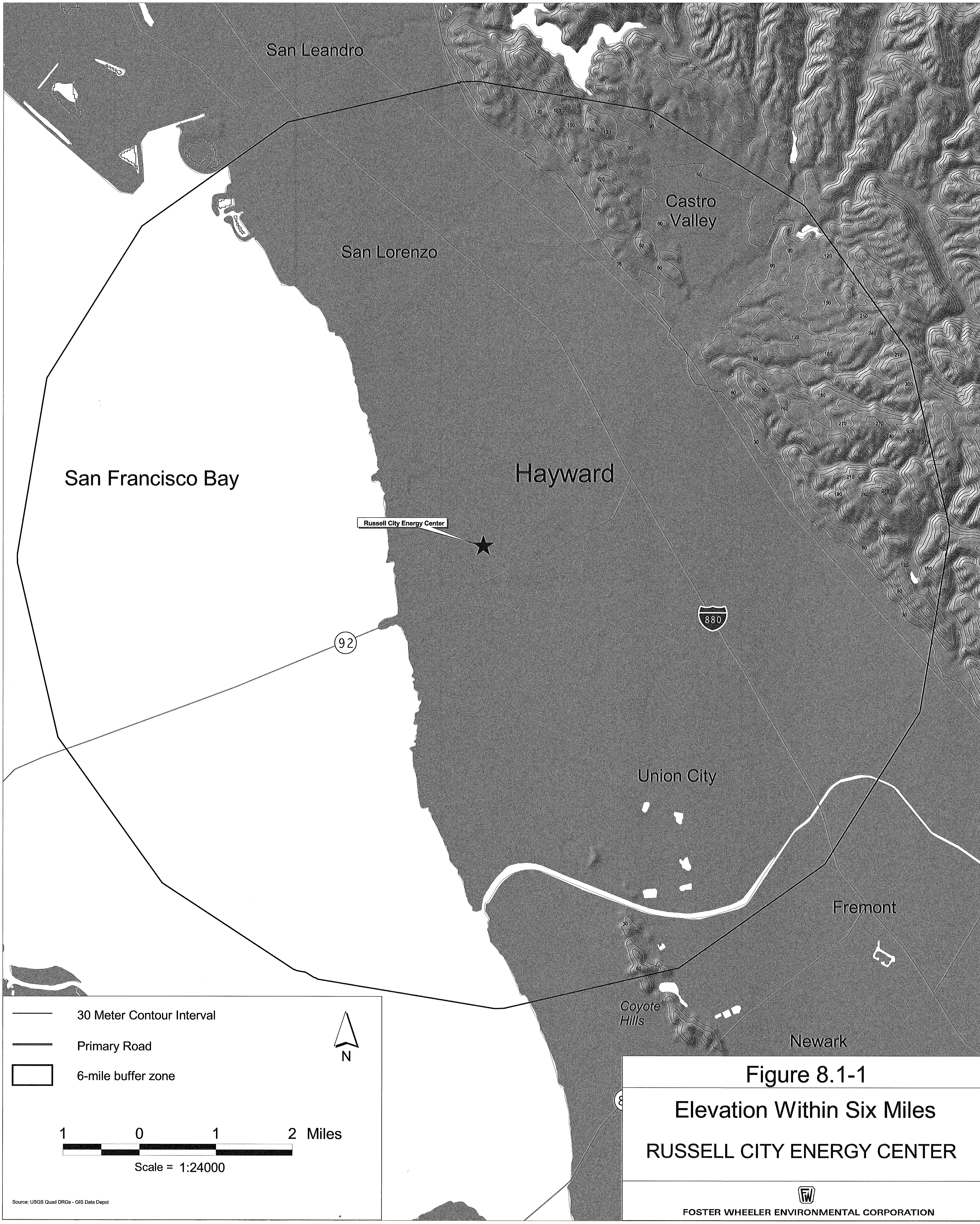

Figure 8.1-1
Elevation Within Six Miles
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8.2 BIOLOGICAL RESOURCES

This section describes biological resources in the vicinity of the Russell City Energy Facility (RCEC) and the Advanced Wastewater Treatment (AWT) Plant, and the potential effects of the project on them. Section 8.2.1 discusses the affected environment, including a regional overview of vegetation, sensitive plant communities, wetlands, wildlife, economically important wildlife species, and special status species. Section 8.2.1 also discusses methods and results of biological field surveys at the RCEC and AWT plant site, and along each of the linear facilities. Section 8.2.2 discusses the effects that construction and subsequent operation of the new facilities may have on special status plant and animal species and sensitive habitats. Section 8.2.3 evaluates any potential cumulative impacts to biological resources in the project vicinity and Section 8.2.4 addresses proposed mitigation measures. Section 8.2.5 presents applicable laws, ordinances, regulations and standards (LORS). Section 8.2.6 presents agency contacts and Section 8.2.7 presents permit requirements and schedules. Section 8.2.8 contains references.

8.2.1 Affected Environment

Coastal habitats along the eastern shore of San Francisco Bay include salt marshes, brackish sloughs, coastal prairies, and coastal sage scrub communities. The largest salt marsh community in California is located around San Francisco Bay. Community types in the project study areas include coastal salt marsh, brackish sloughs, mud flats, emergent marsh, and annual grassland.

8.2.1.1 Regional Biological Resources

The proposed RCEC project is located on the alluvial coastal plain of the San Francisco Bay. The alluvial coastal plains have been largely converted to urban development, salt evaporation ponds, or ruderal (disturbed and weedy) areas. Remnants of the historic northern coastal salt marsh complex remain protected in parks and preserves (Figure 8.2-1). These include the Hayward Regional Shoreline (west of the project site), the San Leandro Shoreline Park and Oyster Bay Regional Shoreline (northwest of the project site), the San Francisco Bay National Wildlife Refuge (south of the project site), and Coyote Hills Regional Park (southeast of the project site). Other biological resources include brackish sloughs such as Alameda Creek, and brackish marshes and abandoned salt evaporation ponds with the potential for restoration.

Biological resources located in the hills east of Hayward and San Leandro include Lake Chabot and Anthony Chabot Regional Park, and Garin Regional Park. Ecosystems occurring in these areas include those commonly encountered in the foothills of the Coast Ranges, such as oak woodland and valley/foothill grassland.

8.2.1.2 Vegetation

Biological habitats within the project area consist primarily of coastal salt marsh, brackish/freshwater marsh, salt production facilities (evaporation ponds), ruderal areas, and urban landscapes with horticultural trees and shrubs. Approximately one-half of the area within a 1-mile radius of the RCEC consists of urbanized and industrial areas within the City of Hayward. The other half consists primarily of northern coastal salt marsh and brackish sloughs that have been variously preserved, converted to other uses (sewage treatment facilities, landfills, and salt evaporation ponds), or are undergoing restoration.

The dominant vegetation types at the RCEC and AWT plant site are annual grassland and seasonal wetland dominated by saltgrass (*Distichlis spicata*), and alkalai heath (*Frankenia salina*). The transmission line corridor, natural gas pipeline, and water pipelines cross urban landscapes dominated by ruderal species (i.e., weedy plants that grow in disturbed areas) and horticultural trees and shrubs.

8.2.1.3 Sensitive Plant Communities

The only sensitive plant community found within the project area is the northern coastal salt marsh habitat. Representative species found in the salt marsh community include pickleweed (*Salicornia virginica*), salt grass (*Distichlis spicata*), and alkali heath (*Frankenia salina*).

8.2.1.4 Wetlands

There are 1.68 acres of seasonal wetlands on the 14.7-acre project site. Much of the historic salt marsh community within 1 mile of the site has been altered or eliminated by urban development, sewage treatment facilities, salt evaporation ponds, and the construction of dikes and levees to prevent flooding and intrusion of saltwater. Remaining salt marsh in the project impact area includes Cogswell Marsh, managed by the East Bay Regional Park District, the Hayward Area Recreation District (HARD) marsh restoration project, and several brackish/freshwater marshes. Creeks and sloughs draining into the Bay include Mt. Eden Creek and two unnamed sloughs draining into Hayward Landing and Johnson Landing.

8.2.1.5 Wildlife

Wildlife habitat on or within 1 mile of the project site and consists of urban land, marginal freshwater/brackish marsh communities, and the highly diverse northern coastal salt marsh communities of the Cogswell Marsh and the HARD Marsh. Listed species in the northern coastal salt marsh community include the salt marsh harvest mouse (*Reithrodontomys raviventris*), clapper rail (*Rallus longirostris obsoletus*), and salt-marsh wandering shrew *(Sorex vagrans halicoetes).*

8.2.1.6 Economically Important Wildlife Species

There are no economically important terrestrial wildlife species within the impact area of the proposed project.

8.2.1.7 Special Environmental Areas in Project Vicinity

Special environmental areas within a 1-mile radius of the project site include Cogswell Marsh, managed by the East Bay Regional Park District, the HARD marsh restoration project and Shoreline Interpretive Center, and a small section of Mt. Eden Creek.

8.2.1.8 Special Status Species

The designation of special status includes all state- and federally-listed species under the state and federal Endangered Species Acts (ESAs); species proposed for those listings; federal Species of Concern (SC); California Species of Special Concern (CSC); California Fully Protected species under the Fish and Game Code; and plant species designated as Rare, Threatened, or Endangered by the California Native Plant Society (CNPS). Species of concern include those that could be listed in the future and those currently protected under other laws (e.g., the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act).

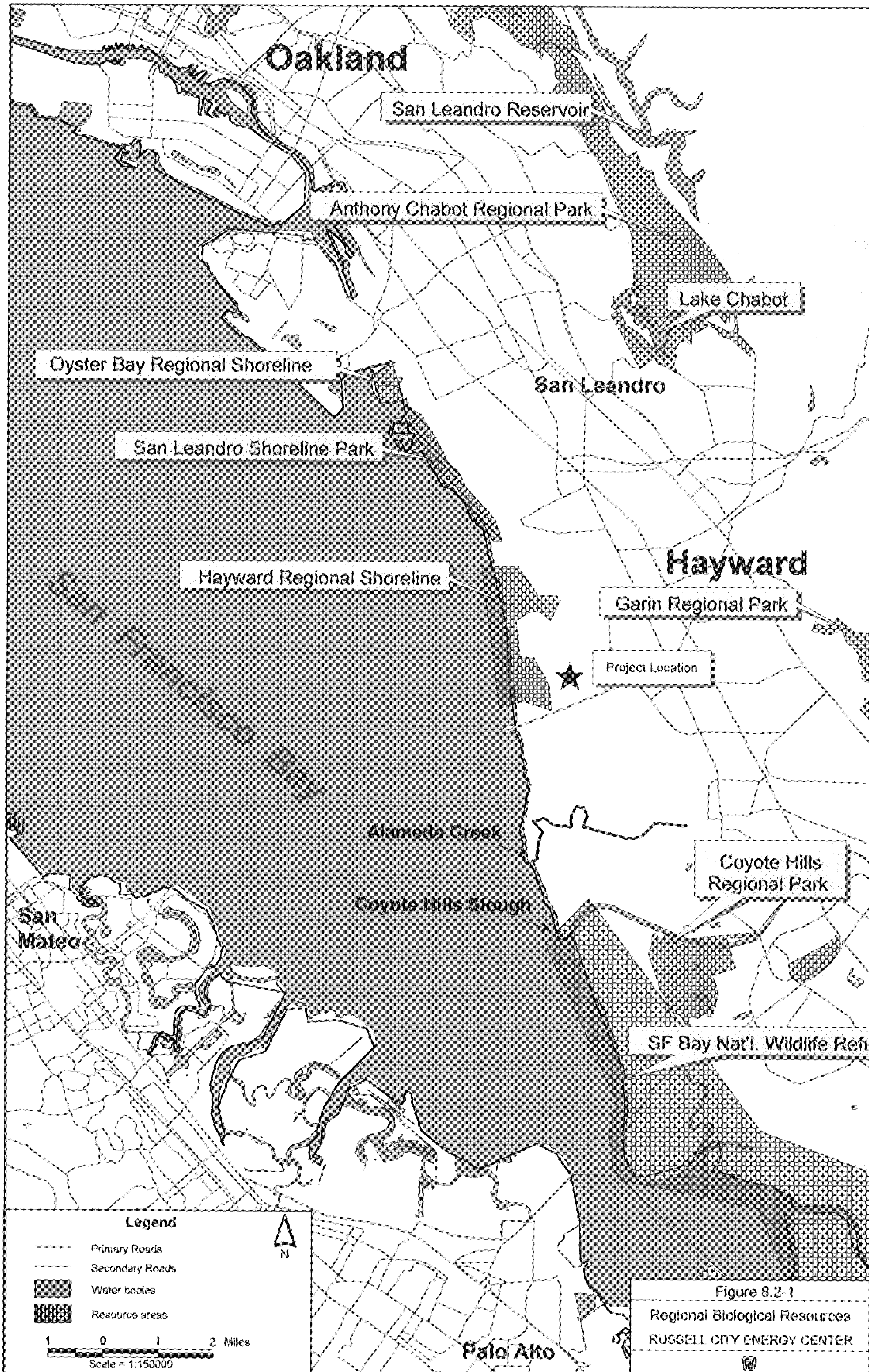


Figure 8.2-1
Regional Biological Resources
RUSSELL CITY ENERGY CENTER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

Standard references used for the biology and taxonomy of plants and plant communities included California Department of Fish and Game (1999); Hickman, ed. (1993); Holland (1986); Mason (1957); Munz (1959); and Skinner and Pavlik, eds. (1994). Standard references used for the biology and taxonomy of wildlife included Behler and King (1979); Ehrlich et al. (1988); Jameson and Peeters (1988); Jennings and Hayes (1994); Mayer and Laudenslayer, eds. (1988); McGinnis (1984); Peterson (1990); Stebbins (1985); Udvardy (1977); Verner and Boss (1980); Whitaker (1980); and Zeiner et al. (1988; 1990 a, b).

A computerized search of the California Natural Diversity Data Base (CNDDB/RareFind report, February 2001) was conducted for the San Leandro, Hayward, Newark, and Redwood Point USGS topographic quadrangles (the "study Area"). This search was conducted to determine if there were any occurrences of state- or federally-listed species recorded within or near the project study area. Known locations of special status species, based on the database search, are mapped on Figure 8.2-2. Appendix 8.2-A contains the CNDDB report. In addition to the CNDDB/RareFind report, a letter was sent to the U.S. Fish and Wildlife Service (USFWS), Sacramento Field Office, requesting file data on special status species that could occur in the project vicinity. The USFWS response is presented in Appendix 8.2-B.

In addition to the literature sources mentioned above, site-specific information was gathered during field surveys conducted in the spring of 2001 (Section 8.2.1.10).

Special Status Plants

Table 8.2-1 lists the special status plant species in the vicinity of the project components, based on CNDDB/RareFind and USFWS data. Brief descriptions of special status plant species that may occur in the project area are presented below. Habitat for these species occurs near the proposed project site.

Alkali milk-vetch (*Astragalus tener* var. *tener*)

- **Habitat and Biology:** Annual herb; CNPS List 1B; that occurs in coastal marsh and other alkaline habitats, such as playas, adobe clay valley and foothill grasslands, and alkaline vernal pools (Skinner and Pavlik 1994).
- **Blooming:** March to June
- **Range:** Sea level to 300 feet above msl. Known from Alameda, Contra Costa, Merced, Monterey, Napa, San Benito, Santa Clara, San Francisco, San Joaquin, Solano, Sonoma, Stanislaus, and Yolo counties.
- **CNDDB/RareFind Records:** There are six records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads. There is one extirpated record within the project impact area, mapped 0.3 miles west of the Southern Pacific Railroad adjacent to the transmission lines.
- **Habitat Present in Study Area:** Habitat for this species occurs in the RCEC and AWT plant site.

.Table 8.2-1. Special status plant species potentially occurring in the RCEC project area.

Scientific Name	Common Name	Federal/ State/ CNPS [a]	Source [b]	Habitat in impact area?	Blooms
Astragalus tener var. *tener*	Alkali milk-vetch	SC/--/1B	1,2	Yes	Mar-May
Atriplex depressa	Brittlescale	SC/--/1B	1	No	May-Oct
Balsamohriza macrolepis var. *macrolepis*	Big-scale balsamroot	--/--/1B	2	No	Mar-June
Cordylanthus maritimus ssp. *palustris*	Point Reyes bird's-beak	SC/--/1B	1	Yes	Jun-Oct
Cordylanthus mollis ssp. *hispidus*	Hispid bird's beak	SC/R/1B	2	Marginal	Jul-Sep
Fritillaria liliacea	Fragrant fritillary	SC/--/1B	2	No	Feb-Apr
Helianthella castanea	Diablo rock rose	SC/--/1B	1	No	Apr-Jun
Hemizonia parryi ssp. *congdonii*	Congdon's tarplant	SC/--/1B	2	No	Jun-Nov
Horkelia cuneata ssp. *sericea*	Kellog's horkelia	SC/--/1B	2	No	Apr-Sept
Lasthenia conjugens	Contra Costa goldfields	E/--/1B	1,2	No	Mar-Jun
Lathyrus jepsonii	Delta tule pea	SC/--/1B	1	Marginal	May-Jun
Lilaeopsis masonii	Mason's lilaeopsis	SC/R/1B	1	No	Apr-Oct
Plagiobothrys glaber	Hairless popcorn flower	SC/--/1A	2	Yes	Apr-May
Suaeda californica	California seablite	PE/--/1B	1	Marginal	Jul-Oct

[a] **Status Categories:**

Federal status determined from a USFWS letter (Knight 2001, personal communication). State status determined from *Special Plants List* (June 1999), and/or *State and Federally Listed Endangered, Threatened, and Rare Plants of California* (April 1999), prepared by CDFG Natural Diversity Data Base. CNPS status determined from *CNPS Inventory of Rare and Endangered Vascular Plants of California* (Skinner and Pavlik 1994). Codes used in table are as follows:

E = Endangered; **T** = Threatened; **R** = California Rare; **PE** = Proposed Endangered

C = Candidate: Taxa for which the USFWS has sufficient biological formation to support a proposal to list as endangered or threatened.

SC = USFWS Species of Concern: Taxa for which existing information may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

SSC = CDFG "Species of Special Concern"

CNPS List: **1A** = Presumed Extinct in CA; **1B** = Rare or Endangered in CA and elsewhere; **2** = R/E in CA and more common elsewhere; **3** = Need more information; **4** = Plants of limited distribution.

-- = Species not state-listed.

[b] **Source:** 1 = From USFWS letter (Knight 2001, personal communication). 2 = From CNDDB/ RareFind.

Hispid bird's beak (*Cordylanthus mollis* ssp. *hispidus*)

- **Habitat and Biology:** Annual herb, hemiparasitic; CNPS List 1B; alkaline meadows and playas.
- **Blooming:** June to September
- **Range:** Alameda, Kern, Merced, Placer, and Solano counties.
- **CNDDB/RareFind Records:** No records for this species on the USGS 7.5-minute San Leandro Quad.
- **Habitat Present in Study Area:** Marginal habitat occurs in alkaline soils in the project site and adjacent stormwater retention pond. Also in playas in Cogswell Marsh and HARD Marsh.

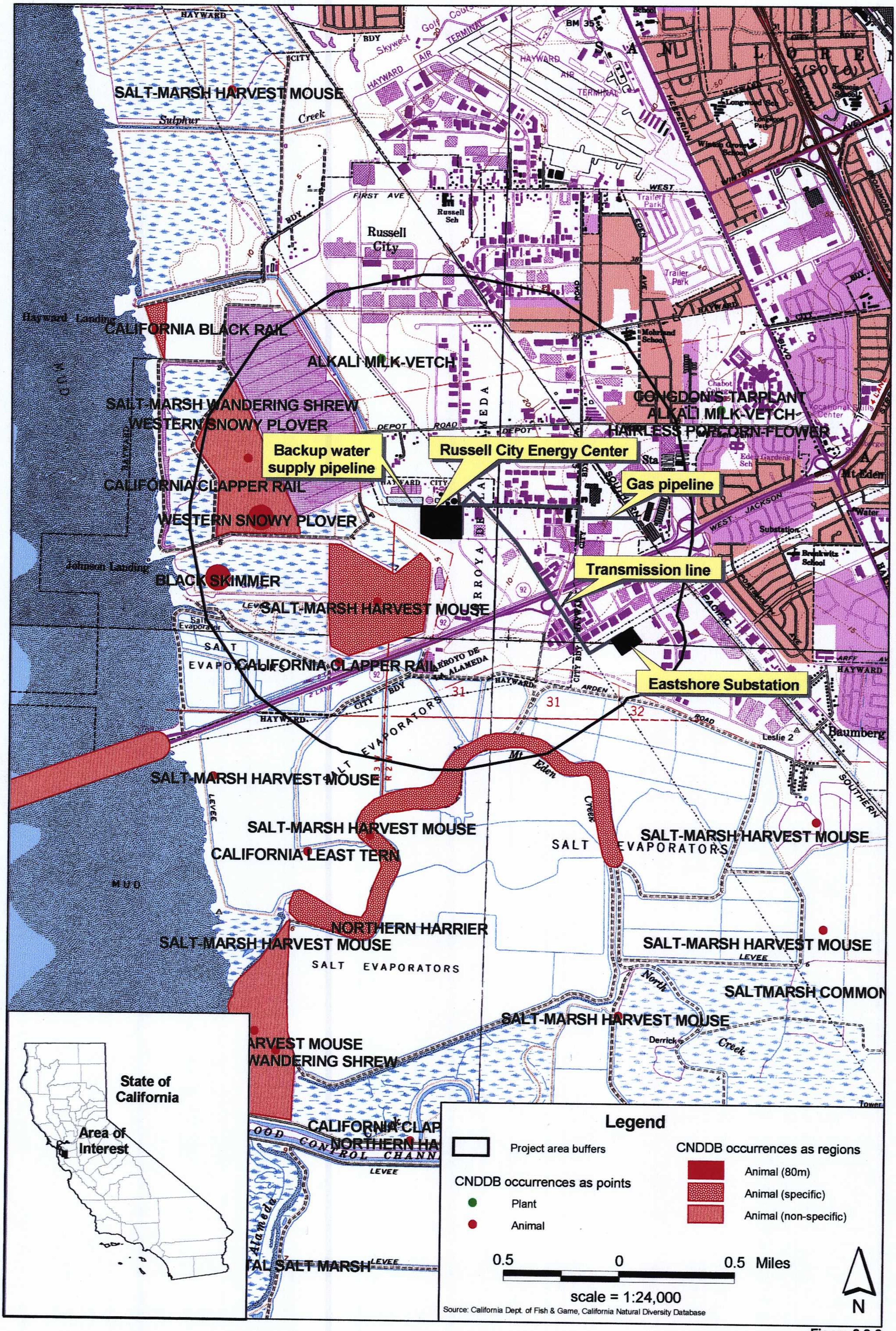


Figure 8.2-2.
Location of special status species records within the RCEC project impact area.

Point Reyes bird's beak (*Cordylanthus maritimus* ssp. *palustris*)

- **Habitat and Biology:** Annual herb; Federal SC and CNPS List 1B; found in coastal salt marshes associated with pickleweed, saltgrass, and jaumea.
- **Blooming:** June to October
- **Range:** Restricted to coastal salt marshes in California and Oregon.
- **CNDDB/RareFind Records:** There are six records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads.
- **Habitat Present in Study Area:** Potential habitat for this species occurs in the salt marsh habitats in Cogswell Marsh and HARD Marsh.

Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*)

- **Habitat and Biology:** Perennial herb; Federal SC, CNPS List 1B; found in brackish marsh (Skinner and Pavlik 1994).
- **Blooming:** May to June
- **Range:** Alameda, Contra Costa, Fresno, Marin, Napa, Sacramento, San Benito, Santa Clara, San Joaquin, and Solano counties.
- **CNDDB/RareFind Records:** There are no records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads.
- **Habitat Present in Study Area:** Potential habitat occurs in brackish/freshwater marshes and sloughs in the western part of the project impact area.

Mason's lilaeopsis (*Lilaeopsis masonii*)

- **Habitat and Biology:** Perennial herb; State R, Federal SC, CNPS List 1B; found in brackish marshes, swamp areas, and riparian scrub (Skinner and Pavlik 1994).
- **Blooming:** April to October
- **Range:** South Sacramento Valley and northeast San Francisco Bay.
- **CNDDB/RareFind Records:** No records on the USGS 7.5-minute San Leandro Quad.
- **Habitat Present in Study Area:** Potential habitat occurs in brackish/freshwater marshes and sloughs in the western part of the project impact area.

Hairless popcorn flower (*Plagiobothrys glaber*)

- **Habitat and Biology:** Annual herb; Federal Endangered and CNPS List 1A; found in meadows, seeps, marshes and swamps. Especially thought to prefer coastal salt marshes and alkaline meadows.
- **Blooming:** April to May
- **Range:** Isolated to alkaline meadows and coastal salt marshes in northern California.
- **CNDDB/RareFind Records:** There are two records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads.
- **Habitat Present in Study Area:** Potential habitat occurs in alkaline soils in the project site.

California seablite (*Suaeda californica*)

- **Habitat and Biology:** Perennial shrub; Federal Endangered and CNPS List 1B; found along margins of coastal salt marshes.
- **Blooming:** July to October
- **Range:** Formerly known from San Francisco Bay area where thought to be extirpated. Currently known from Alameda, San Luis Obispo, and Santa Clara counties.

- **CNDDB/RareFind Records:** There is one record for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads.
- **Habitat Present in Study Area:** Marginal habitat occurs along margins of alkaline soils of Cogswell Marsh and HARD Marsh.

Special Status Wildlife Species

Table 8.2-2 lists the special status wildlife species in the vicinity of the RCEC project components, based on CNDDB/RareFind and USFWS data. Locations of species historically located within 1 mile of the RCEC project components are mapped on Figure 8.2-2. Brief descriptions of special status wildlife species that may occur in the project area are presented below in the following order: mammals, birds, reptiles, amphibians, fish, and invertebrates. Habitat for these species occurs near the project site, but does not occur on the plant site.

Mammals:

Salt-marsh harvest mouse (*Reithrodontomys raviventris*)

- **Habitat and Biology:** Forages on leaves, seeds, and stems of plants that occur in salt marsh habitats. In winter, this species prefers fresh green grasses. Pickleweed and saltgrass are the main food sources (Zeiner 1990). Does not burrow. Builds nests of grass and sedges on the ground.
- **Range:** Restricted to salt marsh habitats around San Francisco Bay.
- **CNDDB/RareFind Records:** There are 24 records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads. Two records occurred within the project vicinity; in the City of Hayward salt marsh southwest of the RCEC plant site, and along Mt. Eden Creek.
- **Nesting/Foraging Habitat Present in Study Area:** Breeding and foraging habitat for this species exists within the salt marsh habitats in Cogswell Marsh, the HARD Marsh, the City of Hayward salt marsh, and Mt. Eden Creek. Brackish marshes and salt evaporating ponds, provide marginal habitat for this species.

Salt-marsh wandering shrew (*Sorex vagrans halicoetes*)

- **Habitat and Biology:** Feeds mainly on invertebrates, insects, worms, snails, slugs, and spiders. Also eats fungi, small mammals, roots, young shoots, and probably seeds. Forages under litter on moist surfaces, underground, and in moist accumulations of dead plant material. Prefers dense litter or ground cover and uses vole runways.
- **Range:** Restricted to salt marsh habitats around San Francisco Bay.
- **CNDDB/RareFind Records:** There are seven records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads. One record occurred within the project vicinity, in the Cogswell Marsh.
- **Nesting/Foraging Habitat Present in Study Area:** Potential habitat for this species occurs in the Cogswell Marsh, the HARD salt marsh, and the City of Hayward Marsh southwest of the project site.

Table 8.2-2. Special status wildlife species evaluated in the RCEC project areas.

Scientific Name	Common Name	Federal/ State[a]	Habitat in impact area?	Source [b]
Mammals				
Corynorhinus townsendii townsendii	Pacific western big eared bat	SC/CSC	No	1
Eumops perotis californicus	Greater western mastiff-bat	SC/CSC	No	1
Myotis evotis	Long eared bat	SC/--	No	1
Myotis thysanodes	Fringed myotis bat	SC/--	No	1
Myotis volans	Long legged myotis bat	SC/--	No	1
Myotis yumanensis	Yuma myotis bat	SC/CSC	No	1
Neotoma fuscipes annectens	San Francisco dusky footed woodrat	SC/CSC	No	1
Reithrodontomys raviventris	Salt-marsh harvest mouse	E/E	Yes	1,2
Sorex vagrans halicoetes	Salt-marsh wandering shrew	SC/CSC	Yes	1,2
Birds				
Accipeter striatus (nesting)	Sharp-shinned hawk	--/SSC	No	2
Agelaius tricolor (nesting colony)	Tricolored blackbird	SC/CSC	No	1,2
Amphispiza belli belli	Bell's sage sparrow	SC/CSC	No	1
Aquila chrysaetos (nesting & wintering)	Golden Eagle	--/SSC	No	2
Ardea herodias (rookery)	Great blue heron	--/--	No	2
Asio flammeus (nesting)	Short-eared owl	--/SSC	No	2
Athene cunicularia hypugea (burrow sites)	Western burrowing owl	SC/CSC	Yes	1,2
Branta canadensis leucopareia	Aleutian Canada goose	T/--	No	1
Buteo regalis	Ferruginous hawk	SC/CSC	Winter foraging	1
Charadrius alexandrinus nivosus (nesting)	Western snowy plover	T/CSC	No	1,2
Circus cyaneus (nesting)	Northern harrier	--/CSC	Yes	2
Elanus leucurus (nesting)	White-tailed kite	--/--	Yes	2
Falco peregrinus anatum	American peregrine falcon	--/E	Yes-foraging	1
Geothlypis trichas sinuosa	Saltmarsh common yellowthroat	SC/CSC	No-foraging	1,2
Haliaeetus leucocephalus	Bald eagle	T/E	No	1,2
Laterallus jamaicensis coturniculus	California black rail	SC/T	No	2
Melospiza melodia pusillula	Alameda song sparrow	SC/CSC	Yes	1
Pelecanus occidentalis californica	California brown pelican	E/E	No	1
Phalacrocorax auritus	Double-crested cormorant	--/SSC	No	2
Rallus longirostris obsoletus	California clapper rail	E/E	No	1,2
Rynchops niger	Black Skimmer	--/SSC	Yes	2
Riparia riparia (nesting)	Bank swallow	--/T	No	2
Sterna antillarum browni (nesting colony)	California least tern	E/E	No	1,2
Reptiles				
Clemmys marmorata marmorata	Northwestern pond turtle	SC/CSC	Marginal	1
Clemmys marmorata pallida	Southwestern pond turtle	SC/CSC	Marginal	1

Table 8.2-2. (continued)

Scientific Name	Common Name	Federal/ State[a]	Habitat in impact area?	Source [b]
Reptiles (cont.)				
Masticophis lateralis euryxanthus	Alameda whipsnake	T/T	No	1,2
Phrynosoma coronatum frontale	California horned lizard	SC/CSC	No	1
Amphibians				
Ambystoma californiense	California tiger salamander	C/CSC	No	1
Rana aurora draytonii	California red legged frog	T/CSC	No	1
Rana boylii	Foothill yellow legged frog	SC/CSC	No	1
Fish				
Hypomesus transpacificus	Delta smelt	T/T	No	1
Oncorhynchus kisutch	Coho salmon	T/E	No	1
Oncorhynchus mykiss *	Central California Valley steelhead	T/E	No	1
Oncorhynchus mykiss *	Central California Coast steelhead	T/E	No	1
Oncorhynchus tshawytscha	Winter run chinook salmon	E/E	No	1
Pogonichthys macrolepotus	Sacramento splittail	PT/CSC	No	1
Spirinchus thaleichthys	Longfin smelt	SC/CSC	No	1
Invertebrates				
Branchinecta lynchi	Vernal pool fairy shrimp	T/--	No	1
Danaus plexippus	Monarch butterfly	--/--	No	2
Hydrochara rickseckeri	Ricksecker's scavenger beetle	SC/--	Marginal	1
Tryonia imitator	Mimic tryonia (California brackishwater snail)	SC/--	Marginal	2

[a] Status Categories:

Federal status determined from the USFWS letter. State status determined from *State and Federally Listed Endangered and Threatened Animals of California* (January 1999) and *Special Animals* (March 1998), prepared by DFG Natural Diversity Data Base. Codes used in table are as follows:

E = Endangered; **T** = Threatened; **R** = California Rare; **PT** = Proposed Threatened

C = Candidate: Taxa for which the USFWS has sufficient biological formation to support a proposal to list as endangered or threatened.

SC = USFWS Species of Concern: Taxa for which existing information may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

SSC = CDFG "Species of Special Concern"

FP = CDFG "Fully Protected"

CNPS List: **1A** = Presumed Extinct in CA; **1B** = Rare or Endangered in CA and elsewhere; **2** = R/E in CA and more common elsewhere; **3** = Need more information; **4** = Plants of limited distribution.

-- = Species not state-listed.

[b] Source: **1** = From USFWS letter (Knight 2001, personal communication). **2** = From CNDDB/ RareFind. **3** = Field observation.

* The *O. mykiss* taxon has an Ecological Significant Unit (ESU) designation, based on genetic isolation resulting from geographic separation.

Birds:

California clapper rail (*Rallus longirostris obsoletus*)

- **Habitat and Biology:** Forages in marsh vegetation, along vegetation and mud flat interface, and along creeks. Along coast, feeds on crab, mussels, clams, snails, insects, spiders, and worms. Will also take mice during high tides. Prefers emergent wetland vegetation dominated by pickleweed and cordgrass, and brackish emergent wetlands dominated by pickleweed, cordgrass, and bulrush. Requires shallow water and mudflats for foraging with adjacent higher vegetation for cover during high water periods.
- **Range:** Locally common year-long in coastal wetlands and brackish areas around San Francisco, Monterey, and Morro bays.
- **CNDDB/RareFind Records:** There are 11 records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads. This species is known to occur in the Cogswell Marsh and the HARD Marsh.
- **Nesting/Foraging Habitat Present in Study Area:** Suitable habitat for this species occurs in the salt marsh and brackish marsh habitats within the study area.

California black rail (*Laterallus jamaicensis coturniculus*)

- **Habitat and Biology:** Occurs most commonly in tidal emergent wetlands dominated by pickleweed, or in brackish marshes supporting bulrushes in association with pickleweed. In freshwater, usually found in bulrushes, cattails, and saltgrass. Usually found in immediate vicinity of tidal sloughs. Typically occurs in high wetland zones near upper limit of tidal flooding, not in low wetland areas with considerable annual and/or daily fluctuations in water levels. During extreme high tides, may depend on upper wetland zone and adjoining upland or freshwater wetland vegetation for cover. Nests are concealed in dense vegetation, often pickleweed, near upper limits of tidal flooding.
- **Range:** Rarely seen, scarce, year-long resident of saline, brackish, and fresh emergent wetlands in the San Francisco Bay area, Sacramento-San Joaquin Delta, at Morro Bay and a few other coastal southern California locations, the Salton Sea area, and the lower Colorado River area.
- **CNDDB/RareFind Records:** There are five records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads. Only one of these records occurred within the project impact area, in the salt marsh near Hayward Landing.
- **Nesting/Foraging Habitat Present in Study Area:** Suitable habitat for this species occurs in the project area in the tidal sloughs in the vicinity of Hayward Landing and Johnson Landing.

Western burrowing owl (*Athene cunicularia hypugea*)

- **Habitat and Biology:** Forages day and night in open dry grassland and desert habitats, and in grass, forb, and open shrub stages of pinyon-juniper and ponderosa pine habitats. Nests in old burrows of ground squirrels or other small mammals. Eats mostly insects; also feeds on small mammals reptiles, birds, and carrion. Short vegetation may increase prey availability, enhance predator detection, and attract burrowing mammals that provide nest sites for burrowing owls. Burrowing owls usually migrate from their nesting site during the winter, but may use their burrow or other burrows as winter shelter. Breeds from March through August. Year-long resident in CA.
- **Range:** Central Valley, Sierra Nevada, and Coast ranges.

- **CNDDB/RareFind Records:** There are eight records for this species on the USGS 7.5-minute Hayward, Newark, Redwood Point, and San Leandro Quads, none of which occurred within the project impact area.
- **Nesting/Foraging Habitat Present in Study Area:** Suitable nesting and foraging habitat for this species occurs in the Project site.

Reptiles:

Northwestern pond turtle (*Clemmys marmorata marmorata*) and Southwestern pond turtle (*Clemmys marmorata pallida*)

- **Habitat and Biology:** Associated with permanent or nearly permanent water in a wide variety of habitat types, normally in ponds, lakes, streams, irrigation ditches or permanent pools along intermittent streams (Zeiner et al. 1988). Eats aquatic plant material, aquatic invertebrates, fish, and frogs (Nussbaum et al. 1983; Stebbins 1985).
- **Range:** Northwestern pond turtles occur throughout northern California west of the Sierra. Nevada (Stebbins 1985). Southwestern pond turtles occur from the San Francisco Bay region, south to northwestern Baja California, chiefly west of the Cascade-Sierran crest (Stebbins 1985).
- **CNDDB/RareFind Records:** There are no records of either subspecies on the USGS 7.5-minute San Leandro Quad.
- **Nesting/Foraging Habitat Present in Study Area:** Suitable breeding and foraging habitat for this species exists within the emergent wetland habitats in the project vicinity.

8.2.1.9 Field Survey Methods

Biological field surveys for the RCEC project were conducted by biologist Brett D. Hartman on February 27 and March 25, 2001, and on April 24, 2001 by Brett D. Hartman and Dean Carrier (qualifications are presented in Appendix 8.2-C). The area surveyed included a 1-mile radius from the Project site, and at least 1,000 feet in each direction from the electric transmission line, natural gas supply pipeline, and wastewater pipeline rights-of-way centerlines. The Eastshore Substation and surrounding vacant land (site of the substation expansion) (Figure 8.2-3 in map pocket) were also surveyed. This section describes the field survey methods used to determine biological resources that could be affected by project activities and the results of those surveys for each of the project areas.

Additional surveys of the RCEC plant and plant AWT site, will be conducted in the late spring and summer of 2001. These surveys will be necessary to identify endangered and threatened flowering plants and migratory bird species that may not be present or readily identifiable in other seasons.

Vegetation

Vegetation surveys included the following tasks:

- Site surveys to determine the type and location of vegetation communities
- Vegetation mapping
- Preparation of plant lists

Activities associated with the special status plant species surveys included the following:

- Consultation with CDFG and USFWS regarding potential occurrence of state- and federally-listed plant species on or near the project area
- Determination of CNPS status of special status plant species using the CNPS electronic inventory (Skinner and Pavlik 1994)

- Determination of habitat preference and flowering times of special status plant species
- Field surveys of the RCEC and AWT plant site, transmission line corridor and substation extension site, natural gas pipeline route, and water supply and wastewater return pipelines, during February and March of 2001.

A list of plant species observed at the project site and linear facilities during 2001 botanical surveys is presented in Table 8.2-3. Due to their bloom time, certain species with potential habitat in the project area of potential effects could not be surveyed during the time in which this AFC was developed.

Additional surveys will be undertaken in June and July to determine whether or not Hispid's birds beak, Point Reyes bird's beak, or Delta tule pea are present in the project area and would be affected by project construction or operation. Of these, Point Reyes bird's beak and Delta tule pea are true salt marsh or brackish marsh species, or species unlikely to occur in more upland situations such as the RCEC power plant and AWT site. Hispid's bird's beak is more likely to be present than Point Reyes bird's beak or Delta tule pea, since this plant's natural habitat consists of alkaline playas and meadows and the project site contains alkaline soils near brackish marsh. Surveys for this plant could take place in June. California seablight also has a post-April blooming period, but is a perennial shrub that is identifiable outside of the blooming period.

Wildlife Surveys

Wildlife surveys for the RCEC project were conducted during the spring of 2001 by biologists Brett D. Hartman and Dean Carrier. Wildlife species were observed in the early morning and late afternoon hours at the project site, the open land belonging to Waste Management Corporation and the City of Hayward stormwater retention basin to the south of the power plant site, the Eastshore Substation and surrounding open land, and along the interpretive trails of the Cogswell Marsh and HARD Marsh. Trapping was not conducted for the salt marsh harvest mouse because of the lack of suitable habitat (pickleweed) on site. Habitat evaluation is the standard method for identifying the likely presence or absence of this species due to the unreliability of trapping as an indicator (Dan Buford, U.S. Fish and Wildlife Service, personal communication, April 30, 2001).

A list of wildlife species observed during surveys of the project site and associated facilities is provided in Table 8.2-4.

Wetland Delineation

A wetland delineation was performed for the RCEC and AWT plant site. Standard methodology as defined in the Corps of Engineers Wetlands Delineation Manual (1987) was used.

Wetland delineation included the following tasks:

- Review of available data on the site, including: National Wetlands Inventory map for the San Leandro quadrangle; Soil Survey of Alameda County, CA, Western Part (1981); and Hayward Shoreline Environmental Enhancement Program (HASPA, 1993)
- Field surveys of the project site on February 28, 2001, and completion of wetland data forms (Appendix 8.2-D)
- Aerial photo interpretation and delineation of wetlands on a 1-foot contour topographic map
- Consultation and field verification of the wetland delineation with Mark DÁvignon of the Army Corps of Engineers, San Francisco District, on April 24, 2001

Table 8.2-3. Plant species observed during botanical surveys for the RCEC project.

Family	Genus	Species/ subspecies/ variety	N/I*	Common name	Power plant and AWT site	Natural Gas & Water Pipelines
DICOTS						
Apiaceae	*Foeniculum*	*vulgare*	I	Fennel		
Asteraceae	*Conyza*	*canadensis*	I	Horseweed	✔	
	Baccharis	*pilularis*	N	Coyote brush	✔	
	Cotula	*coronopifolia*	I	Brassbuttons	✔	
	Grindelia	*Stricta* var. *angustifolia*	N	Gumweed		
	Sonchus	*oleraceus*	I	Common sow thistle	✔	✔
Brassicaceae	*Brassica*	*nigra*	I	Black mustard	✔	✔
Chenopodiaceae	*Chenopodium*	*album*	I	Lamb's quarters		
	Salicornia	*virginica*	N	Pickleweed	✔	
Fabaceae	*Lathyrus*	*Sp.*	N	Wild pea	✔	
Frankeniaceae	*Frankenia*	*salina*	N	Alkali heath	✔	
Geraniaceae	*Geranium*	*molle*	I	Wild geranium	✔	✔
	Erodium	*cicutarium*	I	Filaree	✔	✔
Malvaceae	*Malva*	*nicaeensis*	I	Bull mallow	✔	
Myrtaceae	*Eucalyptus*	*globulus*	I	Blue gum		
Papaveraceae	*Eschscholzia*	*californica*	N	California poppy		
Plantaginaceae	*Plantago*	*lanceolata*	I	English plantain	✔	✔
Polygonaceae	*Rumex*	*crispus*	I	Curly dock	✔	
Primulaceae	*Anagallis*	*arvensis*	I	Scarlet pimpernell		
Solanaceae	*Nicotiana*	*glauca*	I	Tree tobacco		
Urticaceae	*Urtica*	*urens*	I	Dwarf nettle		
MONOCOTS						
Poaceae	*Avena*	*fatua*	I	Wild oat	✔	✔
	Bromus	*diandrus*	I	Ripgut grass	✔	
	Cortadaria	*Sp.*	I	Pampas grass		
	Cynodon	*dactylon*	I	Bermuda grass		✔
	Distichlis	*spicata*	N	Saltgrass	✔	
	Elymus	*sp.*		Wild-rye	✔	
	Hordeum	*murinum* ssp. *leporium*	I	--		
	Lolium	*multiflorum*	I	Italian ryegrass	✔	✔
	Vulpia	*microstachys*	N	Three-week fescue	✔	
Juncaceae	*Scirpus*	*sp.*		Rush		

8.2.1.10 RCEC Plant Site Survey

The project site is bordered on the north by Enterprise Avenue and the City of Hayward Water Pollution Control Facility (or WPCF), on the east by Whitesell Street and the Mag Trucking terminal, on the south by an Alameda County Flood Control District stormwater channel and City of Hayward stormwater retention pond, and on the west by a warehouse and truck terminal/distribution center. Figure 8.2-3 (in map pocket) shows biological resources noted within 1 mile of the plant site and 1,000 feet of the project linear facilities.

Table 8.2-4. Wildlife species observed during 2001 wildlife surveys.

Common Name	Power plant And AWT site	Transmission line	Natural gas pipeline
Alameda song sparrow	✔		
Avocet	✔	✔	✔
Barn swallow	✔		
Black-necked stilt	✔		
Brewer's blackbird	✔	✔	✔
Canada goose	✔		
Common Crow	✔	✔	✔
Common raven	✔	✔	
Cormorant (in flight)	✔		
Killdeer	✔		
Oadwall	✔		
Great egret	✔		
Least sandpiper	✔		
Long-billed dowitcher	✔		
Mallard	✔		
Mourning dove	✔	✔	✔
Northern harrier	✔		
Red-winged blackbird	✔	✔	
Red-tailed hawk	✔		
Rock dove	✔	✔	✔
Ruddy duck	✔	✔	✔
Stacilia	✔		
Turkey vulture			
Western Gull	✔		
Western meadowlark	✔		

Vegetation

The project plant site is dominated by business/industrial development, annual grassland, and seasonal wetland vegetation (in addition to the industrial activities at the Runnels Industries parcel). Table 8.2-5 lists the approximate acreage of habitat types at the plant site. Annual grassland vegetation is dominated by introduced annual grasses such as ripgut brome (*Bromus diandrus*) and Italian wild rye (*Lolium multiflorum*), and ruderal species such as black mustard (*Brassica nigra*), bullmallow (*Malva nicaeensis*), and filaree (*Erodium cicutarium*). Two native grass species are present: three-week fescue

(*Vulpia microstachys*) and wild barley (*Hordeum leporinum*), with coyote brush (*Baccharis pilularis*) along the borders of the property.

Table 8.2-5. Habitat types affected at the Project site.

Habitat type	Acres
Open industrial lot (Runnels Industries)	3.6
Grassland/ruderal areas	9.4
Wetland vegetation	1.7
Totals	**14.7**

Seasonal wetland vegetation on the project site is dominated by salt-tolerant species such as saltgrass (*Distichlis spicata*) and alkalai heath (*Frankenia salina*), with curly dock (*Rumex crispus*), Italian ryegrass (*Lolium multiflorum*), wildrye (*Leymus* sp.) and spikerush (*Eleocharis* sp.) as associates. The City of Hayward's stormwater retention pond, located southwest of the project site, is dominated by pickleweed (*Salicornia virginica*) and brass buttons (*Cotula coronopifolia*), intermixed with uplands dominated by Italian ryegrass (*Lolium multiflorum*) and other ruderal species.

Wildlife

Wildlife species observed foraging at the Project site and adjacent stormwater retention pond included Canada geese, red-winged blackbirds, western gulls, mallards, and least sandpipers. Black-tailed jackrabbits and ground squirrel burrows and runs were noted, with several apparently unoccupied burrow holes in the embankment to Enterprise Avenue on the northern end of the property. No burrowing owls were observed during surveys nor was there evidence of burrowing owl activity at the burrow sites. No mounds suitable for burrowing owl use were found elsewhere on the property.

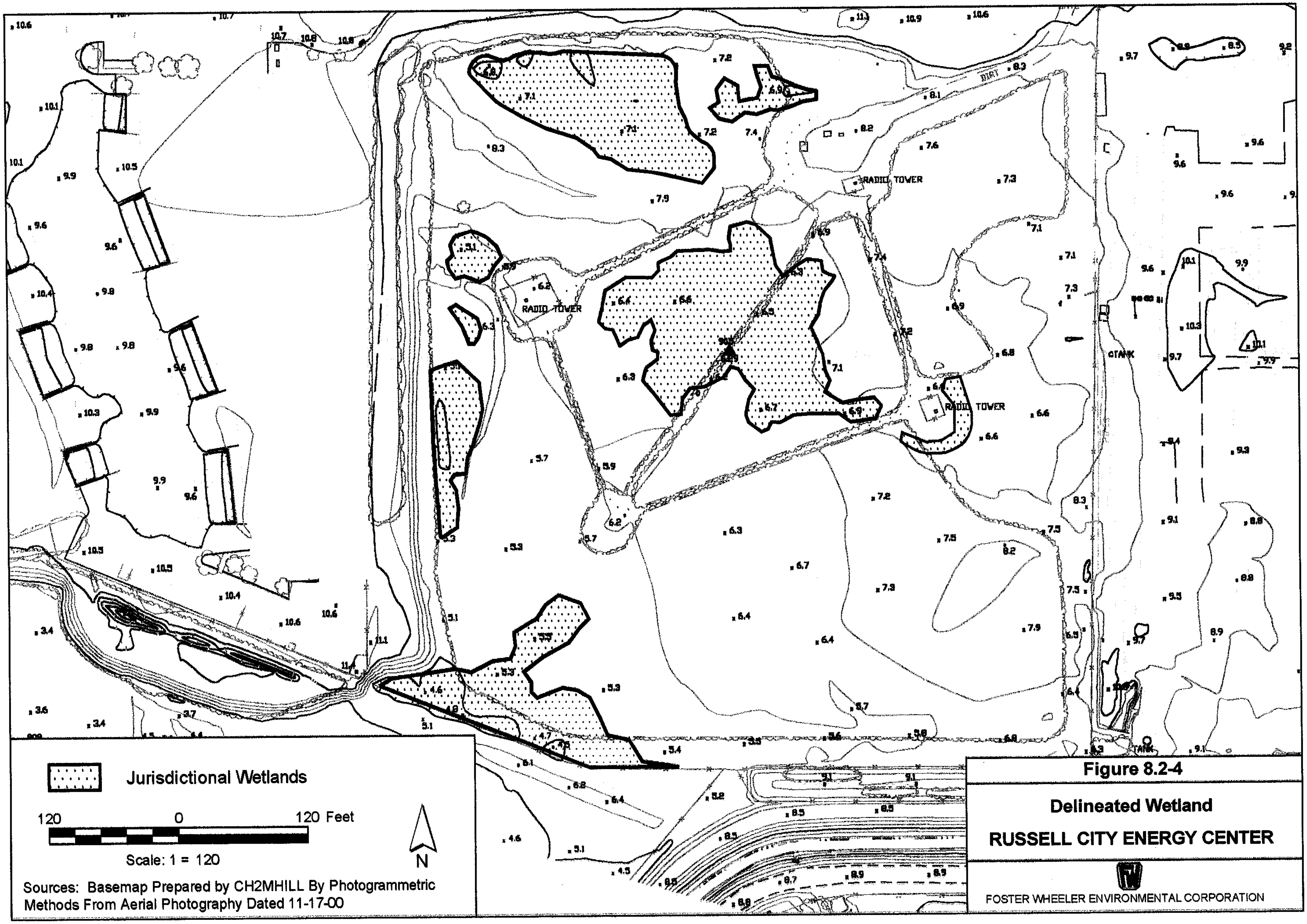
Wetlands

The project site is mapped as palustrine, emergent, temporarily flooded, diked/impounded wetland. The soils are mapped as Reyes Clay, drained. These are very deep, poorly drained soils on tidal flats. The water table has been lowered to a depth of about four feet. There are eight small ponded areas that meet the soils, hydrology, and vegetation criteria of jurisdictional wetlands (subject to Corps of Engineers regulation under the Clean Water Act). However, field surveys revealed that substantial portions of the property have been filled, or are Willows Clay, drained. These are very deep, poorly drained soils on basin rims. These upland areas did not meet the criteria to be classed as wetlands. Figure 8.2-4 shows a wetland delineation of the RCEC and AWT project site. Wetlands were found in eight separate areas that totaled 1.68 acres. The U.S. Army Corps of Engineers, San Francisco District, verified the wetland delineation conducted for the property in the field on April 24, 2001.

The stormwater retention pond near the project site to the south, while cut off from tidal influence, retains remnant elements of the transitional zone between the northern coastal salt marsh community and adjacent uplands. The area is characterized by small mud flats intermixed with upland areas dominated by ruderal species. Hydrologic inputs to the system include overflow from the Alameda Flood Control channel that runs south of the site, and runoff from the Project site.

Electric Transmission Line and Eastshore Substation Expansion

The electric transmission line corridor traverses urban areas and parking lots for most of the route and will not affect biological or wetland resources. The substation is located in a lot dominated by ruderal



Jurisdictional Wetlands

120 0 120 Feet

Scale: 1 = 120

N

Sources: Basemap Prepared by CH2MHILL By Photogrammetric Methods From Aerial Photography Dated 11-17-00

Figure 8.2-4

Delineated Wetland

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FOSTER WHEELER ENVIRONMENTAL CORPORATION

species. Ruderal vegetation includes non-native species that colonize disturbed areas, including disturbed margins around salt marsh habitats. Ruderal species include annual non-native species such as wild oat (*Avena fatua*), ripgut grass (*Bromus diandrus*), Italian rye grass (*Lolium multiflorum*), and tarplant (*Hemizonia* sp.).

Natural Gas Pipeline

The natural gas transmission line corridor runs in Enterprise Avenue, crosses Clawiter Road, and then runs in a gravel-covered right-of-way through the Berkeley Farms facility. There are no biological or wetland resources located along this route.

Wastewater Return Pipeline

The proposed pipeline will be installed within Enterprise Avenue and will not affect biological or wetland resources. This area is dominated by horticultural trees and shrubs, and ruderal vegetation. Ruderal species include annual non-native species such as wild oat (*Avena fatua*), ripgut grass (*Bromus diandrus*), and Italian rye grass (*Lolium multiflorum*).

Construction Laydown and Worker Parking Areas

Two of the proposed construction laydown areas are currently truck parking terminals with little or vegetation or wildlife habitat. As mentioned above, the open land surrounding the Eastshore substation dominated by ruderal species. Ruderal vegetation includes non-native species that colonize disturbed areas, including disturbed margins around salt marsh habitats. Ruderal species include annual non-native species such as wild oat (*Avena fatua*), ripgut grass (*Bromus diandrus*), Italian rye grass (*Lolium multiflorum*), and tarplant (*Hemizonia* sp.).

8.2.1.11 AWT Plant Site Survey

The AWT plant will be situated adjacent to the RCEC plant site and consists of the same types of vegetation, wildlife, and wetlands habitats. Impacts to these biological resources are the same as those projected for the RCEC plant site.

8.2.2 Environmental Consequences

8.2.2.1 Significance Criteria

Potential direct and indirect project impacts to biological resources associated with construction, operation, and maintenance of the RCEC were evaluated. An impact would be considered significant if it resulted in the take of a listed species or its habitat; resulted in take of sensitive species or its habitat that jeopardized its viability, either locally or range-wide; or resulted in loss of species or populations necessary to maintain current distribution.

8.2.2.2 RCEC Plant Site

Construction of the RCEC footprint will result in the permanent loss of approximately 9.4 acres of disturbed ruderal vegetation and approximately 1.68 acres of jurisdictional wetlands (Table 8.2-5). No special status plant species were found at the RCEC plant site and none will be affected by construction of the plant. Construction of this project will likely result in the loss of individuals of several wildlife species occupying this site or dependent upon this site for specific physiological and ecological requirements. However, these species have no special protection status, are common to many areas, and are primarily limited to burrowing rodents (i.e., ground squirrel [*Spermophylus* sp.], pocket gophers [*Thomomys* sp.] and voles [*Microtis* sp.]). Due to the existing level of traffic on Enterprise Avenue, and the low level of wildlife use in this highly urbanized area, construction traffic is not expected to result in increased wildlife road kills. Noise and activity from construction activities will have a negligible and temporary effect on wildlife use of this area.

Electric Transmission Line and Eastshore Substation Expansion

Upgrading of the electric transmission line is not expected to have a significant effect on biological or wetland resources. The project would involve constructing new transmission support towers and adding new conductors. The 1.1-mile route traverses existing areas within the Hayward Industrial Corridor.

Natural Gas Pipeline

Construction of the natural gas pipeline is not expected to result in any significant and long-term effects on biological resources. The pipeline route runs in Enterprise Avenue and under a graveled pipeline right-of-way on the Berkeley Farms property.

Wastewater Return Pipeline

Construction of the wastewater return line would not result in any significant and long-term effects on biological resources. This pipeline runs approximately 260 feet across Enterprise Avenue from the RCEC power plant site under existing paved streets.

Construction Laydown and Worker Parking Areas

Construction laydown and worker parking would not have significant effects on biological or wetland resources, since the trucking terminals on Depot and Enterprise are devoid of vegetation and the open land surrounding the Eastshore Substation consists of ruderal vegetation and does not contain wetlands or biological resources.

AWT Plant

The same impacts projected for the RCEC plant site also apply to the AWT plant. The backup water cooling supply pipeline runs in the WPCF's access pad, and would not affect biological resources. Other pipelines to and from the AWT (water supply, RO waste, microfiltration waste, and stormwater runoff), also run under paved areas.

8.2.2.3 Operation Phase Impacts

RCEC Plant Site

Once constructed and operational, the facility will have a minimal effect on wildlife resources in the area. Trees and shrubs planted for landscape screening around the RCEC, and the RCEC architectural treatment structures themselves, could provide perching or nesting sites for raptorial birds (hawks and falcons) and egg predators (crows and ravens). These could, in turn, use the facility as a base for predation against sensitive species living nearby (such as salt marsh harvest mouse, least tern, etc.). This potential effect could be easily controlled, however, by limiting trees planted to smaller species or species that do not provide strong support for large nests, and by installing devices on possible perching places at the power plant (for example, on the architectural screen) that would discourage raptorial birds from perching.

Operation of the RCEC would produce some noise, as described in Section 8.7 (Noise). Due to the close proximity of existing industrial plants, city streets, and railroad tracks, the noise generated during operation of the RCEC facility is not expected to boost noise levels to a degree that would significantly affect wildlife in the vicinity of the plant. Current noise levels at the site are well above those of more isolated examples of natural salt marsh, yet species appear to have habituated to it. Elimination of some current facilities causing noise (i.e., the sand-blasting operation) may compensate somewhat for increased noise from the facility itself.

Human activity at the facility should have no significant affect on the adjacent salt marsh habitats as long as screening is provided. Lighting would be designed to reduce glare (Section 8.13, Visual Resources).

Electric Transmission Line and Eastshore Substation Expansion

Potential effects of additional electric transmission conductors on bird species utilizing this area could include collision and electrocution. These effects would likely continue throughout the life of the facility. There is no evidence, however, that this is currently a significant problem or that additional conductors on an existing transmission line would increase mortality to a level of significance. Bird collisions with electric conducting wires occur when the birds are unable to see the lines, especially during fog and rain events, and if flushed suddenly from the ground. Factors that affect the risk of collision include weather conditions, behavior of the species of bird, and location of the line. The transmission line that will be upgraded is currently almost entirely located in an urban, developed area.

Natural Gas Pipeline

Operation of the gas pipeline would not result in impacts to special status plants, animals, or wetlands unless a leak occurred. A rupture or leakage of the pipeline could result in reduced air quality and, in severe cases, a fire, but any potential effects on native vegetation or wildlife, would be temporary.

Wastewater Return Pipeline

Operation and maintenance of the wastewater return line would not affect biological resources. This pipeline runs approximately 260 feet across Enterprise Avenue from the RCEC under existing paved streets.

Construction Laydown and Worker Parking Areas

Construction laydown and worker parking areas would return to their pre-construction uses after construction is completed. Hence, there would be no operation impacts.

AWT Plant

Once constructed and operational, the facility will have a minimal effect on biological resources in the area.

8.2.2.4 Potential Stack Emission Effects on Soil and Vegetation

Emissions from the HRSG stacks and cooling tower drift will not significantly affect vegetation and soils surrounding the RCEC project area. The following paragraphs present the results of an analysis of the HRSG stack and cooling tower emissions for the RCEC project. The AWT plant will not produce any emissions of concern.

The purpose of this analysis is to evaluate the potential detrimental effects that the projected HRSG stack and cooling tower emissions from the RCEC plant site will have on surrounding vegetation. Potential pollutant stack emissions included in this analysis include carbon monoxide (CO), inhalable particulates (PM_{10}), and oxides of nitrogen and sulfur (NO_X and SO_2). No pollutant emissions are predicted to result in concentrations exceeding the U.S. Environmental Protection Agency (USEPA) prevention of significant deterioration (PSD) significant impact levels, for either short-term or annual averaging periods for CO, PM_{10}, NO_X, and SO_2. Table 8.2-6 presents the total maximum impact concentrations for the RCEC project, as discussed in Section 8.1 (Air Quality).

Table 8.2-6. RCEC operational effects from HRSG stack and cooling tower emissions.

Pollutant	Averaging Period	Maximum Project Concentration[1] (μg/m³)	State Ambient Air Quality Standards (μg/m)
CO	1-hour	7671	23,000
	8-hour	3847	10,000
NO_X	1-hour	376	470
	Annual	42	100
SO_2	1-hour	125	650
	3-hour	56	1,300
	24-hour	19	109
	Annual	5.3	80
PM_{10}	24-hour	92	50
	Annual	24.5	30

[1]Maximum project concentrations include representative background concentrations
μg/m³ = micrograms per cubic meter

Carbon Monoxide

Plants metabolize and produce carbon monoxide (CO). Few studies on thresholds for detrimental effects on vegetation have been conducted. Most available studies use very high CO concentrations (above 100 parts per million [ppm]). Soil microorganisms probably acts as a buffering system and sink for CO. There are no known detrimental effects on plants due to CO concentrations of 10,000 to 230,000 μg/m³ (USEPA 1979).

Zimmerman et al. (1989) exposed a variety of plant species to CO at concentrations of 115,000 μg/m³ to 11,500,000 μg/m³ from 4 to 23 days. While practically no growth retardation was noted in plants exposed at the lower level, retarded stem elongation and leaf deformation were observed at the higher concentrations. Pea and bean seedlings also exhibited abnormal leaf formation after exposure to CO at 27,000 μg/m³ for several days (USEPA 1979).

Comparatively low levels of CO in the soil have been shown to inhibit nitrogen fixation. Concentrations of 113,000 μg/m³ have been shown to reduce nitrogen fixation, while 572,000 to 1,142,000 μg/m³ result in nearly complete inhibition (USEPA 1979).

Maximum predicted 1-hour and 8-hour CO emissions have been calculated from the RCEC HRSG exhaust stack. The maximum 1-hour CO concentration is 1231 μg/m³. Adding this impact to the maximum 1-hour CO background concentration of 6440 μg/m³, measured at the nearest monitoring station results in a total predicted 1-hour CO concentration of 7671μg/m³. This figure is significantly less than the CO concentration of 115,000 μg/m³ determined to result in minimal growth retardation in plants, as well as the 113,000 μg/m³ concentration found to result in slight reduction of nitrogen fixation. Therefore, predicted CO emission levels from the RCEC are not expected to result in adverse effects on vegetation.

Sulfur Dioxide and Nitrogen Oxides

SO_2 and NO_x are the major airborne pollutants of concern for the RCEC project. The extent of their effect on soils and vegetation would be directly related to a variety of factors, including wind speed, direction and frequency, air temperature, humidity, the geomorphology of the area, and the location of the proposed project in relation to sensitive plant communities in the zone of impact.

Sulfur dioxide tends to convert to sulfite and sulfate during chemical transformation in soils. Interpretation of the results of investigations published to date has engendered considerable controversy due to the complexity of terrestrial ecosystems. However, the effects of acidified precipitation containing sulfate (SO_4) on terrestrial ecosystems have been investigated with respect to alteration of soil chemistry as it relates to vegetation health. High levels of SO_4 may reduce soil pH, thereby decreasing the availability of certain essential nutrients and increasing the concentrations of soluble aluminum, which reduces plant growth.

In soils where nitrate-nitrogen is not limiting plant growth, excess nitrate may percolate through the soil column, carrying base cations and exerting an acidifying effect. Increased atmospheric contributions of nitrate may influence vegetation in a species-specific way, with some species taking advantage of its fertilizing characteristics while others (such as those occurring in nitrogen-limited soils) are adversely affected.

Sulfur is a major plant nutrient and can be directly absorbed into the soil. Therefore, an increase in SO_2 in the soil (particularly at levels below threshold limits) would not have an adverse effect on vegetation.

SO_2 can affect vegetation directly (as a gas) or indirectly by means of its principal reaction product, SO_4 (e.g., acidification of soils). In addition, a third mechanism of impact is the formation of acid mist. Direct effects of injury can be manifested as foliar necrosis, decreased rates of growth or yield, predisposition to disease, and reduced reproductive capacity.

Environmental factors, such as temperature, light, humidity, and wind speed, influence both the rate of gas absorption and the plant physiological response to absorbed quantities. The higher the humidity, the higher the absorption of gases. Exposure duration and frequency are also important factors that determine the extent of injuries.

Guidelines for air emission impact assessment provided in the technical literature are diverse and threshold dosages required to cause injury are extremely variable. This is due to the variety of factors affecting plant responses to phytotoxic gases. Consequently, in cases where emissions are below lower threshold limits, decreased yields can result in the absence of visible injury (Sprugel et al. 1980) and long-term impacts should be addressed.

Among the different published attempts to define SO_2 thresholds for vegetation effects, two represent worst-case situations. Loucks et al. (1980) presented threshold ranges between 131 $\mu g/m^3$ and 262 $\mu g/m^3$ SO_2, and McLaughlin (1981) suggested values of 1310 $\mu g/m^3$ SO_2 for the 1-hour average and 786 $\mu g/m^3$ for the 3-hour average.

According to the dose-injury curve for SO_2-sensitive plant species provided by the USFWS (1978), the lowest 3-hour concentration expected to cause injury to plants is approximately 390 $\mu g/m^3$, which is significantly higher than the projected emissions from the RCEC. However, these predicted values are applicable only when plants are growing under the most sensitive environmental conditions and stage of maturity. Thresholds for chronic plant injury by SO_2 have been estimated at about 130 $\mu g/m^3$ on an annual average (USFWS 1978). The maximum annual average concentration modeled for this project (0.02 $\mu g/m^3$) is far below the USFWS threshold for chronic exposure, and the worst-case projected 3-hour maximum of about 3.67 $\mu g/m^3$ is substantially below the McLaughlin protection level of 786 $\mu g/m^3$. Consequently, the projected concentration of SO_2 is not expected to cause visible foliar injury or significant adverse chronic effects.

Nitrogen dioxide is potentially phytotoxic, but generally at exposures considerably higher than those resulting from most industrial emissions. Exposures for several weeks at concentrations of 280 to 490 $\mu g/m^3$ can cause decreases in dry weight and leaf area, but 1-hour exposures of at least 18,000 $\mu g/m^3$ are required to cause leaf damage. The modeled maximum RCEC emissions of NO_2 impacts of 0.36 $\mu g/m^3$ are far below these threshold limits (219.0 $\mu g/m^3$ or 0.1169 ppm). In addition, the total predicted maximum 1-hour NO_2 concentrations of 169 $\mu g/m^3$ would be significantly less than the 1-hour threshold (7,500 $\mu g/m^3$ or 3,989 ppm) for 5 percent foliar injury to sensitive vegetation (USEPA 1991). This indicates that NO_X emissions from the RCEC, when considered in the absence of other air pollutants, would not adversely affect vegetation.

Airborne Particulates

Particulate emissions will be controlled by inlet air filtration and use of natural gas. The deposition of airborne particulates (PM_{10}) can affect vegetation through either physical or chemical mechanisms. Physical mechanisms include the blocking of stomata so that normal gas exchange is impaired, as well as potential effects on leaf adsorption and reflectance of solar radiation. Information on physical effects is scarce, presumably in part because such effects are slight or not obvious except under extreme situations (Lodge et al. 1981). Studies performed by Lerman and Darley (1975) found that particulate deposition rates of 365 g/m^2/year caused damage to fir trees, but rates of 274 g/m^2/year and 400-600 g/m^2/year did not damage vegetation at other sites.

The maximum annual predicted concentration for PM_{10} from the RCEC is 0.22 $\mu g/m^3$. Assuming a deposition velocity of 2 cm/sec (worst-case deposition velocity, as recommended by the California Air Resources Board [CARB]), this concentration converts to an annual deposition rate of 0.14 g/m^2/year, which is several orders of magnitude below that which is expected to result in injury to vegetation (i.e., 365 g/m^2/year). The addition of the maximum predicted annual particulate deposition rate for the RCEC to the maximum background concentration of 24.3 $\mu g/m^3$, measured at the nearest monitoring station yields a total estimated particulate deposition rate of 15.5 g/m^2/year, utilizing the 2 cm/sec factor. This total is still approximately one order of magnitude less than levels expected to result in plant injury.

The primary chemical mechanism for airborne particulates to cause injury to vegetation is by trace element toxicity. Many factors may influence the effects of trace elements on vegetation, including temperature, precipitation, soil type, and plant species (USFWS 1978). Trace elements adsorbed to particulates emitted from power plant emissions reach the soil through direct deposition, the washing of plant surfaces by rainfall, and the decomposition of leaf litter. Ultimately, the potential toxicity of trace elements that reach the root zone through leaching will be dependent on whether the element is in a form readily available to plants. This availability is controlled in part by the soil cation exchange capacity, which is determined by soil texture, organic matter content, and kind of clay present. Soil pH is also an important influence on cation exchange capacity; in acidic soils, the more mobile, lower valence forms of trace metals usually predominate over less mobile, higher valence forms. The silty clay and clay soils located in the RCEC project area will have a lower potential for trace element toxicity due to the comparatively high soil pH commonly found in bay soils.

Perhaps the most important consideration in determining toxicity of trace elements to plants relates to existing concentrations in the soil. Several studies have been conducted relating endogenous trace element concentrations to the effects on biota of emissions from model power plants (Dvorak et al. 1977, Dvorak and Pentecost et al. 1977, Vaughan et al. 1975). These studies revealed that the predicted levels of particulate deposition for the area surrounding the model plant resulted in additions of trace elements to the soil over the operating life of the plant which were, in most cases, less than 10 percent of the total existing levels. Therefore, uptake by vegetation could not increase dramatically unless the forms of deposited trace elements were considerably more available than normal elements present in the soil.

Cooling Tower Discharges

Contaminants within the RCEC cooling tower drift are expected to consist almost entirely of the minerals that are not removed by the AWT process. Metals and other chemicals of concern will be neutralized and removed from the cooling tower makeup water before it is introduced into the plant cooling water system.

PM_{10} emissions from the HRSG stacks and cooling towers were calculated for the RCEC. The maximum annual deposition rate for the RCEC of 0.14 g/m^2/year is several magnitudes below that which is expected to result in mechanical injury to vegetation (i.e., 365 g/m^2/year; see previous discussion on airborne particulates; Lerman and Darley 1975).

Various salts from cooling water and the pH neutralizing process (Table 8.15-3) are expected to be in the cooling tower water. These low levels of salts are not expected to result in injury to the surrounding environment. Pahwa and Shipley (1979) exposed vegetation (corn, tobacco, and soybeans) to varying salt deposition rates to simulate drift from cooling towers that use saltwater (20-25 parts per thousand) circulation. Salt stress symptoms on the most sensitive crop plants (soybeans) were barely perceptible at a deposition rate of 2.98 g/m^2/year (Pawha and Shipley 1979). Using an assumption that 100 percent of the airborne particulates from the RCEC emissions produce salts in the cooling tower drift, the calculated deposition rate of 0.14 g/m^2/year (which includes HRSG stack emissions) is more than one order of magnitude below the deposition rate that was shown to cause barely perceptible vegetation stress from salt mist. This highly conservative estimate of deposition and the fact that the RCEC cooling tower will use fresh water makes this evaluation much overstated. Therefore, cooling tower drift is not expected to have any impact on vegetation in surrounding habitats within the maximum impact radius for the RCEC cooling tower drift.

8.2.2.5 Wastewater Discharges

When the plant is operating at full capacity, approximately 3.33 million gallons of secondary effluent wastewater per day will be pumped through the cooling water supply pipeline from the City of Hayward Water Pollution Control Facility and treated to tertiary quality in the AWT. Almost half of the water eventually ends up in the cooling tower effluent. Effluent from the cooling tower blowdown will returned to the Water Pollution Control Facility via the wastewater return pipeline. During normal operating conditions, the RCEC will discharge 53 gallons per minute (0.076 million gallons per day) and at peak conditions, approximately 66 gallons per minute (0.095 million gallons per day) will be discharged to the wastewater return pipeline. The City of Hayward discharges this effluent through the East Bay Dischargers Authority (EBDA) pipeline to the EBDA outfall in San Francisco Bay near the Oakland Airport. The RCEC project thus provides a net benefit to water quality in San Francisco Bay by reducing the amount of freshwater effluent discharged to the Bay, without increasing the pollutant loading of the water discharged.

8.2.3 Cumulative Impacts

The RCEC project would not result in significant cumulative effects on special status plants, natural plant communities, wetlands, or wildlife. Though the project would result in a permanent loss of 1.68 acres of seasonal wetlands, this loss would be mitigated by replacement or enhancement of equal or larger quantity of better quality wetlands in the general project area, a net benefit to the environment. There would be no permanent loss of special status plants or sensitive wildlife habitats. As a result, the project is not expected to result in any significant cumulative impacts to biological resources.

8.2.4 Proposed Mitigation Measures

The following mitigation measures would ensure that any potentially significant project environmental impacts to biological resources would be mitigated below the threshold of significance.

- The project will require an individual permit from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act, to fill the 1.68-acres of seasonal wetlands on site. The permit application will include a mitigation plan that identifies how the seasonal wetlands will be replaced in kind, either through a mitigation bank, by purchase of wetland property and dedication of a conservation easement for that property, or by support of wetland and wildlife habitat restoration efforts in the project area. The mitigation plan will be developed in consultation with the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and San Francisco Bay Regional Water Resources Control Board.
- Wetlands adjacent to the construction site (the parcels south of the RCEC site) will be avoided. A Stormwater Pollution Prevention Plan (SWPPP) will be developed to ensure sediment from the project site does harm not any adjacent wetland areas. Mitigation measures in the SWPPP will include the implementation of silt fence and other sediment control measures, and temporary fencing to ensure entry into sensitive salt marsh communities is avoided. This will be especially important on the southern boundary of the project construction area. Temporary fencing will be implemented to ensure entry into sensitive salt marsh areas south of the project site or other wildlife habitats is avoided.
- Monitoring of construction activities will be carried out by personnel trained to detect any potential and unforeseen impacts on listed, sensitive, or migratory wildlife and their habitats adjacent to the project site. If actual or potential effects are detected, the construction foreman will cease the activities that are potentially affecting these species and will consult with a professional biologist qualified to assess the situation and make recommendations to alter or alleviate any activities that are resulting in these effects.

Project biologists will conduct additional field surveys in June for the Hispid's birds beak, Point Reyes bird's beak, and Delta tule pea. In the event that these plants are identified on site during their blooming phases, additional consultation with regulatory agencies and mitigation planning will be undertaken to ensure that any potential impact to these species is mitigated to a level below significance.

8.2.5 Applicable Laws, Ordinances, Regulations, and Standards

Table 8.2-7 describes the applicable laws, ordinances, regulations, and standards (LORS) pertaining to biological resources for the RCEC project.

Table 8.2-7. Laws, ordinances, regulations, and standards.

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
Federal					
Endangered Species Act of 1973 and implementing regulations, Title 16 United States Code (USC) §1531 et seq. (16 USC 1531 et seq.), Title 50 Code of Federal Regulations (CFR) §17.1 et seq. (50 CFR 17.1 et seq.).	Designates and protects federally threatened and endangered plants and animals and their critical habitat.	USFWS and NMFS	Issues letter of concurrence after review of mitigation measures. Issues Biological Opinion (BO) with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction. Section 7 consultation may not be required.	Figure 8.2-1a & b 8.2.1.2 8.2.1.4 Table 8.2-1 8.2.2.2 8.2.5.2
Section 7 of Fish and Wildlife Coordinating Act, 16 USC 742 et seq., 16 USC 1531 et seq., and 50 CFR 17.	Requires consultation if any project facilities could jeopardize the continued existence of an endangered species. Applicability depends on federal jurisdiction over some aspect of the project.	USFWS	Issues BO with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	8.2.1.4 8.2.5.2
Section 10(1)(A) of the ESA	Requires a permit to "take" threatened or endangered species during lawful project activities. If no federal nexus for project, a Habitat Conservation Plan (HCP) may be necessary.	USFWS	USFWS issues a Section 10(1)(A) Federal Fish and Wildlife Permit and/or HCP approval.	N/A	8.2.2.1 8.2.5.2
Section 404 of Clean Water Act of 1977 (33 USC 1251 et seq., 33 CFR §§320 and 323).	Gives the USACE authority to regulate discharges of dredge or fill material into waters of the United States, including wetlands.	USACE	Individual permit to fill wetlands adjacent to tidal waters on the RCEC project site.	PCNs to be developed describing the project and wetland mitigation measures, permits to be obtained before construction in wetlands.	8.2.2.1 8.2.2.2 8.2.3.1 8.2.5.2

Table 8.2-7. (continued)

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
Section 401 of Clean Water Act of 1977.	Requires the applicant to conduct water quality impact analysis for the project when using 404 permits and for discharges to waterways.	CRWQCB	Water Quality Certification	Water quality analysis currently being conducted, Certification to be obtained before construction begins in 2002.	8.2.3.1 8.2.5.2
Migratory Bird Treaty Act 16 USC §§703-711.	Prohibits the non-permitted take of migratory birds.	USFWS and CDFG	Issues BO with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	8.2.1.2 8.2.2.2 8.2.2.3 8.2.2.4 8.2.3.3 8.2.5.2
State					
California Endangered Species Act of 1984, Fish and Game Code, §2050 through §2098.	Protects California's endangered and threatened species.	CDFG	Issues letter of concurrence after review of mitigation measures. Issues BO with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	Figure 8.2-1a & b 8.2.1.2 8.2.1.4 8.2.2.2 8.2.5.2
Title 14, California Code of Regulations (CCR) §§670.2 and 670.5.	Lists plants and animals of California declared to be threatened or endangered.	CDFG	Issues BO with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	8.2.1.4 Table 8.2-1

Table 8.2-7. (continued)

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
Fish and Game Code Fully Protected Species. §3511: Fully Protected birds §4700: Fully Protected mammals §5050: Fully Protected reptiles and amphibians §5515: Fully Protected fishes	Prohibits the taking of listed plants and animals that are Fully Protected in California.	CDFG	Issues BO with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	Figure 8.2-1a & b 8.2.1.2 8.2.1.4 8.2.2.2 8.2.5.2
Fish and Game Code §1930, Significant Natural Areas.	Designates certain areas such as refuges, natural sloughs, riparian areas, and vernal pools as significant wildlife habitats. Listed in the CNDDB.	CDFG	Issues BO with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	8.2.1 Figure 8.2-1a & b 8.2.1.1 8.2.1.2 8.2.1.4 Figure 8.2-4 8.2.2.2 8.2.2.3
Fish and Game Code §1580, Designated Ecological Reserves.	The CDFG commission designates land and water areas as significant wildlife habitats to be preserved in natural condition for the general public to observe and study.	CDFG	Issues BO with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	Figure 8.2-1a & b 8.2.2.3

Table 8.2-7. (continued)

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
Fish and Game Code §1600, Streambed Alteration Agreement.	Reviews projects for impacts on waterways, including impacts to vegetation and wildlife from sediment, diversions, and other disturbances.	CDFG	Issues conditions of the Streambed Alteration Agreement that reduces and minimizes effects on vegetation and wildlife.	Streambed Alteration Agreement needed only if project impacts banks of waterways during construction.	8.2.2.3
Native Plant Protection Act of 1977, Fish and Game Code, §1900 et seq.	Designates state rare and endangered plants and provides specific protection measures for identified populations.	CDFG	Reviews mitigation options if there will be significant project effects on threatened or endangered plant species.	Mitigation measures being prepared for review by agencies. Letter of concurrence to be obtained before construction.	Figure 8.2-1a & b 8.2.1.4 8.2.2.3 8.2.3.2
CDFG Policies and Guidelines, Wetlands Resources Policy.	Provides for the protection, preservation, restoration, enhancement, and expansion of wetland habitats in California, including vernal pools.	CDFG California Environmental Protection Agency (Cal/EPA) CRWQCB	Reviews 404 permit application and wetland mitigation measures for compliance.	PCNs to be developed that include wetland mitigation measures. 404 permit to be obtained before start of construction.	8.2.2.2 8.2.5.2
Public Resource Code §§25500 & 25527.	Siting of facilities in certain areas of critical concern for biological resources, such as ecological preserves, wildlife refuges, estuaries, and unique or irreplaceable wildlife habitats of scientific or educational value, is prohibited, or when no alternative, strict criteria is applied.	USFWS CDFG	Issues BO with Conditions after review of BA.	Applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	8.2.1.2 8.2.2.3 8.2.3.2

Table 8.2-7. (continued)

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
Title 20 CCR §§1702 (q) and (v).	Protects "areas of critical concern" and "species of special concern" identified by local, state, or federal resource agencies within the project area, including the CNPS.	USFWS CDFG	Issues BO with Conditions after review of BA.	Consultant to applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	Figure 8.2-1a & b 8.2.1.2 8.2.1.4 Table 8.2-1 8.2.3.1 8.2.5
Title 14 CCR Section 15000 et seq.	Describes the types and extent of information required to evaluate the effects of a proposed project on biological resources of a project site.	USFWS CDFG	Issues BO with Conditions after review of BA.	Consultant to applicant currently engaged in informal consultation with USFWS. Letter of concurrence will be obtained prior to construction.	8.2.2.1 8.2.2.3 8.2.5

8.2.6 Involved Agencies and Agency Contacts

There are a number of agencies that are involved with biological resources and special status species. The agencies and persons to contact for each of these agencies are shown in Table 8.2-8.

Table 8.2-8. Agency contacts.

Agency	Contact	Title	Telephone
U.S. Fish and Wildlife Service Federal Building 2800 Cottage Way, Room W-2605 Sacramento, California 95825	Dan Buford	Branch Chief, Bay and Delta Branch	(916) 414-6600
California Department of Fish and Game 7329 Silverado Trail Napa , CA 94558 Mail: P.O. Box 47, Yountville, CA 94599	Carl Wilcox	Wildlife Biologist	(707) 944-5500
U.S. Army Corps of Engineers 333 Market Street San Francisco, CA 94105	Ed Wylie Mark DÁvignon	South Section Chief Wetland Specialist	(415) 977-8464 (415) 977-8446
San Francisco Bay Regional Water Quality Control Board 1515 Clay Street, Suite 1400 Oakland, CA 94612	Keith Lichen Dale Bower	Contacts for surface water non-point sources, Alameda County	(510) 622-2300

8.2.7 Permits Required and Schedule

Applicable biological resources permits required for the project are listed below and in Table 8.2-9.

Table 8.2-9. Permits required and permit schedule.

Permit/Approval Required	Agency	Schedule
Clean Water Act, Section 404, Individual Project Permit to fill jurisdictional wetlands	U.S. Army Corps of Engineers, San Francisco District	Application concurrent with AFC filing, data adequacy, and approximately four-month review
Clean Water Act, Section 401, Water Quality Certification (for filling jurisdictional wetlands)	Regional Water Quality Control Board	Application concurrent with AFC filing, data adequacy, and approximately four-month review

Information requirements for these permits include:

- Complete characterization of the wetlands on wetland delineation forms (Appendix 8.2-D)
- Site maps showing the wetland delineation and location of the wetlands to be filled
- A description of the project that will fill the wetlands
- Construction methods that will be used and their potential effects on water quality in adjacent water bodies
- A complete mitigation plan, including an assessment of the quality of the wetlands fill and a plan to replace the filled wetlands at an acreage ratio of 1:1 or better with wetlands of equivalent or better quality, as near as possible to the location of the filled wetlands.

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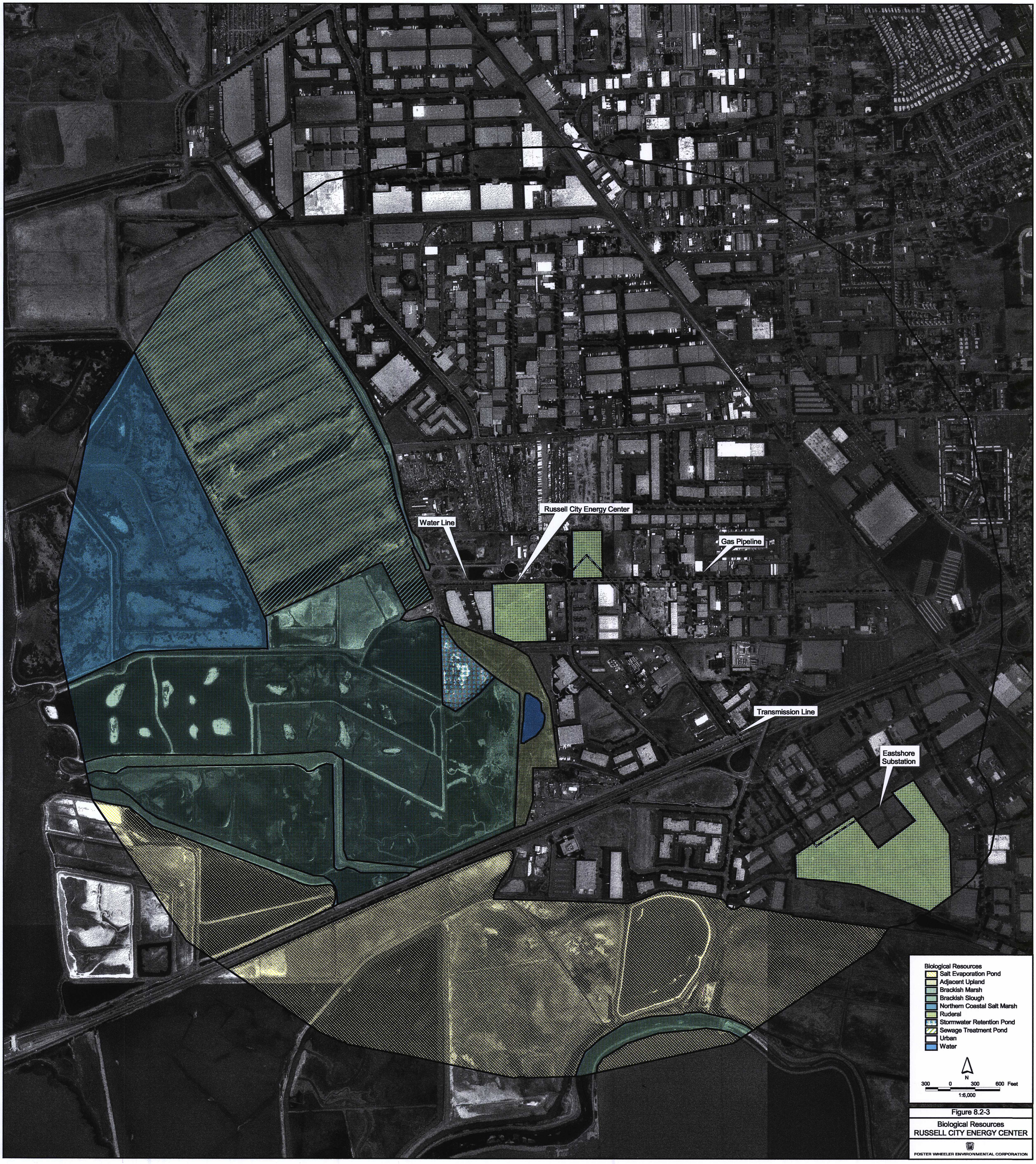


Figure 8.2-3

Biological Resources
RUSSELL CITY ENERGY CENTER

8.3 CULTURAL RESOURCES

Cultural resources in the general project area include historic and prehistoric archaeological sites, historic buildings and structures, and resources of traditional cultural significance to Native Americans and other groups. This section analyzes the Russell City Energy Center (RCEC) project's potential effects to cultural resources within the project Area of Potential Effect (APE). For the purposes of this analysis, the APE is defined as the immediate project site and corridors extending 50 feet to either side of the electrical transmission, natural gas, water supply and return line centerlines. Background information is provided for a broader area.

Section 8.3.1 discusses the affected environment, including the natural setting, prehistoric background, ethnographic background, and historic background. Section 8.3.1 also discusses methods and results of archival research and a pedestrian field survey, and discusses the cultural resources documented within the APE. Section 8.3.2 discusses the effects that construction and subsequent operation of the project facilities may have on cultural resources. Section 8.3.3 evaluates any potential cumulative impacts to cultural resources in the project vicinity, and Section 8.3.4 addresses proposed mitigation measures. Section 8.3.5 presents applicable laws, ordinances, regulations, and standards (LORS). Section 8.3.6 presents agency contacts, and Section 8.3.7 presents permit requirements and schedules. Section 8.3.8 contains references.

8.3.1 Affected Environment

Cultural resources are the traces of human occupation and activity that, in northern California, extend back in time for at least 11,500 years. Archaeologists have reconstructed general trends of prehistory. Written historical sources tell the story of the past 200 years. A cultural resources inventory of the project area, as described in Section 8.3.1.5, has not located cultural resources within the project APE. Contact with the Native American Heritage Commission (NAHC) did not result in identification of traditional cultural properties in the project area.

8.3.1.1 Prehistoric Background

This section discusses general trends in California prehistory. Section 8.3.1.2 discusses the history of archaeological research in west-central California. Section 8.3.1.3 presents the results of archival research and archaeological field surveys conducted for this project.

The general trend throughout California prehistory was the increase in population density over time, coupled with greater sedentism and the use of a greater diversity of food resources. Chartkoff and Chartkoff (1984) identified three major periods of prehistory observed throughout California: Pre-Archaic, Archaic, and Pacific. These patterns are roughly correlated with the Paleoindian, Archaic, and Emergent periods, developed by Fredrickson (1974) for west–central California. As Chartkoff and Chartkoff observe, culture change occurred in different ways and at different times throughout California. These changes nevertheless followed a broad pattern, outlined below.

Pre-Archaic Period (Prior to 11,000 years before present [BP])

Evidence throughout California and the western United States generally suggests that Pre-Archaic (or Paleoindian) populations were small and their subsistence economies included the capture of big game such as now-extinct large Pleistocene mammals including mammoth and mastodon. Recent research in the Great Basin, which offers better preservation of Pre-Archaic sites than does California, indicates that the economies of the Pre-Archaic peoples of the far western United States were based on a wide-ranging hunting and gathering strategy, dependent to a large extent on local lake-marsh habitats (Willig 1988).

Large, fluted lanceolate projectile points known as Clovis points, which are the most widely recognized markers for this time period, have been found in the Clear Lake locality at the Borax Lake Site to the north of the project area (Meighan and Haynes 1970), the Tulare Lake Basin to the south (Wallace and Riddell 1988), and sporadically elsewhere in California. There are no known Pre-Archaic sites from the Bay area.

Early to Middle Archaic Period (11,000–6,000 years BP)

During the Early and Middle Archaic periods, northern California prehistoric cultures, as elsewhere, began to put less emphasis on large game hunting. Subsistence economies probably diversified somewhat, and Archaic-era people may have begun to use certain ecological zones, such as the coast littoral, more intensively than before. Advances in technology, such as the advent of milling stones, indicate that new food processing methods became important during the Archaic, enabling more efficient use of certain plant foods including grains and plants with hard seeds. A model of early Holocene adaptation devised for the eastern Great Basin (Price and Johnston 1988) may be applicable to California. According to this model, this was a period of gradual warming and drying that supported a specialized economy based largely on marsh, lake, and stream resources. It supported higher population densities and a greater degree of sedentism than the Pre-Archaic period.

The earliest Archaic sites from west–central California are from the Los Vaqueros Reservoir area in eastern Contra Costa County, where two sites have recently produced artifact assemblages and human burials dated between 9,870 and 6,600 years before present (BP). Prior to the Los Vaqueros excavations, Early to Middle Archaic deposits in the Bay–Delta areas were limited to isolated human burials. No sites dating to these periods have been found in the immediate project vicinity. However, the lack of sites from these periods may reflect the alluvial environment as well as the extensive urban development that may have destroyed or covered sites. It is possible that as yet undiscovered Early and/or Middle Archaic sites lie deeply buried or beneath existing paved and landscaped surfaces in the project area.

Late Archaic Period (6,000–4,000 years BP)

One important technological advance during the Late Archaic was the discovery of a process for removing the tannins from acorns, which made it possible to exploit this abundant and nutritious, though labor intensive, resource (Chartkoff and Chartkoff 1984). Prehistoric trade networks also began to diversify and develop during the Late Archaic, bringing raw materials and finished goods from one region to another. Resource exploitation during this period, as well as during the Early and Middle Archaic, was generally seasonal. Bands moved between established locations within a clearly defined and defended territory, scheduling the harvest of particular resources according to the time of their availability. Aggregations of food resources, such as occurred at the shores of a large body of water or along a major fish-producing river, allowed for larger aggregations of people, at least seasonally. Dispersed resources, large and small mammalian game during the winter for example, meant dispersal across the landscape into small family groups for more efficient food harvesting. The spear thrower (atl-atl) may have been introduced or increased in importance during this period, accounting for the change in projectile point styles from the Western Stemmed series to the Pinto and Humbolt series, which are generally stemmed or have indented bases, or both. There was also an increase in the importance of seed grinding (Price and Johnston 1988).

It appears that the shell mound sites along San Francisco Bay were first occupied during the Late Archaic. Shell mound sites excavated in the Coyote Hills area contain Late Archaic components. Most of these sites have produced intact human burials and a great variety of artifacts, a reflection of the diverse subsistence practices. Acorns and other nut and berry crops appear to have been the primary plant resources targeted during this period. At sites along the Bay, the abundant remains of marine animals, including shellfish, fish, and mammals, reflect the occupants' early adaptation to the marine and bayshore estuarine environment. Obsidian from the North Coast Ranges and eastern Sierra also appears at these sites, reflecting the early existence of extensive trade networks.

Early and Middle Pacific Periods (4,000–1,500 years BP)

According to Chartkoff and Chartkoff (1984), the beginning of the Pacific Period is marked by the advent of acorn meal as the most important staple food resource for most California Indians. Increasing population densities throughout the period made it desirable and necessary for California populations to produce more food from available land and to seek more dependable food supplies. The increasing use of food processing techniques, such as seed grinding and acorn leaching, developed during the Archaic, allowed for the exploitation of more dependable food resources. Increasing use of previously neglected ecological zones may also have been part of this trend.

In the Bay area, Early and Middle Pacific sites are typically composed of well-developed midden deposits with human burials and residential features, representing long-term permanent villages. During this period, archaeological evidence indicates an increase in the use of the estuarine and marine zones and fully developed exploitation of these areas. Site assemblages are characterized by a well-developed bone tool and ornament industry; shell beads, ornaments, and pendants; and both unshaped and well-shaped mortars and pestles. Stone tools are manufactured of both locally available chert and imported obsidian. The predominant projectile point type is the shouldered lanceolate form, although side-notched and stemmed points and large lanceolate-shaped bifaces also occur. Burials are typically in a flexed position.

Late and Final Pacific Period (1,500 years BP-Historic Era)

A.D. 500 (1,500 years BP) is a cultural watershed throughout California. Sometime near this date, the bow and arrow replaced the spear thrower and dart as the hunting tool and weapon of choice. The most useful markers for this period tend to be the small projectile points used as arrow tips. The date of bow and arrow introduction is a point of some controversy, but most authors place it between A.D. 500 and 600. Others believe bows and arrows were introduced as early as A.D. 250 (750 years BP; Hughes 1986) or as late as A.D. 700 (1,300 years BP; Bennyhoff and others 1982).

During the Final Pacific Period, populations became increasingly sedentary and dependent on stored staple foods. Staple foods were stored for the winter in permanent settlements with populations as high as 1,000 persons. At the same time, there is evidence of continued diversification of the resource base. By the Final Pacific Period, every available ecological niche was exploited, at least on a seasonal basis. There was full exploitation of the marine/estuarine zone and further development of long distance trade networks and more complex social and political systems.

Late and Final Pacific period sites are generally well-developed midden deposits, some with surface components. The midden deposits contain both cremated and intact human burials and residential features, including house floors, reflecting the increasingly sedentary populations. Bedrock mortar milling stations were first established in the Bay area around 1,300 years ago. Although portable mortars and pestles continued to be used, smaller specimens were preferred. Changes in the size of ground stone tools reflect the dramatic increase in the use of small-seeded plant resources. Olivella and clamshell disc beads, frequently found in burials, appear to have been manufactured at Bay Area sites. Small unmodified obsidian pebbles and large flake blanks were imported almost exclusively from the Napa Valley. There is evidence that, during this period, inhabitants of the Bay area had well-established trade relations with the Yurok, the Maidu, the Miwok, and several other interior groups. This period has its end in the late 18^{th} century with the arrival of Euroamericans in the project area.

8.3.1.2 Archaeology and Archaeological Sensitivity of the Project Area

Upland areas near watercourses were favored locations for prehistoric occupation. In the San Francisco Bay Area, the Bay margins are also high sensitivity areas for archaeological resources, due to their proximity to fish and shellfish resources in the Bay. Before historic times, the project site was most likely located at the boundary between dry land and tidal marshland. The evidence for this is that the boundary of the Hispanic-era land grant rancho San Lorenzo runs very near the project site's southern boundary. Examination of Hispanic era land grant rancho boundaries confirms that they generally ran up to, but not beyond, the dry land-marshland boundary. The project area is of high sensitivity for prehistoric archaeological deposits, because this boundary area was a frequent site for villages and temporary camps.

Mt. Eden Creek is located within one-quarter mile of the Eastshore Substation. From such a spot, the prehistoric occupants were able to exploit a variety of ecological niches on the alluvial plain and foothills and to take advantage of marine resources. Along the shores of San Francisco Bay, including the project area, occupation was intermittent and sparse prior to around 5,000 to 7,000 years ago. In addition, evidence for occupation prior to 7,000 years ago was hidden by rising sea levels or buried under sediments caused by natural and man-made Bay marshland infilling along estuary margins.

The first formal archaeological study in the San Francisco Bay area was conducted by Max Uhle, who, in 1902, excavated a trench into a shell mound site on the eastern shore of the Bay at Emeryville (CA-Ala-309). At that time, it was assumed that prehistoric California Indian culture had been primitive and unchanging. Although Uhle found stratigraphic differences in mortuary patterns and artifactural assemblages, other scholars largely ignored the evidence of social complexity and maintained the assumption that no meaningful changes took place during California's prehistory (Uhle 1907; Kroeber 1925).

Nels Nelson was the first person to carry out formal archaeological research in the Bay area. He surveyed the prehistoric shell mounds of the Bay area and identified more than 400 mounds around the Bay. Some of the largest Nelson sites included Uhle's Emeryville mound (1,000 by 300 feet and 32 feet deep), the Stege mounds (240 by 160 feet and 350 by 250 feet), and the Ellis Landing mound (460 by 245 feet and more than 30 feet deep). Unfortunately, Nelson did not formally record or accurately map these sites and their approximate locations have been inferred from site remnants, topographic indications, and other lines of evidence.

Nelson and other early researchers in the Bay area believed that there were no important breaks in the cultural record of the Bay area and no important cultural changes during the area's prehistory. Although Nelson found differences in shellfish species between upper and lower portions of the Ellis Landing mound, which he excavated, he attributed these differences to environmental causes (changes in the environment led to changes in the abundance of different shellfish species). More recent research in the project area and archaeological excavations, largely conducted to mitigate the impacts of various construction projects, has disproven the theory that prehistoric culture was static in the project area. Instead, we know that a series of prehistoric cultural developments occurred, as outlined above.

8.3.1.3 Ethnographic Background

The project site is situated within the historical Chochenyo territory of the Costanoan Indians. The term "Costanoan" is derived from "Costaños", the Spanish word for "coast people". The term refers to a language family found throughout a large area that included the eastern perimeter of the San Francisco Bay and San Francisco Peninsula, or from the Carquinez Straits down to the southern margin of the Bay, and up to the Golden Gate. The Costanoan language family included eight distinct languages, Chochenyo among them. These eight languages have been described as "as different from one another as Spanish is from French" (Levy 1978). All eight Costanoan languages also belong to the Penutian language stock. Penutian languages were spoken throughout north–central California by a number of aboriginal groups, including the Wintu, Maidu, Miwok, and Yokuts. Linguistic evidence suggests that Costanoan speakers occupied the Bay area by 1,500 years ago.

In 1971, Bay area descendants of the Costanoans organized as the Ohlone Nation ("Ohlone" is probably being derived from the Miwok word meaning "people of the west"). Therefore, it is correct to speak of the Costanoans when reviewing the ethnographic background of these people and to speak of the Ohlone when referring to their current status as a nation. The Ohlone Nation received title to the cemetery where their ancestors who died at Mission San Jose are buried. However, no official governmental recognition has ever been given to the Costanoans.

Figure 8.3-1 shows the approximate location of aboriginal territories in the project area at a scale of 1:24,000. The Chochenyo or East Bay Costanoans occupied the Eastshore of San Francisco Bay, between Richmond and Mission San Jose, and as far east as Livermore Valley. The project area is at the southern extent of historical Chochenyo territory. To the south, the Tamyen or Santa Clara Costanoan territory extended around the south end of the Bay and into the lower Santa Clara Valley. It is possible that the southern part of the project area was also within Tamyen territory. In 1770, Chochenyo and Tamyen speakers each numbered approximately 1,200.

In addition to, and overlapping the larger ethnic groups based on linguistic distinction, the Costanoan-speaking people lived in approximately 50 separate and politically autonomous tribelets, that comprised the basic unit of Costanoan political organization. Each tribelet had one or more permanent villages and any number of smaller camps. The village served as a political, social, and ceremonial center in which the tribelet congregated during the winter and from which members of the tribelet launched foraging parties to temporary camps in the warmer months. Surplus food was stored in the larger villages. The name of the tribelet was often the name of its principal village. The average number of persons in a tribelet was approximately 200 (Levy 1978). The position of tribal chief was inherited patrilineally, usually from father to son, although a woman could also hold the position. The chief had extensive responsibilities, including acting as the leader of a council of elders who were responsible for advising the community.

Ethnographic data pertaining to the Ohlone is incomplete at best. The first Euroamericans to record contact with the Ohlone were Fathers Fages and Crespi, who in 1772 traveled up the east side of San Francisco Bay to the Carquinez Straits and then turned south through the Walnut Creek, San Ramon, and

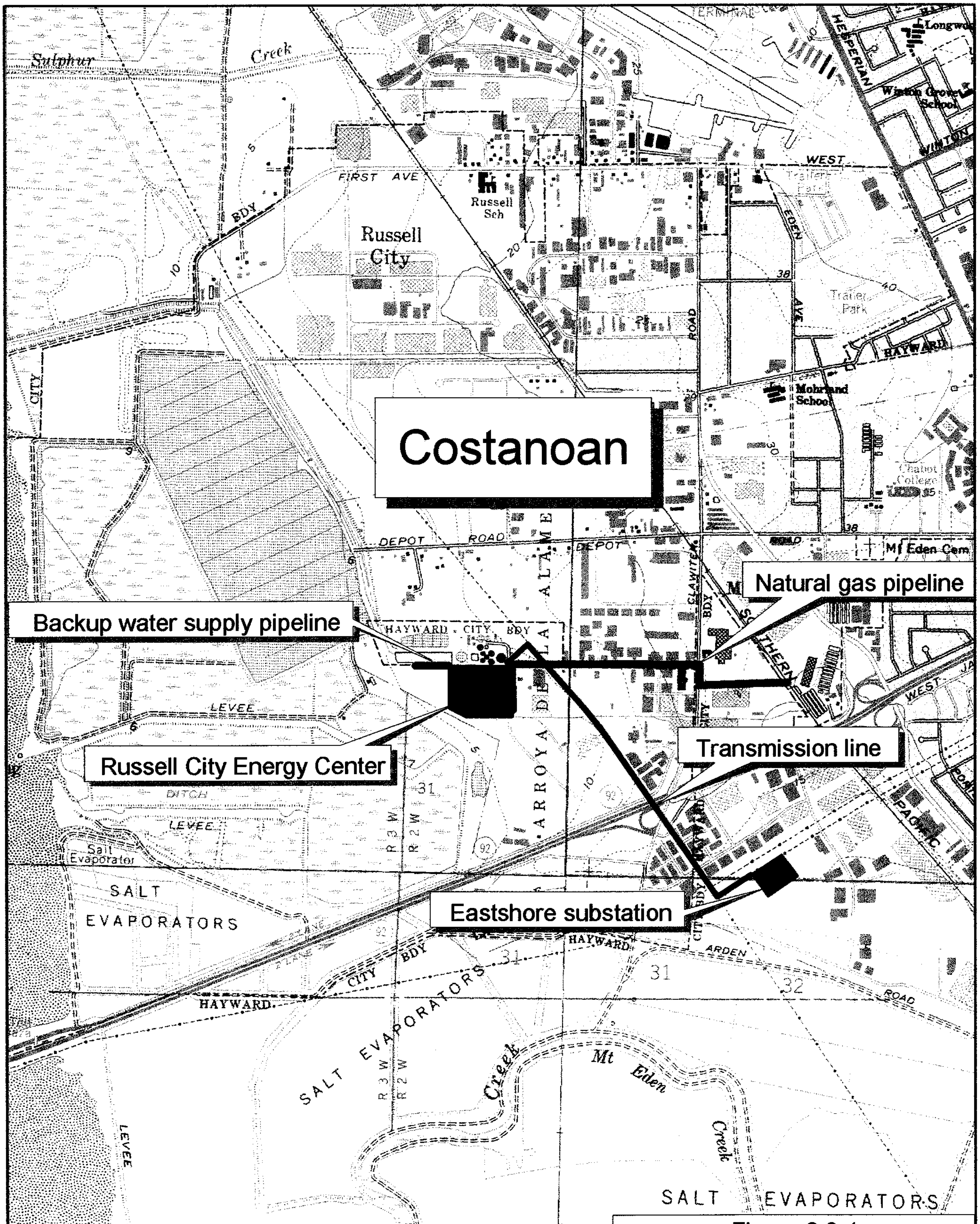
Livermore valleys. Fages and Crespi noted "numerous villages of very gentle and peaceful heathen, many of them of fair complexion" (Cook 1957).

During the next decade, the establishment of Mexican missions at San Francisco, Santa Clara, and San Jose had profound and irrevocable effects upon the Indian population. The missions also resulted in a co-mingling of peoples of different linguistic and cultural backgrounds and a blurring of cultural identities. In addition to the Costanoans, Northern Valley Yokuts, Plains Miwok, Lake Miwok, Coast Miwok, and Patwin were all brought to Mission San Jose (Levy 1978). By 1834, when the missions were secularized, the effects of disease, military reprisals, and the recruitment of Indians as Christian converts had all but obliterated Ohlone culture. The subsequent arrival of Anglo populations further hastened the cultural extinction.

Ethnographic information available for the Ohlone comes primarily from accounts of early explorers, from mission records, and from a few ethnographers who, in the early and middle years of the 20th century, were able to work with the few remaining native informants (e.g., Kroeber 1925; Harrington 1942; Merriam 1967). These lines of evidence indicate that the Costanoans were hunter–gatherers and that fish and shellfish were an important part of the coastal Ohlone diet. Clams, mussels, steelhead, sturgeon, salmon, and lampreys were all eaten. The Ohlone probably fished with harpoons, nets, and twined basketry traps. Fish poisoning with soaproot was reportedly a common practice. The Ohlone also reportedly used a variety of techniques to hunt large and small mammals, including deer, elk, antelope, bears, mountain lions, sea lions, whales, dogs, wildcats, rabbits, gophers, squirrels, mice, moles, woodrats, raccoons, and skunks. Sinew-backed bowls and arrows with a cane shaft and blunt bone or stone tip were used for larger animals, and deadfall snares were used for large and smaller game. Sea animals may have been clubbed from tule balsas or from the banks of tidal sloughs. Communal rabbit drives were sometimes held. Migratory waterfowl and birds also had a prominent place in the Ohlone diet, and waterfowl were particularly important. Canada geese, snow geese, ducks, and coots (mudhen) were hunted using decoys made from a bird carcass stuffed with grass. Hawks, doves, and quail were also hunted and eaten.

The acorn was undoubtedly the most important of the plant foods gathered. Acorns were ground to a meal using stone mortars and pestles, then leached through an open-weave basket to remove the tannins. The leached acorn mush was consumed immediately or formed into cakes, which were dried and stored. Acorns came predominantly from the valley oaks, coast live oaks, and interior live oaks. Black oak acorns, less common in the project area, were preferred and may have been obtained in trade with people in the hills to the east where the black oak is more common. Alternatively, the Oroyson may have had reciprocal food-gathering privileges with neighboring tribelets that allowed them to get their own black oak acorns (Banks and Fredrickson 1977). Buckeyes were processed in a similar manner to acorns but were considered an inferior food. The Ohlone also gathered and made use of laurel nuts, hazelnuts, and an assortment of wild roots, bulbs, fruits, nuts, and seeds.

Plant and animal resources were also used for medicinal, ornamental, and other functional uses (e.g., baskets, shelters, and tools). Resources that were available on a seasonal basis may have influenced prehistoric occupation patterns. For example, acorns are available in October and November, hard seeds can be harvested from May to September, and certain shellfish in California are not edible from May through October (Bard and Busby et al. 1987). During various seasons, foraging parties left the tribelet villages to engage in fishing, hunting, and the collection of plants within the tribelet's territory and to engage in trade outside this territory.



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Sources: Geographic Data Technology, Environmental Systems Research Institute, USGS Quad DRGs - GIS Data Depot

Figure 8.3-1

Aboriginal Territories

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

The main trading partners with the Costanoans were the Plains Miwok, Sierra Miwok, and Yokuts. The Costanoans supplied the Yokuts with mussels, abalone shell, and dried abalone; they supplied the Sierra Miwok with olivella shell; they supplied the Plains Miwok with bows; and they supplied all of these groups with salt (Davis 1961, in Levy 1978). (The Plains Miwok word for salt is actually borrowed from a Costanoan language.) In exchange, the Costanoans received pinyon nuts from the Yokuts and may have received clamshell disk beads from the Miwok. The Costanoans also fought wars, most often over disputed territories, with other Costanoan tribelets and with the Esselen, Salinan, and Northern Valley Yokuts (Levy 1978).

The Costanoans lived in thatched domed structures with rectangular doorways and a center hearth. The Costanoans also constructed domed assembly houses and circular or oval fenced dance enclosures, both of which were located in the center of the village, surrounded by dwellings. Sweathouses, used by adult men and women, were built into pits excavated out of the banks of streams near the village. The Costanoans generally buried their dead within the village. Bodies were flexed in a variety of positions, including seated, and faced in various directions.

As noted above, the hunting and gathering lifeway of the Ohlone was interrupted by the arrival of Euroamericans, who brought disease (including a 1833 malarial epidemic and a 1837 smallpox epidemic, which killed a large percentage of Costanoans), dislocation (as most surviving Costanoans were brought to the Spanish missions), and cultural atrophy (as the Costanoans were Christianized and traditional lifeways no longer practiced at the missions). Mexicans and Americans took over much of the Costanoan lands during the 1830s and 1840s, securing land grants and claims to natural resources within these territories. Following secularization of the missions in 1834, many Costanoans served as ranch hands to the Mexicans and Americans who had taken their land.

8.3.1.4 Historic Background

Recorded history in the project area begins with early Spanish exploration in the area, the arrival of missionaries, and the establishment of Mission San Jose approximately 10 miles inland (east) from the project site. This was followed by secularization of the missions and division of lands in the project vicinity into a number of large ranchos, the development of an agricultural land use pattern, and the expansion of shipping during the Hispanic Period continuing into the American Period. The agricultural land use pattern was eventually replaced with the arrival of rail transport and subsequent rapid urban expansion. Urban expansion included the formation and incorporation of cities, such as Hayward, San Leandro, Fremont, Newark, and Union City, as well as the growth of large-scale industries such as salt production.

Documented historic-era resources in the project area are associated chiefly with the various industries that developed here from the mid-1800s to the mid-1900s. The industrial history of the project area can be divided into several historic themes: agriculture and ranching, the landings and shipping industry, railroads and other transportation-related industries, and the salt production industry.

Hispanic Period

The earliest historic records for the project area are the accounts of Spaniards who explored the Bay area, beginning in the late 1700s. The hills to the southeast of the project area were identified as the site for one of the 13 missions established in California. "La Mission del Gloriosisimo Patriarca San Jose" (subsequently referred to as "Mission San Jose") was dedicated by Friar Fermin Lasuan on June 11, 1797, at the site of what had been a Costanoan village, "Oroysom". A large area surrounding the mission and extending westward to the coast, including the mission itself, the mission potrero (pasturelands), and the mission embarcadero (landing) were part of the Ex Mission San Jose lands. From 1806 to 1833, Mission San Jose became the most prosperous and second largest (in terms of population) of the California missions. Father Duran served at the Mission San Jose and administered his office as president of all of the California missions during this time. The Costanoan Indians who had preceded the Spanish explorers and missionaries in the project were forced into the missions, along with Indians from interior California.

Following the independence of Mexico from Spain and the secularization of the Spanish missions in 1834, most of the land in the project area was parceled out by Mexican governors as large land grants, or "ranchos", primarily, but not exclusively, to "Californios" (second generation, native-born descendants of early soldiers and civil servants under Spanish and then Mexican rule). "Rancho San Lorenzo" was granted to Francisco Soto and Guillermo Castro. It included present day Castro Valley, Hayward and part of San Lorenzo.

In addition to ranching, Californios continued the trade in salt and hides in the project area. During this time, most of the Mission Indians were either hired on as ranch hands or were relocated to one of the reservations located far to the east or north.

American Period

The Californios were followed by a new wave of immigrants who came to California and the project area in the mid-1800s, following reports of gold discoveries. The project area was not a particularly active mining area (although there was some mining in the hills to the east), but it was active in supplying the mines in the Sierra Nevada Mountains further east with food, hardware, and clothing. In addition, San Francisco provided a good market for agricultural commodities, such as vegetables and grains, and the project area saw a growth in agriculture and ranching beginning in the mid-1800s. Joel Russell staked a claim on what he believed to be open range and marshland in 1853. When his claim was disputed by Guillermo Castro, agent for the Soto San Lorenzito Rancho (the western half of the Rancho San Lorenzo granted to Francisco Soto), the U.S. Land Commissioners held against Russell in 1856, and he purchased the land he had squatted on. He sold off much of this property, retaining 320 acres between Mt. Eden and what later became Hayward's Landing. Mt. Eden soon emerged as a center of the salt industry.

Salt making is an early East Bay industry with a long history. The first commercial salt operation in Alameda County began in 1854, when John Johnson constructed levees around tidal pools to evaporate water. Early salt making was mostly a small, family-run business. Many of these used Chinese labor. The Oliver Salt Company, later purchased by Leslie Salt in 1931 consolidated most of the small works in 1927. These salt works continued in production until 1992, when the land and tidal marshes came under the East Bay Regional Park District as the Hayward Regional Shoreline. Currently, efforts are being made to restore natural tidal flow to the former evaporation ponds.

The Russell City Energy Center project takes its name from Russell City, one of the many towns throughout the west that were platted, but never extensively developed. Named after Joel Russell, an early pioneer in the area, the town was planned by the Russell heirs and real estate agents from San Francisco. The San Francisco fire and earthquake of 1906 inspired a frenzy of real estate development throughout the bay area, and Russell City was advertised as only one hour away from San Francisco and 25 minutes from Oakland by rail and ferry. The developers planted palm trees and offered prospective buyers a free ticket from the city to inspect the available lots. Streets were graded and sidewalks installed, but in the end only three homes were actually constructed. Many of the lots had been bought by speculators, not home builders, and a lawsuit brought by the Russell heirs against their real estate agents delayed and discouraged development. The depression of 1910 brought an end to speculation in Russell City for the time being.

During the Great Depression Russell City began to develop in earnest, although in a haphazard and unplanned way. Migrants from the south in search of work could purchase one of the originally platted 25 foot-lots for as little as $20, and many did so. Russell City was in an unincorporated area of Alameda County and had no sewers, city water or other utilities. It was surrounded by a hog farm/packing plant, the municipal landfill, automobile graveyards, and the Southern Pacific railroad tracks. With no utilities available, outhouses and shallow wells were the norm. World War II drew more people to the area, and Russell City continued to grow, reaching a population of 1,500 by 1957. Being in an unincorporated area of the county and a relatively short drive from San Francisco and Oakland, Russell City had certain advantages when it came to nightlife. A number of bars and after hours clubs, such as the Russell City Country Club, The Front, Mrs. Alves', and Pitman's Rendezvous figured prominently in the creation of a musical style known as the West Coast Blues. Musicians such as Big Mama Thornton, T. Bone Walker, Albert Collins, Junior Walker, and Ray Charles would head to Russell City after closing time in the bigger cities and perform past dawn (Stone 1995).

Electrical Distribution System

Electrical power plants began to be constructed in the late 1880s. Long distance transmission was pioneered in California in 1891, with a 14-mile-long line constructed for a hydroelectric facility in San Bernardino County. In the 1890s, a PG&E predecessor constructed a 22-mile-long electrical transmission line between the Folsom hydroelectric plant and downtown Sacramento. This was one of the earliest long-distance transmission lines. By the 1920s, electrical power companies had constructed a number of long-distance lines, a number of these to transmit hydroelectric power from the Sierra Nevada mountains to major population centers in the central Valley and on the California coast. Most early transmission lines were steel truss structures based on the design of steel windmill for the oil industry. The electrical service industry coalesced around private, regulated monopolies like PG&E, and a few municipal utility districts.

The electrical transmission line nearest the RCEC runs between the Grant and Eastshore Substations. Further south, this line connects eventually to the Newark Substation, which was first constructed in the 1920s. The Eastshore Substation was recently (within the past year) replaced on an adjacent lot. This Grant to Eastshore 115-kV transmission line appears on 1939 aerial photographs.

Historic Archaeological and Historic Site Sensitivity

Sensitivity for historic resources and historic archaeological resources in the project area is low. Early historic uses of the area included salt processing and the Bay Area salt industry had its beginnings near the project area. Most of the salt works in the immediate area, however, have been long abandoned and are in a poor state of preservation. None of these are particularly near any proposed project facilities. The Hayward Area Recreation Department has acquired title to some abandoned salt ponds near the Bay shore, about a mile from the project site, and has plans to preserve or interpret some early salt processing features. Some historic archaeological deposits were recorded south of the Eastshore Substation, south of Arden Road. These included sites with Chinese ceramics possibly associated with salt pond development or salt production; however, they are not near project facilities. Historic archaeological deposits are less likely to be present near project features, including the transmission line, natural gas line, and water supply and wastewater return pipelines.

8.3.1.5 Resources Inventory Methods

Inventory methods for the RCEC project consisted of archival research, an intensive pedestrian survey, architectural reconnaissance, and Native American consultation.

Archival Research Methods

Foster Wheeler Environmental conducted a records search at the Northwest Center of the California Historical Resources Information System (CHRIS) at Sonoma State University in Rohnert Park, Sonoma County on February 15, 2001. An area bordered by the western edge of the City of Hayward Water Pollution Control Facility, State Route 92, Interstate 880, and West Winton Avenue was searched. All of the natural gas pipeline alternative routes, including the preferred alternative, are located within this area.

In addition to reviewing available survey reports, lists of historic properties (e.g. the National Register of Historic Places, California Inventory of Historic Resources, California Points of Historic Interest, and California Landmark files) were reviewed to locate historic archaeological sites within the project area. Project Staff studied USGS topographic maps and other historical maps to determine where unrecorded historic structures and features might be located.

Archaeological Survey Methods

Andrew Gorman conducted a pedestrian field survey for the RCEC project. Mr. Gorman has a Bachelors degree in Archaeology and eight years of archaeological experience. The project site, natural gas pipeline route, water supply and wastewater return pipelines, and electrical transmission line and substation expansion area were surveyed by Mr. Gorman on March 27 and 28, 2001. (Andrew Gorman's qualifications are attached as Appendix 8.3-A.)

RCEC Plant Site

Much of the proposed site is occupied by the transmitting antennas and transmitter building of radio station KFAX AM 1100. The antenna masts occupy only a small portion of the site the remainder is in heavy grass cover. Visibility of the ground surface on the day of the survey ranged from zero to 80 percent due to the presence of ruderal vegetation. The area was walked in approximately 15-meter transects, and the sod was scraped back and the exposed soil troweled for artifacts every 15-meters. Grassed areas along the transects were probed with a shovel for surface artifacts or rocks, and opportunistic use was made of any areas of exposed soils encountered. No deep subsurface tests were made to avoid damaging the ground radial system for the antenna towers that are buried approximately 6-inches deep in a pattern radiating from the base of each tower. The only artifacts encountered were modern trash. An area along Enterprise Avenue about 7 meters in width is elevated above the remainder of the lot by 5 feet or so and is recent fill.

The eastern portion of the power plant site is currently occupied by Runnels Industries, a metal sandblasting and painting firm. This area is a dirt lot, with excellent ground surface visibility, although at least 40 percent of the ground is covered by buildings, concrete foundation slabs, and asphalt regrind and gravel. A pedestrian survey was made of this area and no artifacts were located. The buildings are all industrial metal and portable buildings erected in the past 30 years. The site is composed largely of recent fill to unknown depth.

Electrical Transmission Line and Eastshore Substation Expansion—The RCEC will utilize an existing high voltage transmission corridor to connect to the Eastshore Substation south of State Route 92. The transmission towers that currently occupy this corridor appear to be recently constructed and are located in previously disturbed areas, namely the parking lots of industrial buildings, and a highway interchange right-of-way. No signs of cultural resources were seen along the route. The proposed project would connect with the Eastshore Substation, which was constructed within the past year, and would involve removal of existing electrical transmission towers and their replacement with single or double-pole structures. The existing structures are standard-design 115-kV steel lattice towers. They appear on the 1939 aerial photographs and were probably built in the 1920s or 1930s, after construction of the Newark Substation to the south, to which they connect. The field study included the substation expansion.

Natural Gas Pipeline—The natural gas pipeline route will run in Enterprise Avenue, cross Clawiter Road, and then run in an existing pipeline corridor that is covered in gravel to PG&E gas distribution pipeline 153 that lies on the east side of the Union Pacific railroad tracks. A drive-by reconnaissance was conducted in these areas along the proposed alignment. Where the ground was visible on either side of the street, the surveyor inspected the exposed surface on foot to about 20 meters/65 feet on either side of the street.

Wastewater Return Pipeline—The wastewater return line will cross under Enterprise Avenue to the City of Hayward Water Pollution Control Facility. This area is entirely paved.

AWT Plant

The field survey conducted for the RCEC site included the AWT site.

Construction Laydown and Worker Parking Areas

Two of the three potential construction laydown and worker parking areas are surfaced lots. The third area, the open land surrounding the PG&E Eastshore Substation, was included in the archaeological survey for the project.

Architectural Reconnaissance Methods

Historic buildings and structures older than 45 years are potentially significant historic resources in the project area. The project team conducted a drive-by architectural reconnaissance to determine whether potentially significant historic architecture is located within the APE, and, if so, whether the project would significantly affect the structures. Special attention was given to building sites appearing on historic USGS maps, and structures that were associated with the salt industry, or historic farm buildings of significant architecture that might be located at the project site or immediately adjacent to it. No such buildings or structures are located near the project site. The project site, transmission line, gas pipeline, and water supply and wastewater return lines are all located in a previously developed industrial area. Structures in the area are mostly commercial buildings built within the past 30 years.

Native American Consultation Methods

The Native American Heritage Commission (NAHC) was contacted by mail on March 29, 2001, and information regarding traditional cultural properties and sacred places, such as Native American cemeteries, in the project area, was requested. On April 6, 2001, the NAHC responded that there are no known sacred lands in the project vicinity. The NAHC also forwarded a list of Native American groups or individuals that may have knowledge regarding traditional cultural properties and sacred places in the project area. A letter was sent to each of these parties on May 8, 2001 requesting information about such properties. This correspondence is included in Appendix 8.3-B.

8.3.1.6 Resources Inventory Results

Prehistoric Resources

Archival research located no previously recorded sites within or near the project APE. None of the surveys on file conducted in and near the proposed project area had located significant cultural resources. The archival research area included land within 1000 feet of the project site and the linear facilities. No new archaeological sites or isolates were found within the project APE during pedestrian field survey. The survey area included the entire project site and areas within 100 feet of the natural gas pipeline, electrical transmission line, and water supply and wastewater discharge pipeline.

Historic Resources

The project would involve removal of 6 of the existing electrical transmission towers and their replacement with new single-pole or double-pole towers. The existing towers may be more than 45 years old (towers appear on 1939 aerial photographs). They are part of a line connecting the Grant Substation with the larger Newark Substation, in Fremont, through the Eastshore Substation. A cultural resources site record is included in Appendix 8.3-C.

The transmission towers are not significant from an architectural, historical, or engineering standpoint. Though there is a relative lack of historical research on transmission towers and their architectural and historical significance, a recent consulting report on this topic makes it clear that "the specific elements of the transmission tower had largely evolved into a modern form" by the 1920s (Mikesell 2000). This form was a structural engineering descendent of the windmill, radio communication, and bridge support towers that were developed in the late 19^{th} and early 20^{th} centuries. Towers very similar to these are located throughout California and elsewhere, some of very recent construction.

These transmission towers also do not have associations with significant historical events involving the development of the electrical infrastructure system in the region, that would warrant preservation or mitigation of what would be the adverse effect of replacing several of the towers with towers of new design. The key historical events in the history of electrical infrastructure development took place in the between 1890 and 1910 (Mikesell 2000). These included the first long-distance electrical transmission (from hydroelectric generators) step-up, step-down transmission, alternating current, three-phase transmission, and improved transformer design. The transmission towers are not eligible for listing on the California Register of Historic Places or National Register of Historic Places and so no mitigation is proposed.

8.3.2 Environmental Consequences

8.3.2.1 Significance Criteria

Under the California Environmental Quality Act (CEQA), an action may be considered to have a significant impact on cultural resources if it will cause a substantial adverse change to an historical resource or a "unique archaeological resource." Historical resources are those that are eligible for listing on the California Register of Historical Resources (California Public Resources Code [PRC] §5024.1; Title 14, §4852 et seq., California Code of Regulations [CCR]). A property considered for listing can be an object, building, structure, site, area, place, record, or manuscript. A property is historically significant if it "is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, economic, or cultural annals of California." (PRC §5020.1[j]). Such a property meets the California Register criteria if it:

a) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

b) Is associated with the lives of persons important in our past;

c) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

d) has yielded, or may be likely to yield, information important in prehistory or history (PRC 5024.1).

Archaeological resources may qualify for significance under CEQA if they are determined to be unique archaeological resources as defined in PRC §21083.2. A unique archaeological resources is:

An archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1) *Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.*
2) *Has a special or particular quality such as being the oldest of its type or the best available example of its type.*
3) *Is directly associated with a scientifically recognized important prehistoric or historic event or person (PRC §21083.2).*

It may appear that the California Register of Historical Resources was designed for properties of the historic era while the criteria for consideration as a "unique archaeological resource" were designed to apply to prehistoric archaeological resources. Most significant archaeological resources (prehistoric or historic), however, would qualify for the California Register (particularly criteria A and D). Similarly, most significant historic archaeological sites (but not historic buildings and structures, or sites lacking archaeological deposits) would qualify as "unique archaeological resources."

A significant impact on a historical resource would be one that would cause a "substantial adverse change" to it (CCR, Title 14 §15064.5). That is, an action would be considered a significant adverse impact if it "demolishes or alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for inclusion in, the California Register of Historical Resources," or a local register of historical resources.

8.3.2.2 Construction Phase Impacts

Prehistoric Resources

There are no known prehistoric archaeological resources at the project site, along the transmission line, gas pipeline, or water supply and discharge pipeline routes. It is possible, however, that the project could encounter buried cultural resources during the construction phase of the project that have not previously been discovered, since the project area is an alluvial area of high deposition and is also an area of high prehistoric archaeological sensitivity.

Historic Resources

The project would involve the removal and replacement of 6 transmission towers. Though the towers are more than 45 years old, this would not be a significant impact, because the towers are not architecturally or historically significant, and do not qualify for listing on the California Register of Historical Resources.

8.3.2.3 Operation Phase Impacts

Impacts to cultural resources are not anticipated during operation of the proposed facility. Maintenance of the gas and water lines will not cause any effects outside of the initial construction area of impact.

8.3.3 Cumulative Impacts

Since the project would not affect known significant cultural resources, it would not be likely to cause significant cumulative impacts. If the project were to encounter a buried prehistoric midden site, the possibility of cumulative impacts would arise because such sites may be highly significant and those that have been recorded in the project area have been partly damaged or destroyed by agricultural activity and other development.

8.3.4 Proposed Mitigation Measures

Implementation of the following mitigation measures will lower any potential project impact to archaeological resources below the threshold of significance. These measures establish procedures to follow in case previously undiscovered archaeological deposits are encountered below the ground surface.

Preconstruction Assessment and Construction Training

The project archaeologist will visit the project area before construction begins to become familiar with the site conditions. As construction begins, the project archaeologist will conduct a worker education session for construction supervisory personnel to explain the importance of and legal basis for the protection of significant archaeological resources. This worker education session can take place at the same time as the paleontological training session (Section 8.8) since both disciplines will involve the monitoring of excavation activities (although in different areas). Information about archaeological resources may be combined with information about cultural resources in the training brochure that will be distributed to construction supervisory personnel.

Emergency Discovery

If the construction staff or others identify archaeological resources during construction, they will immediately notify the project archaeologist and site superintendent, who will halt construction in the immediate vicinity of the find, as necessary. The project archaeologist will use flagging tape, rope, or some other means as necessary to delineate the area of the find within which construction will halt. This area will include the excavation trench from which the archaeological finds came as well as any piles of dirt or rock spoil from that area. Construction will not take place within the delineated find area until the project archaeologist, in consultation with the CEC staff, can inspect and evaluate the find.

If human remains are encountered during construction, project officials are required by law (California Health and Safety Code 7050.5) to contact the county coroner. If the coroner determines that the find is Native American, the coroner is required to contact the NAHC. The NAHC is required (Public

Resources Code 5097.98) to determine the Most Likely Descendant, notify that person, and request that they inspect the burial and make recommendations for treatment or disposal.

Site Recording and Evaluation

The project archaeologist will follow accepted professional standards in recording any find and will submit the standard Department of Parks and Recreation historic site form (Form DPR 523) and locational information to the Northwest Information Center of the California Historic Resources Information System at Sonoma State University, Rohnert Park.

If the project archaeologist determines that the find is not significant, construction will proceed. If the project archaeologist determines that further information is needed to determine whether the find is significant, the CEC and State Historic Preservation Officer (SHPO) will be notified, and the consultant will prepare a plan and a timetable for evaluating the find, in consultation with the CEC and SHPO.

Mitigation Planning

If the project archaeologist and the consulting parties (the CEC and SHPO) determine that the find is significant, they will prepare and carry out a mitigation plan in accordance with state and federal guidelines. This plan will emphasize the avoidance, if possible, of significant archaeological resources. If avoidance is not possible, recovery of a sample of the deposit from which the archaeologist can define scientific data to address archaeological research questions will be considered an effective mitigation measure for damage to or destruction of the deposit.

The mitigation program, if necessary, will be carried out as soon as possible to avoid construction delays. Construction will resume at the site as soon as the field data collection phase of any data recovery efforts is completed. The project archaeologist will verify the completion of field data collection by letter to Calpine/Bechtel and the CEC-PM so that Calpine/Bechtel and the CEC-PM can authorize construction to resume.

Curation

The project archaeologist will arrange for curation of archaeological materials collected during the monitoring and mitigation program at a qualified curation facility, that is, a recognized, nonprofit archaeological repository with a permanent curator. The archaeologist shall submit field notes, stratigraphic drawings, and other materials developed as part of the archaeological excavation program to the curation facility along with the archaeological collection.

Report of Findings

If buried archaeological deposits are found during construction, the archaeologist will prepare a report summarizing the monitoring and archaeological investigatory program implemented to evaluate the find or to recover data from an archaeological site as a mitigation measure. This report will describe the site soils and stratigraphy, describe and analyze artifacts and other materials recovered, and explain the site's significance. This report will be submitted to the curation facility with the collection.

Project Archaeologist Qualifications

The project archaeologist will meet the minimum qualifications for principal investigator on federal projects under the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation*. The project archaeologist is qualified, in addition to site detection, to evaluate the significance of the deposits, consult with regulatory agencies, and plan site evaluation and mitigation activities.

8.3.5 Applicable Laws, Ordinances, Regulations, and Standards

The CEC environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of the California Environmental Quality Act (CEQA) (Public Resources Code 15000 *et seq.*) with respect to cultural resources. CEQA and its implementing regulations state that "Public agencies will seek to avoid damaging effects on an archaeological resource whenever feasible."

The California Public Resources Code (PRC) and California Code of Regulations (CCR) provide statutes and guidelines for lead agency compliance with CEQA when evaluating potential effects on historical resources. For example, CCR §21083.2 *Archaeological Resources* addresses the evaluation of potential projects on archaeological resources and defines the term "unique archaeological resource." The PRC, Title 14, §15064.5 *Determining the Significance of Impacts to Archaeological and Historical Resources* lists the criteria for the California Register of Historical Resources and defines the meaning of significant impact for historical and archaeological resources.

If a county coroner were to determine that human remains discovered on project lands were Native American, Section 7050.5 of the California Health and Safety Code and Section 5097.98 of the Public Resources Code would apply. These laws require that the county coroner notify the NAHC when a Native American grave is found. The NAHC would then identify a most likely descendant to inspect the burial site and make recommendations for treatment or disposal.

8.3.6 Involved Agencies and Agency Contacts

Table 8.3-2 lists the state agencies involved in cultural resources management for the project and lists a contact person at each agency. These agencies include the Native American Heritage Commission, which would be a consulting party in case human remains are found that are prehistoric or historic-era Native American in origin. The California Office of Historic Preservation (OHP) is also listed. This agency is responsible for management of the state and federal historic preservation programs in California. If properties potentially eligible for listing in the California Register of Historical Resources were discovered during construction, the OHP might wish to be a consulting party. Since the project involves federal permitting (Air Quality Prevention of Significant Deterioration Permit), the OHP would become involved in the event of a significant archaeological find.

8.3.7 Permits Required and Schedule

Though this project requires federal, state, and local permits, in addition to CEC site certification, none of these are specific to cultural resources management.

Table 8.3-1. Applicable cultural resources LORS.

Law, Ordinance, Regulation, or Standard	Applicability	Mitigation Effective?	AFC Reference
California Environmental Quality Act, Section 15064.5	Project construction may encounter archaeological resources	Yes	Section 8.3.4, 8.3.5
California Public Resources Code, Section 21083.2 "Archaeological Resources"	Construction may encounter buried archaeological sites	Yes	Section 8.3.2.1, 8.3.5
California Code of Regulations, Title 14, Section 15064.5 "Determining the Significance of Impacts"	Construction may encounter buried archaeological sites	Yes	Section 8.3.2.1, 8.3.5
California Health and Safety Code, Section 7050.5	Construction may encounter Native American graves, coroner calls NAHC	Yes	Section 8.3.4, 8.3.5
California Public Resources Code, Section 5097.98	Construction may encounter Native American graves, NAHC assigns Most Likely Descendant	Yes	Section 8.3.4, 8.3.5

Table 8.3-2. Agency contacts.

Issue	Contact	Title	Telephone
Native American traditional cultural properties and human remains	Ms. Debbie Treadway Native American Heritage Commission	Associate Government Program Analyst	(916) 653-4038
California Register of Historical Resources and/or Federal agency NHPA Section 106 compliance (if emergency discovery with federal permit involvement)	Dr. Knox Mellon California Office of Historic Preservation	State Historic Preservation Officer (SHPO)	(916) 653-6624

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Russell City Energy Center AFC

May 2001

8.4 GEOLOGICAL HAZARDS AND RESOURCES

This section presents an evaluation of potential impacts to geological resources and the potential geological hazards that might result from construction and operation of the Russell City Energy Center (RCEC) and the Advanced Wastewater Treatment (AWT) Plant and the associated linear facilities. Section 8.4.1 describes the existing environment that the project may affect. Section 8.4.2 identifies potential impacts on the environment associated with development of the RCEC. Section 8.4.3 discusses potential cumulative impacts, and Section 8.4.4 addresses proposed mitigation measures. Section 8.4.5 presents the laws, ordinances, regulations, and standards applicable to geological resources and hazards. Section 8.4.6 describes the agencies involved and provides agency contacts, and Section 8.4.7 describes permits required. Section 8.4.8 provides the references used to develop this section.

8.4.1 Affected Environment

8.4.1.1 Geologic Location

The project area, including the project site and associated linear facilities, is located along the eastern shore of South San Francisco Bay (Bay), which lies centrally within the Coast Ranges Physiographic Province of California. The Bay fills a northwest-trending structural depression in the central Coast Ranges and lies roughly between the San Andreas Fault to the west and the Hayward Fault to the east (Figure 8.4-1). The RCEC is located approximately 14 miles (22 km) from the San Andreas Fault and 3 miles (5 km) from the Hayward Fault.

8.4.1.2 Regional Geologic History

Basement rocks underlying the Bay area are those of the Franciscan Assemblage (50 to 200 million years old) and the Great Valley Sequence (65 to 150 million years old). These are generally overlain by rocks of Miocene age and younger that were deposited at the continental margin during the past 15 million years. Most of the rocks in the Bay area were folded and faulted as a result of early convergence of the North American and Pacific plates. About 10 million years ago, the tectonic regime in the Bay area changed from convergent to a transform boundary between the North American and the Pacific plates. In the Bay area, the relative horizontal (strike-slip) movement along this boundary is about 47 mm/yr, and is being distributed among the various faults of the San Andreas system. Over geologic time, the San Andreas Fault accommodates about 24 mm/yr of this movement, while the Hayward Fault accommodates about 9 mm/yr at Fremont (Petersen *et al.,* 1996).

In general, the Hayward Fault forms the boundary between two distinctly different geologic and geographic provinces. The hills on the east side of the fault are up to 10 million years old, but the flatlands on the west side are barely 10,000 years old. The Bay lies in a structural depression marked by downbowed and/or down-faulted sediment as young as middle Pleistocene. The Bay was formed during the Quaternary (last 2 million years). During the last major glaciation approximately 15,000 years ago, sea level was 330 feet (100 meters) lower than it is currently. At that time, the Bay contained no standing water, and the fluvial systems draining the surrounding hills emptied directly into the Sacramento-San Joaquin River, which flowed to the Pacific Ocean. The sea level began to rise as the ice from the great continental glaciers began to melt. The sea entered the Bay approximately 10,000 years ago, reaching its present level about 6,000 years ago.

After the Early Holocene sea level rise, sediments formerly carried far into the Pacific Ocean began to be deposited in and around the margins of the Bay. Most of the alluvial sediment in the vicinity of the project site was derived from Alameda Creek. Alameda Creek, with a drainage area of 633 square miles

(1640 kilo-meters), is the largest drainage basin contributing to the alluvial plains along the east side of the Bay and displays a well developed alluvial-fan system (Helley and Miller 1992). This system is the largest alluvial fan along the east side of the Bay and is up to 750 ft (225 m) thick. The fluvial system of Alameda Creek generated a complete, progressive suite of deposits: fan, levee, floodplain, flood basin, and Bay mud. At the turn of the century, Alameda Creek had two main distributary channels that bifurcated at the Coyote Hills, which lie approximately 4.6 miles (7.4 km) south of the project site. One channel flowed north and west around the north end of Coyote Hills, and the other flowed south and west, and reached the Bay south of Coyote Hills. Currently, only the north channel (Alameda Creek), is active, and is located approximately 2 miles (3.2 km) south of the site.

Over time, the rock basin of the Bay has been filled with silt, sand, and clay. "Older Bay mud" is the earliest material at the bottom of the Bay; it ranges in thickness from less than one foot to more than 200 feet (BCDC 1967). The older Bay mud consists of dark, plastic, semi-consolidated, organic-rich clay and silty clay, and interfingers with older alluvial fan deposits. The thickness of the older Bay mud increases toward the central portion of the Bay (BCDC 1967).

Overlying the older Bay mud is a sand layer and a layer of "younger Bay mud". The layer of younger Bay mud in some locales is as thick as 130 feet (BCDC 1967). Age of the younger Bay mud ranges from 2,500 to more than 7,000 years Before Present (BP).

8.4.1.3 Local Geology

The project site is located along the eastern shore of the Bay within the San Leandro and Newark 7.5 Minute U.S. Geological Survey (USGS) topographic quadrangles. This area is divided into four northwest-trending structural zones. From east to west, they are: (1) the Diablo Range, (2) a zone of alluvial fans grading west to alluvial plains, (3) the Coyote Hills, and (4) muds of San Francisco Bay (Helley and Miller 1992). The Hayward Fault separates structural zones 1 and 2, and faults inferred by Snetsinger (1976) bound both sides of the Coyote Hills. The site lies within Zone 4, the Bay Mud zone.

Coyote Hills (zone 3) is approximately 5 miles south of the site and appears as an elongate mass of contorted rocks that protrude through the sediments of the Bay plain. The Coyote Hills extend in a northwest-southwest direction for about 5 mi (8 km) and rise almost 300 ft (100 m) above sea level. The Hills represent a thin horst block of Franciscan Complex (bedrock) within the overall structural depression of the Bay (Helley and Miller 1992). The down-faulted block of bedrock on the northeast side of the hills is about 600 ft (200 m) deep under alluvial materials (Hazelwood 1976). The northern extension of the Silver Creek Fault was inferred by Snetsinger (1976) as the mechanism for down faulting. There is no other geomorphic or paleoseismic evidence for activity along this fault and consequently it is not considered to be active, i.e., there is no evidence of seismic activity within the last 11,000 years (Holocene).

The Hayward Fault is one of several northwest-trending strike-slip faults associated with right-lateral tectonic movement between the North American and Pacific Plates. The Hayward Fault forms the east boundary of the alluvial fans and plains (zone 3) in the Hayward and Newark quadrangles (Hall 1958; Lienkaemper *et al.* 1991).

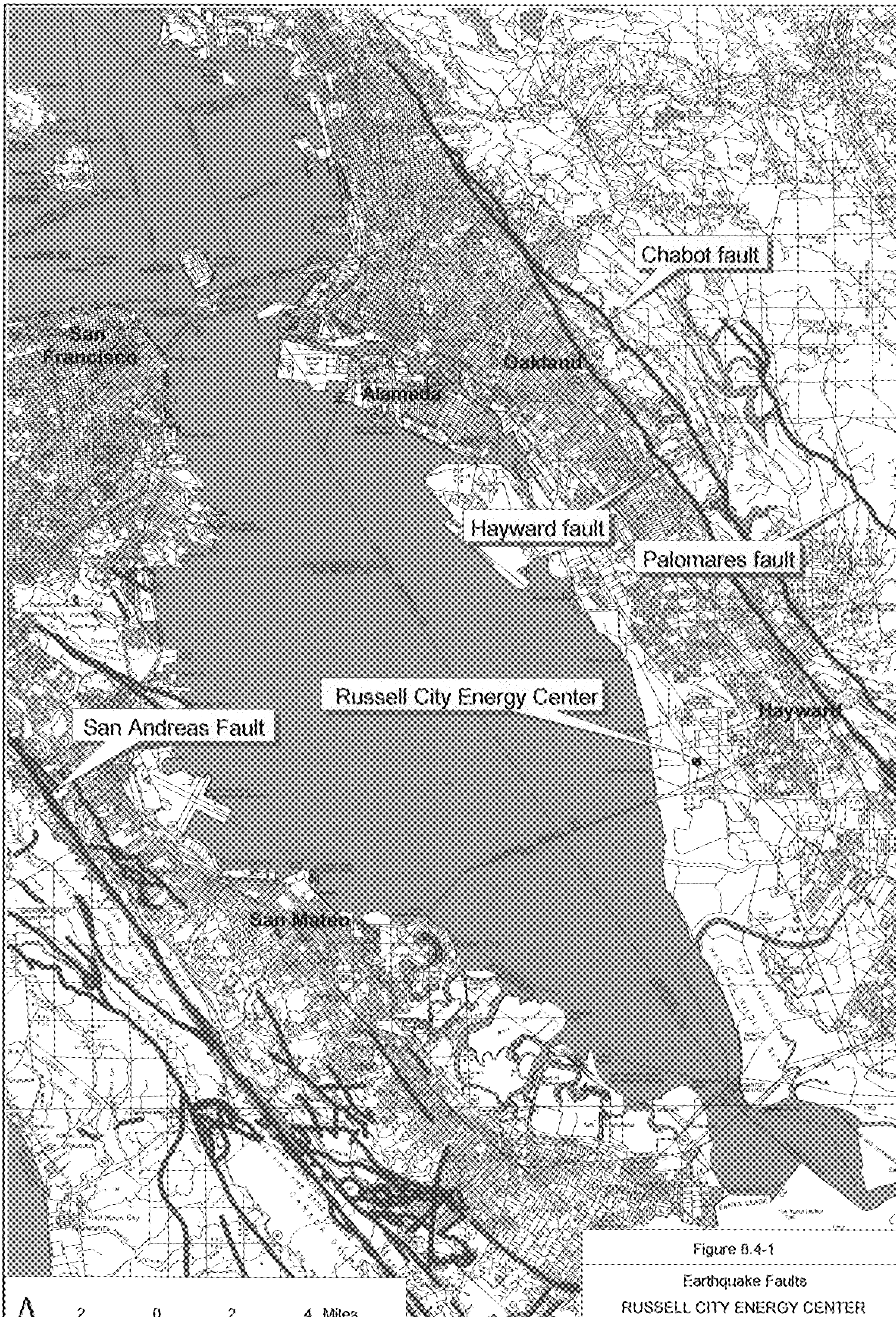


Figure 8.4-1

Earthquake Faults

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

8.4.1.4 Seismic Setting

The project site is located in a seismo-tectonically active region. Table 8.4-1 identifies all active faults that may pose a potential geologic hazard to the RCEC (Petersen *et al.*,1996). Active faults are those that show evidence of displacement during Holocene time (11,000 years ago to present). In addition, Table 8.4-1 identifies the approximate distance from the RCEC, nature of displacement, slip rate, maximum moment magnitude (M), recurrence interval, location and various other characteristics unique to each fault.

As shown in Table 8.4-1, the San Andreas Fault and Hayward Fault are close to the site and are classified as "A" type faults. Faults with an "A" classification are capable of producing large magnitude events (M $\geq$ 7.0), have a high rate of seismic activity (i.e., having slip rates greater than 5 mm/yr), and have well constrained paleoseismic data (i.e., evidence of displacement within the last 700,000 years). Table 8.4-1 also lists "B" class faults, which lack paleoseismic data necessary to constrain the recurrence intervals of large-scale events. Faults with a "B" classification are capable of producing an event of magnitude 6.5 or greater. The San Andreas Fault and Hayward Fault systems are historically the most active of those listed in Table 8.4-1 and, because of their proximity to the site, they present the greatest seismic hazard.

Hayward Fault Zone

The project site is located approximately 3 miles (5 km) west of the Hayward Fault Zone. The Hayward Fault Zone consists of one known active strand and as many as three sub-parallel strands that generally lie east of the active strand. The active strand is marked by shutter ridges, offset streams, and cultural features such as offset railroad tracks, roads, sidewalks, and building foundations; and active creep. Evidence for parallel fault strands in the eastern part of the fault zone is less abundant. For the most part, the fault traces are defined by linear features such as topographic benches and narrow ridges (USGS 1970).

The Hayward Fault Zone is the southern segment of an extensive fracture zone consisting of the Hayward Fault and the Rodgers Creek, Healdsburg, and Macama fault segments. The zone extends northwest to Mendocino County, a total distance of 175 miles (280 km). A 53-mile- (86 km-) long Hayward Fault segment extends from San Pablo Bay to an obscure convergence with the Calaveras fault near Mount Misery east of San Jose, California.

Several segments of the Hayward Fault are undergoing fault creep, a very gradual horizontal displacement that occurs both episodically and continuously (Lienkaemper *et al.* 1991). While fault creep has been documented along many segments of the Hayward Fault between San Pablo and Fremont, it has not been observed along all segments throughout the fault's length. The displacement is almost purely right-lateral although small segments have a vertical component of displacement.

San Andreas Fault

The project site is located approximately 14 miles (22 km) northeast of the San Andreas Fault. The San Andreas Fault is part of a complex system of faults, isolated segments of the East Pacific Rise, and scraps of tectonic plates lying east of the East Pacific Rise that collectively separate the North American plate from the Pacific plate (Wallace 1990). Relative movement between the Pacific and the North American tectonic plates dominates the regional seismo-tectonic setting. The boundary between the Pacific and North American tectonic plates extends from the Rivera triple junction, south of Baja California,

Table 8.4-1. Active faults in the project area.

FAULT NAME AND GEOMETRY (ss) strike slip, (r)reverse, (n) normal (rl) rt. lateral, (ll) left lateral, (o) oblique	Distance from RCEC (km)**	Length (km)	Slip Rate (mm/yr)	Rank (1)	Mmax (2)	R.I. (3)	Rake	dip	Endpt. N	Endpt. S	Comment
A FAULTS											
SAN ANDREAS FAULT ZONE											
San Andreas (Peninsula) (rl-ss)	22	88	17.00	M	7.1	400	180	90	-122.60;37.81	-122.60:37.18	Slip rate is based on Clahan, et al. (1995) and assumptions by WGNCEP (1996). Max. magnitude base on 1.6 m displacement.
San Andreas (1906) (rl-ss)	22	470	24.00	M	7.9	210	180	90	-121.41;40.25	-121.51;36.82	Slip rate based on Neimi and Hall (1992) and Prentice, et al (1991). Assumption that 1906 events rupture North Cost, Pennisula, and Santa Cruz Mtns. Segments to San Juan Bautista. Max magnitude based on 1906 average 5 m dispacement (WGCEP, 1990: Liekaemper, 1996)
HAYWARD – RODGERS CREEK FAULT ZONE											
Hayward (total length) (rl-ss)	5	86	9.00	M-W	7.1	167	180	90	-122.41; 38.05	-121.81; 37.45	Well constrained slip rate for southern segment reported by Lienkaemper, et al. (1995) and Lienkaemper and Borchardt (1995). Recurrence (167 yrs) and slip per event (1.5 m) are based on WGCEP (1990). Model weighted 50%.
Hayward (south) (rl-ss)	5	43	9.00	W	6.9	167	180	90	-121.13; 37.73	-121.81; 37.45	Well constrained slip rate reported by Lienkaemper, et al. (1995) and Lienkaemper and Borchardt (1996). Recurrence (167 yrs) and slip per event (1.5 m) are based on WBCEP (1990). The southern segment can be projected to Calaveras fault along prominent zone of seismicity. Net slip rate of 9 mm/yr can be resolved into 3 mm/yr vertical and 7.6 mm/yr r.l. along postulated Mission Link blind thrust of Andrews, et al (1992) along with southern connection. Model weighted 50%.
Hayward (north) (rl-ss)	20	43	9.00	M	6.9	167	180	90	-122.41; 38.05	-122.13; 37.73	Well constrained slip rate for southern segment reported in Lienkaemper, et al. (1995) and Lienkaemper and Borchardt (1996). Recurrence (167 yrs) and slip per event (1.5 m) are based on WGCEP (1990). Model weighted 50%

Table 8.4-1. (continued).

FAULT NAME AND GEOMETRY (ss) strike slip, (r)reverse, (n) normal (rl) rt. lateral, (ll) left lateral, (o) oblique	Distance from RCEC (km)**	Length (km)	Slip Rate (mm/yr)	Rank (1)	Mma x (2)	R.I. (3)	Rake	dip	Endpt. N	Endpt. S	Comment
Rodgers Creek (rl-ss)	65	63	9.00	M	7.0	222	180	90	-122.77; 38.54	-122.34; 38.09	Slip rate is composite of slip rate reported by Schwartz, et al. (1992) and slip rate from Hayward fault (Lienkaemper and Borchardt, 1996). Recurrence (222 yrs) and slip per event (2.0 m) are based on WGCEP (1990).
B FAULTS											
SAN GREGORIO-HOSGRI FAULT ZONE											
Hosgri (rl-ss)	40	172	2.50	M-P	7.3	646	180	90	-121.73; 36.15	-120.69; 34.86	Slip rate based on San Simeon fault slip rate reported in Hanson and Lettis (1994).
San Gregorio (Sur region) (rl-ss)	40	80	3.00	P	7.0	411	180	90	-122.16; 36.81	-121.74; 36.18	Late Qt. Slip rate of 1-3 mm/yr based on assumed transfer of slip from Hosgri flt. Slip rate from San Simeon flt. (Hanson and Lettis (1994) and Hall et al (1994).)
San Gregorio (rl-ss)	50	129	5.00	P	7.3	400	180	90	-122.67; 37.89	-122.13; 36.81	Weber and Nolan (1995) reported Holocene slip rate of 3-9 mm/yr; latest Pleistocene slip rate of 5 mm/yr (min) and lt. Qt. Slip rate of about 4.5 mm/yr reported by Simpson, et al. (written communication to J. Lienkaemper, 1995).
CALAVERAS FAULT ZONE											
Calaveras (s. of Calaveras Reservoir) (rl-ss)	20	106	11	P-M	6.2	33	180	900	-121.79; 37.43	-121.18; 36.62	Includes Paicines fault south of Hollister. Slip rate is composite based on slip rate for a branch of Calaveras fault reported by Perkins & Sims (1988) and slip rate of Paicines fault reported by Harms, et al. (1987). Creep rate for fault zone approximately 15 mm/yr. Maximum earthquake assumed to about 5.2 (Oppenheimer, et al., 1990).
Calaveras (north of Calaveras Reservoir) (rl-ss)	15	52	5	M	6.8	146	180	90	-122.03; 37.86	-121.81; 37.45	Slip rate based on composite of 5 mm/yr rate reported by Kelson, et. al (1996) and 6 mm/yr creep rate from small geodetic net reported by Prescott and Lisowski (1983).

Table 8.4-1. (continued).

FAULT NAME AND GEOMETRY (ss) strike slip, (r)reverse, (n) normal (rl) rt. lateral, (ll) left lateral, (o) oblique	Distance from RCEC (km)**	Length (km)	Slip Rate (mm/yr)	Rank (1)	Mma x (2)	R.I. (3)	Rake	dip	Endpt. N	Endpt. S	Comment
BAY AREA											
Concord-Green Valley (rl-ss)	60	66	6.00	M	6.9	176	180	90	-122.20; 38.45	-121.98, 37.89	Moderately constrained slip rate for Concord fault based on Snyder, et al. (1995). Slip rate of 6 mm/yr should be considered a minimum. No slip rates reported for Green Valley fault.
Greenville (rl-ss)	40	73	2.00	P	6.9	521	180	90	-121.94; 37.98	-121.50; 37.42	Wright, et al (1982) reported a slip rate of about 1 mm/hr, based on an offset stream channel. A 10 km rl offset of a serpentinite body suggests a long term slip rate of 2-3 mm/yr.
Hayward (SE extension) (rl-r-o)	5	26	3.00	U	6.4	220	180	90	-121.90; 37.47	121.72; 37.28	Unconstrained slip rate based on slip budget between adjacent Calaveras flt. and assumed major slip junction of Calaveras and Hayward flt. (WGNCEP, 1996). Possible significant reverse component not considered.
Monte Vista-Shannon (r 45, E)	45	41	0.40	P-M	6.8	2410	90	45	-122.19; 37.38	-121.79; 37.21	Poorly constrained slip rate based on vertical separation of late Pleistocene terrace and assumptions of age of terrace (23-120 ka) and flt. Dip reported by Hitchcock, et al. (1994). Actual dip and fault width is variable. 15 km width approximates average.
Ortigalita (rl-ss)	45	66	1.00	P	6.9	1153	180	90	-121.28; 37.28	-120.91; 36.76	Poorly constrained slip rate based on vertical slip rate reported by Clark, et al (1984) (0.01-0.04 mm/yr), assumptions regarding H:V ratio, and geomorphic expression of flt. Consistent with about 1 mm/yr.
Point Reyes (r, 50 NE)	90	47	.030	P	6.8	3503	90	50	-123.24; 38.18	-122.83; 37.94	Poorly constrained long term (post-Miocene) slip rate based on vertical offset of crystalline basement (McCulloch, 1987).
Quien Sabe (rl-ss)	40	23	1.00	P	6.4	647	180	90	-121.36; 36.93	-121.21; 36.76	Poorly constrained slip rate estimated by authors based on vertically offset alluvial fan (Bryant, 1985) and assumptions regarding H:V ratio (6:1 to 14:1) based on 26JAN86 M5.8 earthquake (Hill et al, 1990) and age of fan surface based on soil profile development.

Table 8.4-1. (continued).

FAULT NAME AND GEOMETRY (ss) strike slip, (r)reverse, (n) normal (rl) rt. lateral, (ll) left lateral, (o) oblique	Distance from RCEC (km)**	Length (km)	Slip Rate (mm/yr)	Rank (1)	Mmax (2)	R.I. (3)	Rake	dip	Endpt. N	Endpt. S	Comment
Sargent (rl-r-o)	45	53	3.00	P	6.8	1200	180	90	-121.94; 37.14	-121.45; 36.87	Slip rate is rl. Creep rate reported by Prescott and Burford (1976). Nolan, et al. (1995) reported a minimum Holocene rl slip rate of 0.6 mm/yr in Pajaro River area, found evidence suggesting 0.8m of rl offset and a recurrence interval of about 1.2 ka. However, the penultimate event about 2.9 ka was characterized by about 1.7m of rl offset, suggesting max. earthquake of M 6.9. Recurrence of 1.2 ka used, but further work necessary to resolve maximum magnitude, slip rate, and recurrence.
West Napa (rl-ss)	55	30	1.00	U	6.5	701	180	90	-122.37; 38.41	-122.24; 38.16	Unconstrained slip rate based on assumption that geomorphic expression of fault is consistent with about 1 mm/yr slip rate (WGNCEP, 1996).
Zayante-Vergeles (rl-r)	48	56	0.10	P	6.8	8821	180	90	-121.97; 37.09	-121.46; 36.79	Slip rates reported by Clark, et al (1984).

(1) W = well-constrained slip rate; M = moderately constrained slip rate; P = poorly constrained slip rate.
(2) Maximum moment magnitude calculated from relationships (rupture area) derived by Wells and Coppersmith (1994)
(3) R.I. = recurrence interval
* Data from Petersen et al., 1996. Probabilistic Seismic Hazard Assessment for the State of Califonia.
** Approximate distance.

northwards to the Mendocino triple junction. Atwater (1970) and, more recently, Irwin (1990) describe the evolution of the Pacific-North American plate boundary. For much of the length of the plate boundary, and certainly for the site region, the San Andreas Fault functions as a transform fault (tectonic plate boundary) with strike-slip displacement (Wilson 1965).

Local Seismicity

Earthquakes in the San Francisco Bay area during the past 15 years are concentrated near the juncture of the San Andreas Fault and Calaveras faults, and in the East Bay area. Seismicity along the San Andreas Fault on the San Francisco Peninsula is relatively low compared to the Calaveras-Hayward-Rogers Creek Fault Zone. On the Hayward Fault, small earthquakes are common throughout most of the fault length through San Pablo southeast to Fremont. South of Fremont, the Hayward Fault is seismically quiet. The seismicity, however, continues along a zone trending more southeasterly, denoting an active connection with the Calaveras fault near the Calaveras Reservoir. On the Calaveras fault north of this juncture there is no obvious correlation between seismicity and the mapped trace of the Calaveras fault. This high level of seismic activity present along the Calaveras fault south of Calaveras Reservoir transfers to the Hayward Fault near Fremont (USGS 1987).

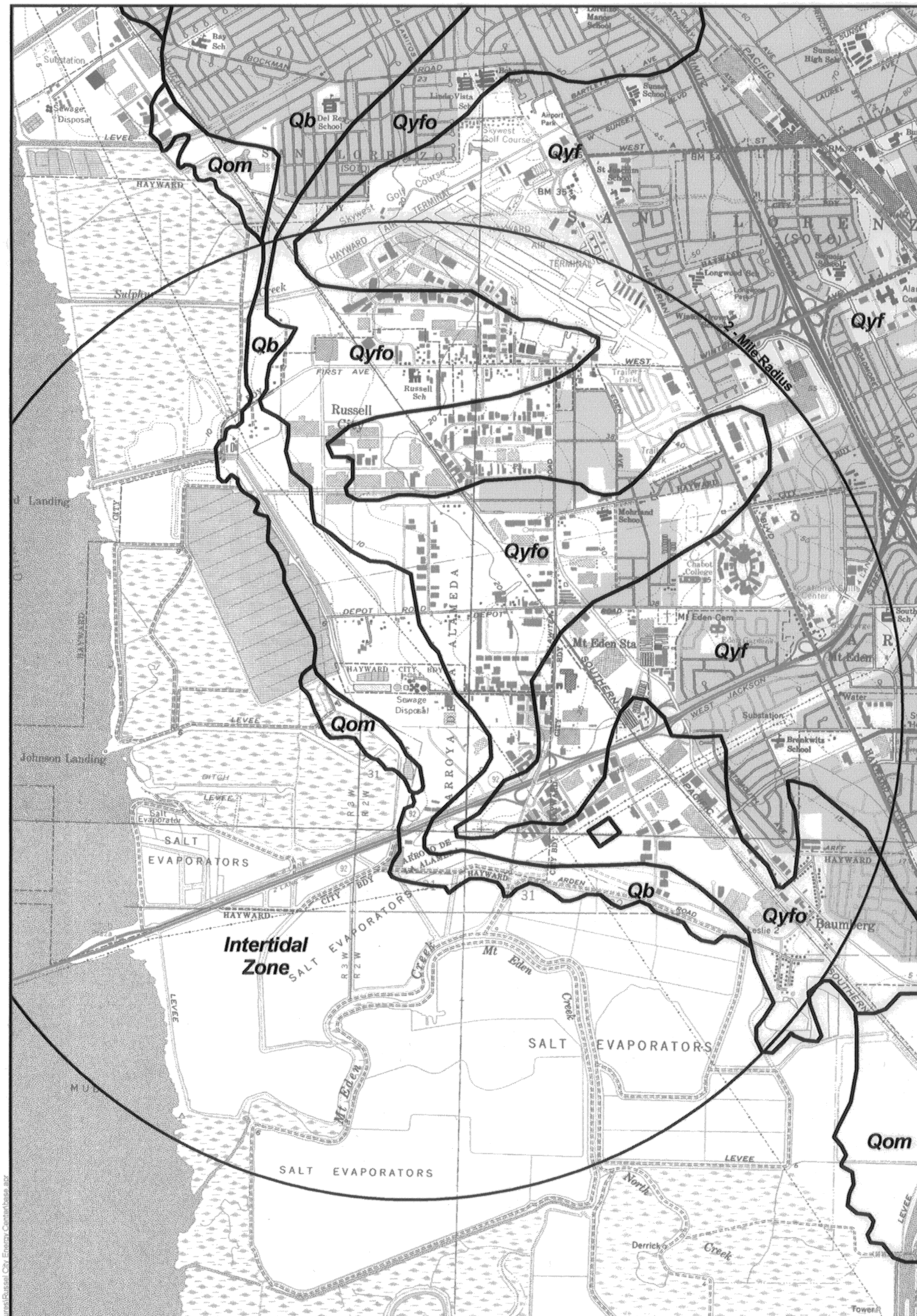
Earthquake History

A number of moderate to great earthquakes (greater than a M6) have affected the Bay Area; 22 such events have occurred in the last 160 years, averaging one every seven years. Earthquakes of magnitudes greater that 6 have occurred within 30 kilometers of the Hayward Fault in 1836, 1858, 1864, 1865, 1868, 1898, 1906, 1911, 1984, and 1989. Only the 1836 and 1868 events caused surface rupture of the Hayward Fault. Earthquakes of magnitude greater than 5.0 that have occurred within 62 miles (100 km) of the site are identified in Table 8.4-2. Historically, more earthquakes greater than magnitude 5 have occurred on the Calaveras-Hayward-Rogers Creek zone than on the adjacent segment of the San Andreas Fault.

8.4.1.5 Site Geology

Figure 8.4-2 is depicts the geology beneath the project site and transmission and gas pipeline routes (Helley, et al., 1972). On a regional scale, the project features are underlain by unconsolidated Holocene (Q) inter-tidal and alluvial fan, basin, and plain deposits, ranging from clay to gravel in particle size. As shown on Figure 8.4-2, the project site and electric transmission line, and water and gas pipeline routes are underlain by fine grain infterfluvial basin deposits (Qb), medium grain younger fluvial fan and plain deposits (Qyfo), coarse grain younger alluvial fan and basin deposits (Qyf), and fine grain older Bay Mud deposits (Qom). The RCEC is located in the flood basin zone and is underlain by Qb deposits.

The interfluvial basin fine grain deposits (Qb) consist of plastic, poorly sorted, organic-rich clay and silty clay and locally contains thin beds of well-sorted silt, sand, and fine gravel and that interfingers with the younger fluvial deposits (Qyfo). The Qyfo deposits consist of loose, moderately sorted fine to medium sand, silt, and silty clay and that interfingers with the younger alluvial fan deposits (Qyf). The Qyf deposits consist of unconsolidated, moderately sorted, permeable fine sand and silt with gravel becoming more abundant toward fan heads, located east of the site. The physical properties of the sediments underlying the project site and pipeline route are summarized in Table 8.4-3.



N

2000 0 2000 Feet

1:24,000

Qb - Quarternary Basin
Qom - Older bay mud
Qyfo - Younger fluvial fan
Qyf - Younger fan

Sources: Helley, et al., 1972. USGS Quad DRG - GIS Data Depot

Figure 8.4-2

Geology

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Table 8.4-2. Earthquakes within 100 km of the project area.

Distance[3] (Km)	Source[1]	Date						Location		Local Magnitude	Maximum[2] Intensity
		Year	Month	Day	Hour	Minute	Second	Latitude	Longitude		
3	DNA	1864	05	21	02	01	0.04	37.500	122.000	5.80	
11	DNA	1858	11	26	08	35	0.04	37.500	121.900	6.30	
14	CCN	1999	04	23	16	43	43.2	37.387	122.037	5.40	
20	DNA	1868	10	21	15	53	0.04	37.700	122.100	6.80	
23	USN	1955	09	05	02	01	18.0	37.400	121.800	5.8	VII
24	CCN	1989	04	03	17	46	34.2	37.432	121.770	5.00	
28	CCN	1988	06	13	01	45	36.5	37.393	121.740	5.00	
34	DNA	1838	06	--	--	--	4	37.600	122.400	7.00	
34	DNA	1836	06	10	15	30	0.04	37.800	122.200	6.80	
34	DNA	1856	02	15	13	25	0.04	37.600	122.400	5.90	
36	ISC	1986	03	31	11	55	39.1	37.525	121.617	5.60	
36	SIG	1980	01	24	19	0	0	37.800	121.800	5.90	VII
36	BRK	1984	04	24	21	15	19.0	37.320	121.700	6.20	
37	ISC	1980	01	27	02	33	34.9	37.776	121.753	5.00	
37	SIG	1984	04	24	21	15	0	37.300	121.700	6.20	VII
38	T-A	1911	07	01	22	0	0	37.250	121.750	6.60	
39	CCN	1990	04	07	02	39	17.50	37.876	121/979	5.09	
41	DNA	1935	09	10	23	55	0.04	37.850	122.250	5.00	
42	CCN	1989	08	08	08	13	27.4	37.145	121.927	5.00	
45	BRK	1988	06	27	18	43	22.3	37.131	121.878	5.30	
46	USN	1957	03	22	19	44	21.0	37.700	122.500	5.30	VII
50	SIG	1989	10	18	0	04	0	37.100	121.800	7.10	IX
52	PDE	1989	10	25	01	27	26.6	37.078	121.832	5.00	
52	DNA	1808	06	21	0	0	0.04	37.800	122.500	6.30	

Table 8.4-2. (continued)

Distance[3] (Km)	Source[1]	Date						Location		Local Magnitude	Maximum[2] Intensity
		Year	Month	Day	Hour	Minute	Second	Latitude	Longitude		
53	USN	1955	10	24	04	10	44.0	38.000	122.000	5.40	VII
56	PDE	1989	10	18	0	25	04.9	37.043	121.807	5.0	
57	DNA	1926	10	24	22	51	49.54	37.020	122.200	5.50	
58	CCN	1998	10	14	02	22	53.1	37.620	121.371	5.50	
58	DNA	1840	01	16	0	0	0.04	37.000	122.100	6.33	
59	DNA	1919	09	04	20	15	45.04	38.000	122.330	5.00	
59	DNA	1964	11	16	02	46	41.74	37.060	121.690	5.00	
60	DNA	1866	03	26	20	12	0.04	37.100	121.600	5.90	
60	PAS	1967	12	18	17	24	31.9	37.010	121.788	5.20	
64	CCN	1989	10	18	0	7	43.4	36.989	121.737	5.09	
64	DNA	1979	08	06	17	5	22.44	37.109	121.511	5.90	
64	ROT	1964	11	15	02	46	43.0	37.000	121.717	5.20	
68	DNA	1881	04	10	10	0	0.04	37.300	121.300	6.00	
69	BRK	1990	04	18	15	46	3.5	36.951	121.702	5.09	
69	USN	1959	03	02	23	27	17.0	37.000	121.600	5.30	VI
72	GS	1999	08	18	01	06	18.9	37.907	122.686	5.00	V
74	BRK	1993	01	16	06	29	34.9	37.025	121.459	5.30	
74	PDE	1990	04	18	13	41	38.8	36.918	21.670	5.00	
74	USN	1949	03	09	12	28	39.0	37.000	121.500	5.10	VII
74	USN	1954	04	25	20	33	28.0	36.900	121.700	5.30	VIII
74	DNA	1897	06	20	20	14	0.04	37.000	121.500	6.30	
78	ISC	1990	04	18	13	53	50.5	36.872	121.670	5.30	
78	PAS	1974	11	28	23	01	21.8	36.902	121.607	5.00	
82	DNA	1898	03	31	07	43	0.04	38.200	122.400	6.50	

Table 8.4-2. (continued)

Distance[3] (Km)	Source[1]	Date						Location		Local Magnitude	Maximum[2] Intensity
		Year	Month	Day	Hour	Minute	Second	Latitude	Longitude		
83	BDA	1974	11	03	08	26	10.4	36.000	121.500	5.00	VI
83	DNA	1864	02	26	13	47	0.04	36.900	121.500	5.90	
87	DMG	1902	05	19	18	31	0	38.300	121.900	5.50	VIII
91	G-R	1926	10	22	12	35	11.0	36.700	122.000	6.10	VIII
92	DNA	1892	11	13	12	45	0.04	36.800	121.500	6.00	
92	PAS	1969	10	27	10	59	41.1	36.895	121.345	5.00	
94	DNA	1939	06	24	13	01	54.04	36.800	121.450	5.50	
97	BRK	1960	01	20	03	25	53.0	36.780	121.430	5.00	
98	GS	1998	08	12	14	10	25.1	36.755	121.464	5.30	
100	SIG	1906	04	18	13	12	0	38.000	123.000	8.30	XI

(1) BDS M. Bath and S. Duda (1979).
BRK Berkeley, Haviland, California, USA.
CCN Central California Network (See U.S. Geological Survey 1969-77).
DMG California Division of Mines and Geology (Real and others, 1978).
DNA Decade of North American Geology (DNA project).
G-R Gutenberg and Richter, 'Seismicity of the Earth'.
GS U.S. Geological Survey, Denver, CO, USA.
ISC International Seismological Centre, Newbury, UK.
NAO Norse Array Observatory, Norway
PAS Pasadena, California.
PDE Preliminary Determination of Epicentres from NEIS/CGS.
ROT Rothe, J.P. 'The Seismicity of the Earth', 1953-1965, UNESCO, 1969.
SIG Catalog of Significant Earthquakes (Dunbar, Lockridge, Whiteside, 1993).
T-A S. D. Townley and M. W. Allen (1939).
USN U.S. Network Catalog (Hays and others, 1975).

(2) "Maximum Intensity" is another measurement of perceptible ground movement. However, Local Magnitude was used whenever possible throughout the study.

(3) "Distance in kilometers" is equal to the radial distance from the site.

Table 8.4-3. Physical properties of local sedimentary deposits.

Geol. Unit	No. of Samples	Depth of Test (ft)	Natural Dry Density (lb/ft³)	Natural Moisture Content (% dry wt.)	Penetrometer (blows/ft)	Infiltration Rate (in/hr⁺)
Qyf	122	8.1 ± 5.2	115 ± 9	18.3 ± 8.1	35 ± 22	0.6 - 2.0
Qyfo	40	7.6 ± 5.9	118 ± 8	17.9 ± 7.9	50 ± 17	0.06 - 0.2
Qb	---	---	---	---	---	0.06 - 0.6
Qm	---	---	---	---	---	---
Qof (shallow)	76	4.2 ± 4.2	121 ± 7	16.6 ± 4.8	26 ± 19	0.2 - 2.0
Qof (deep)	21	7.7 ± 4.9	123 ± 7	14.2 ± 5.7	116 ± 50	---
Qom	---	---	---	---	---	<0.06
QTs (shallow)	39	2.5 ± 2.2	116 ± 8	22.6 ± 7.0	23 ± 15	---
QTs (deep)	17	7.2 ± 3.3	120 ± 4	19.5 ± 6.7	92 ±24	---

* From standard soil survey – State of California, Department of Public Works, Division of Highways.

\+ Modified from U.S. Soil Conservation Service. 1981. Soil Survey, Alameda County, California, Western Part. p. 103.

Soil boring logs from borings advanced at the eastern portion of the project site indicate fill material consisting of moist, fine to medium grain, clayey sand extending to a depth of approximately 3 feet below ground surface (bgs). Below a depth of 3 feet, a black, silty clay unit is encountered and extends to the total depth of the boreholes, approximately 15 feet. Groundwater was encountered at approximately 6 feet bgs within each boring.

The sediments that underlie the project site and linear project features will be referred to herein as "younger Bay mud." The younger Bay mud is between 20 and 60 feet in thickness and overlies the older Bay mud. The older Bay mud deposits are substantially different from the younger Bay mud. Since it is more deeply buried, the older Bay mud has been consolidated by lithostatic pressure from above and consequently contains less moisture. As a result, the older Bay deposits provide a good foundation for poles and similar structures (BCDC 1967).

The older Bay mud overlies bedrock of the Franciscan Formation, which consists of a sequence of greenstones, greywacke, radiolarian chert and serpentinite (Helley and Miller 1992). The unconformable contact between the older Bay mud and bedrock is approximately 400 feet below ground surface (bgs) in the vicinity of the project site (Hazelwood 1976).

The top layers of younger Bay mud are highly compressible and lose considerable strength when disturbed. As a result, the younger Bay mud creates foundation problems for construction. Special consideration as to design of structures and supporting foundation members must be taken into account when building on this material (BCDC 1967). When the younger Bay mud is overloaded by fill, it becomes increasingly unstable as the thickness of the fill increases and will ultimately fail if the slopes at the edge of the fill are steep (BCDC 1967). The strength of the younger Bay mud increases with depth as a result of the overlying pressure. Like the older Bay mud, the lower levels of the younger Bay mud have been consolidated and may provide a good foundation for poles and similar structures.

8.4.1.6 Geologic Hazards

This section analyzes the existing geologic hazards within and surrounding the project site. There are five hazards in this area that could be potentially significant. These hazards are:

- Seismic ground shaking
- Ground rupture
- Ground failure
- Subsidence and settlement
- Seismic seiches

Seismic Ground Shaking

The most important geologic hazard that could affect the project is the risk to life and property from an earthquake generated by the Hayward Fault or the San Andreas Fault, which are capable of producing magnitude 7.1 and 7.9 events, respectively.

The project site is located in Seismic Zone 4 according to the California Building Code (CBC) 1998. This location implies a minimum horizontal acceleration of 0.4g for use in earthquake resistant design. Mualchin and Jones (1992) produced a map of maximum credible earthquake accelerations for California; their figure for the site indicates a horizontal acceleration of 0.5g.

Ground motions can be estimated by probabilistic method at specified hazard levels. The intensity of ground shaking depends on the distance of the earthquake epicenter to the site, the magnitude of the earthquake, site soil conditions, and the characteristic of the source. The California Division of Mines and Geology (CDMG) and the USGS recently completed a study to identify the seismic hazard based on a review of these characteristics and historical seismicity throughout California (Petersen, *et al.* 1996). The results of these studies suggest there is a 10 percent probability that the peak horizontal acceleration experienced at the site would exceed 0.55g in 50 years. However, this value is based on firm rock site conditions ($V \geq 760$ m/s). Because the RCEC will be located on the younger Bay mud ($V \leq 360$ m/s), it is likely to experience greater amplification of seismic shaking during an earthquake. Studies from past earthquakes show that such "poor ground" poses a greater potential hazard than does proximity to the fault or to the center of the earthquake.

Recent observations of geodetic strain and fault creep indicate that the current rate of strain accumulation along the Hayward Fault is approximately 9 mm/yr. Whether this rate is representative of the entire fault zone for the entire 167-year recurrence interval is unknown. However, Coppersmith (1982) estimated a probability of 14 to 26 percent for a M7 event to occur within the next 50 years along the Hayward Fault assuming strain accumulations (slip) rates of 3mm/yr and 6 mm/yr, respectively.

Earthquake planning scenarios published by the USGS (1982 and 1987) were reviewed for the San Andreas Fault and Hayward Fault. The planning scenarios contained predicted seismic intensity distribution maps (PSIDM) for a M8.3 earthquake on the San Andreas Fault (based on 1906 Earthquake) and a M7.1 for the Hayward Fault, based on a postulated rupture of the entire 53-mile (86 km) length of the fault. The PSIDMs depict severe shaking with partial or total destruction of some buildings. Both scenarios take into account the various ground (geologic) conditions and their impact on seismic wave fronts.

Ground Rupture

Three fault systems can affect the subject site: the northern extension of the Silver Creek Fault to the south, the San Andreas Fault to the southwest, and the Hayward Fault to the east, located approximately 5, 14, and 3 miles (8 km, 22 km, and 5 km) from the site, respectively. The northern extension of the Silver Creek Fault is an inferred fault with no reported recent (Holocene) activity and is not considered active. The active faults nearest to the project site are the Hayward Fault and San Andreas Fault. Surface rupture would likely occur immediately along the known trace of the Hayward Fault and San Andreas Fault, while severe shaking would occur at the project site. No known active faults cross the plant site or the water and natural gas pipelines and electric transmission line routes.

Ground Failure/Liquefaction

Liquefaction is a process by which water-saturated materials (including soil, sediment, and certain types of volcanic deposits) lose strength and may fail during strong ground shaking. Liquefaction is defined as "the transformation of a granular material from a solid state into a liquefied state as a consequence of increased pore-water pressure" (Youd 1992). This behavior is most commonly induced by strong ground shaking associated with earthquakes. In some cases, a complete loss of strength occurs and catastrophic ground failure may result. However, liquefaction may happen where only limited strains develop, and ground surface deformations are much less serious.

Sediments underlying the project site have a high liquefaction potential. The project site is located in a region designated as having a "high potential" for ground failure in the event of a major earthquake. This "high potential" is attributed to the seismic activity of the San Andreas Fault and Hayward Fault, the shallow depth to groundwater (between 5- and 10-feet bgs for the RCEC), and the unconsolidated to weakly consolidated younger Bay mud beneath the site.

There are four types of ground failure or collapse of soil structures that commonly result from liquefaction: lateral spread, flow failure, ground oscillation, and loss of bearing strength. Based on the site geology and topography, there is a moderate to high potential for the effects of lateral spread, ground oscillation and loss of bearing strength to be experienced in the event of a major earthquake. Each type is briefly defined below:

Lateral Spread

This term defines the lateral displacement of surficial blocks of sediment as the result of liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluidized mass, gravity plus inertial forces that result from the earthquake may cause the mass to move downslope towards a cut slope or free face (such as a river channel or a canal). Lateral spreads most commonly occur on gentle slopes that range between 0.3° and 3°, and commonly displace the surface by several meters to tens of meters. Such movement typically damages pipelines, utilities, bridges, and other structures having shallow foundations. During the 1906 San Francisco earthquake, lateral spreads causing displacement of only a few feet damaged many water supply pipelines. Thus, liquefaction compromised the ability to fight the fires that caused about 85 percent of the damage to San Francisco.

Ground Oscillation

When liquefaction occurs at depth and the slope is too gentle to permit lateral displacement, the soil blocks that are not liquefied may decouple from one another and oscillate on the liquefied zone. The resulting ground oscillation may be accompanied by opening and closing of fissures and sand boils, which may damage structures and underground utilities.

Loss of Bearing Strength

When a soil loses strength and liquefies, loss of bearing strength may occur beneath a structure, possibly causing the structure to settle and tip. If the structure is buoyant, it may float upward.

Subsidence and Settlement

Land surface subsidence can be induced by both natural and human phenomena. Natural phenomena include: subsidence resulting from tectonic deformations and seismically induced settlements; soil subsidence due to consolidation, hydrocompaction, or rapid sedimentation; subsidence due to oxidation or dewatering of organic-rich soils, and subsidence related to subsurface cavities. Subsidence related to human activity includes subsurface fluid or sediment withdrawal. Underground mining may also cause subsidence, but that is not a factor at this locality.

No evidence of subsidence has been documented in the region surrounding the RCEC. However, in the City of Newark, located approximately 10 miles (16 km) southeast of the site, documented subsidence has occurred. USGS reports indicate that land has subsided as much as 1 to 2 feet in the City of Newark and 13 feet in the region of San Jose as a result of excessive groundwater pumping. There is a potential for further subsidence in these areas because continued groundwater pumping is likely to occur.

Due to the loose, compressible nature of the younger Bay mud, there is a potential for soil settlement to occur at the site. Settlement would primarily be a consequence of an increase in overlying pressure from construction of structures associated with the project facilities. In the event of a major earthquake, subsidence and settlement will likely occur as a result of ground failure from liquefaction.

Seismic Seiches

Due to the relative proximity of the project site to the Bay, there is a potential for the project facilities to be impacted by seismic seiches resulting from the occurrence of a major earthquake along the San Andreas Fault and/or Hayward Fault. Earthquakes may affect open bodies of water in two ways: by creating seismic sea waves and by creating seiches. Seismic sea waves (often called "tidal waves") are caused by abrupt ground movements (usually vertical) on the ocean floor in connection with a major earthquake. A rise of water of even two or three feet in the Bay due to a seismic sea wave, if coupled with a high tide and onshore wind, could do serious damage to near-to-sea level developments. A seiche is a sloshing of water in an enclosed basin such as the Bay. It is caused by earthquake motion; the sloshing can occur for a few minutes or several hours. Seiches could be damaging in the Bay in the event of a large earthquake combined with a high tide and onshore winds.

8.4.1.7 Geologic Resources

The production of salt by means of a solar process using evaporation ponds is the only mineral resource in the vicinity of the project. Cargill Incorporated, located in the City of Newark, operates several salt evaporator ponds approximately 1.5 miles (2.5 km) south of the project site (CDMG SP 103, 1999) and gas and water supply and discharge pipelines, and electric transmission line routes. Soils exposed at the site and along proposed gas pipeline and transmission line corridors are unlikely to be a source of construction material because they contain too many fines-grained sediments for use as aggregate. No other geologic resources such as mines or pits were identified in the vicinity of the project site.

Recreational geologic resources typically include rock or mineral collecting, volcanoes, surface hydrothermal features, and surface expression of geologic features unique enough to generate recreational interests of the general public (e.g., natural bridges, caves, features associated with glaciation, and geomorphic features such as waterfalls, cliffs, canyons, and badlands). There are no known recreational geologic resources associated with the proposed site.

8.4.2 Environmental Consequences

The potential environmental effects from construction and operation of the RCEC on geologic resources and risks to life and property from geologic hazards are presented in the following subsections.

8.4.2.1 Significance Criteria

The project would cause a significant adverse impact to geological resources if it would:

- Significantly reduce access to geological or mineral resources of economic importance.
- Present a significant risk of injury by exposing people or structures unnecessarily to the consequences of major geologic hazards such as large seismic events.
- Cause large-scale erosion or land subsidence.

The potential for land subsidence, either seismically induced or by proposed building load factors will be further evaluated in a geotechnical investigation to be performed prior to the start of detailed design of the project facilities.

8.4.2.1 Construction Phase Impacts

RCEC Plant Site

Preparation of the ground surface at the power plant site will involve grading, leveling, and filling. The plant site is situated on interfluvial basin deposits (Qb). As noted in Table 8.4-3, underlying sediments are dense and have low infiltration rates. These sediments may require some additional drainage measures; otherwise, they present minimal problems for preparation of a level surface on which to construct the power plant. The plant site will occupy 12.55 acres of land. The site will be graded to achieve a minimum one percent slope to promote surface drainage, and areas adjacent to equipment will be surfaced with asphalt or concrete. If there is excess material that cannot be used, it will be disposed of at a suitable location offsite. Site grading will not result in large-scale erosion or adverse impacts to the geological environment.

Seismic hazards and potential adverse foundation conditions will be minimized by conformance with the recommended seismic design criteria of the CBC [CBC (1998)] Seismic Zone 4 requirements. The seismic requirements are further defined in Appendix 10-B titled, "Structural Engineering Design Criteria" and is found in Section 10-B titled, "Seismic Hazard Mitigation Criteria". The facility arrangement is such that no major structures or equipment are within the projected trace of any active or potentially active faults.

Electric Transmission Line and Eastshore Substation Expansion—The net electrical power produced by the facility will be transmitted from the switchyard, through new overhead transmission lines to PG&E's existing Eastshore Substation. Construction of the transmission towers and stringing the conductors will take place by helicopter crane, with ground support. Construction of the transmission line and expansion of the Eastshore Substation are not expected to negatively impact mineral resources since there are no known mineral resources associated with these sites. Also, these structures will be constructed in accordance with Seismic Zone 4 requirements contained in the CBC as further defined in Appendix 10-B, Section 5.1. No large-scale erosion is anticipated.

Natural Gas Pipeline—Land disturbance during construction of the 0.9 mile buried natural gas pipeline will be 3 feet wide, since the pipeline will be constructed within the roadway pavement. Pipeline excavation to a minimum depth of about 4 feet (1.3 m) in the younger alluvial fan deposits may be performed with a backhoe or trenching machine, and the soil temporarily laid in a windrow next to the trench. After the pipe is connected, it will be laid in the trench on a soil cushion and the trench backfilled with soil. Construction of the natural gas pipeline is not expected to negatively impact mineral resources since there are no known mineral resources along the pipeline route.

Wastewater Return Pipeline—Land disturbance during construction of the buried wastewater return pipeline will be 4 feet wide, since the pipeline will be constructed within the roadway pavement and will extend across Enterprise Avenue. Pipeline excavation in the younger alluvial fan deposits may be performed with a backhoe or trenching machine, and the soil temporarily laid in a windrow next to the trench. No large-scale erosion is anticipated. After the pipe is connected, it will be laid in the trench on a soil cushion and the trench backfilled with soil. Constructions of the pipeline is not expected to negatively impact mineral resources since there are no known mineral resources associated along the pipeline route.

AWT Plant

The AWT plant will be located next to the RCEC. Construction-related impacts would be the same or less than those associated with the power plant. Four water pipelines will cross Enterprise Avenue. The potential impacts will be the same for the RCEC wastewater return line described above.

Construction Laydown and Worker Parking Areas

These areas occur on developed land on previously disturbed ground. No significant adverse impacts to geological resources are expected. The Depot Road and Enterprise Avenue sites are surfaced in gravel. The PG&E substation site is open field, but disturbance due to parking and laydown would be minimal.

8.4.2.2 Operation Phase Impacts

RCEC Plant Site

The plant structures and equipment will be designed in accordance with CBC, Seismic Zone 4 requirements, which are further defined in Appendix 10-B, Section 5.1. Compliance with the CBC (1998), Seismic Zone 4 requirements will minimize the exposure of people to the risks associated with large seismic events. In addition, the major structures will be designed to withstand the strong ground motion of a design earthquake. A design earthquake is the postulated earthquake that is used for evaluating the earthquake resistance of a particular structure. Because the seismic hazard in the region of the project area is relatively well defined, the design earthquake would be established by the maximum, or characteristic, magnitude earthquake that can potentially occur on those faults identified on Table 8.4-1.

No major structures or equipment are within the projected trace of any active faults.

Electrical Transmission Line and Eastshore Substation Expansion—The pads for the transmission line towers will be founded on piles or piers in unconsolidated deposits of fine sand, silt and silty clay (Qyfo and Qyf). The tower pads will be designed and constructed in accordance with CBC, Seismic Zone 4 requirements and will be designed to withstand strong ground motion of a design earthquake. The transmission line will not cross the projected trace of any active faults.

Natural Gas Pipeline—The natural gas pipeline will be constructed in unconsolidated deposits of fine sand, silt and silty clay (Qyfo and Qyf). The pipeline will be designed to withstand the strong ground motion and ground failure (liquification) of a design earthquake.

Wastewater Return Pipeline—The wastewater discharge pipeline will be constructed in unconsolidated deposits of fine sand, silt and silty clay (Qyfo and Qyf). The pipeline will be designed to withstand the strong ground motion and ground failure (liquefaction) of a design earthquake.

AWT Plant

Design criteria for the AWT plant and any potential impacts will be similar to those described for the RCEC plant.

8.4.2 Cumulative Impacts

The project facilities will be constructed to the requirements of the CBC Seismic Zone 4. Site-specific geotechnical investigations will be performed prior to final design and construction. Since construction and operation of the project will not cause significant impacts to geological resources, it will not cause cumulative impacts to geological resources.

8.4.3 Proposed Mitigation Measures

Mitigation measures for the project are as follows:

- Perform geotechnical field surveys to locate geologic hazards at the plant site and natural gas pipeline route to evaluate their impact on the construction activities and the environment.
- Structures will be designed to meet seismic requirements of the 1998 CBCs. Moreover, the design of plant structures and equipment will be in accordance with CBC, Seismic Zone 4 requirements to withstand the strong ground motion of a design earthquake.
- An engineering geologist(s), certified by the State of California, will be assigned to the project to carry out the duties required by the CBC to monitor geologic conditions during construction and approve actual mitigation measures used to protect the facility from geologic hazards.
- Modifications of existing topography will not destroy any unique geologic or topographic features.

8.4.4 Applicable Laws, Ordinances, Regulations, and Standards

Design, construction and operation of the RCEC will be conducted in accordance with applicable laws, ordinances, regulations, and standards (LORS) pertinent to geologic resources and hazards during and following construction. The LORS are summarized in Table 8.4-3.

Table 8.4-3. LORS Applicable to geologic resources and hazards.

LORS	Applicability	Mitigation Effective?	AFC Reference
CBC (California Building Code)	Design and construction of manmade structures with respect to seismic safety features; design and construction of open excavations.	Yes	Section 8.4.5.2

8.4.5.1 Federal

The Uniform Building Code [UBC (1997)] specifies the acceptable design criteria for construction of facilities with respect to seismic design and load bearing capacity. However, the CBC incorporates by reference the UBC and contains additional requirements, and is the applicable code to be followed for the proejct.

8.4.5.2 State

The CBC (1998) specifies the acceptable design criteria for construction of facilities with respect to seismic design and load-bearing capacity.

8.4.6 Involved Agencies and Agency Contacts

There is one agency that is involved with geologic resources and hazards at the project site. The agency contact is listed in Table 8.4-4.

Table 8.4-4. Involved agencies and agency contacts.

Issue	Contact/Agency	Title	Telephone
Building Permit; Grading/Drainage/Erosion Control Permit	City of Hayward Department of Public Works	Planning and Permitting	(510) 583-4720

8.4.7 Permits Required and Schedule

Permits required for matters dealing with geologic resources and hazards for the project and the schedule to obtain each of these permits are provided in Table 8.4-5. Information required to obtain each permit is also included.

Table 8.4-5. Permits required and permit schedule.

Permit/Required Information	Schedule
Building Permit including Seismic Design Criteria: • 30 day review and approval process • Requires structural, civil, electrical and mechanical plans • Geotechnical/Geologic report • Identify geologic hazards and potentially conduct a seismic risk analysis • Architectural plans	Submit application 30 days prior to start of construction.
Grading/Drainage/Erosion Control Permit: • Engineered Grading Plan • Topographic Plan • Drainage controls • Surface Hydrology Report • Geotechnical/Geological Hazard Evaluation • Identify material source or disposal location and haul route • Erosion and Dust Control Plan • Traffic Control Plan	Submit application 30 days prior to start of construction activities.

8.4.8 References

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8.5 HAZARDOUS MATERIALS HANDLING

This section presents an evaluation of potential impacts to human health and the environment from the storage and use of hazardous materials in conjunction with the RCEC and the Advanced Wastewater Treatment (AWT) plant. A full description of the project is presented in Section 2. Closure of the RCEC is discussed in Section 4.

Section 8.5.1 describes the existing environment that the project may affect. Section 8.5.2 identifies potential impacts on the environment and human health from development of the project. Section 8.5.3 investigates potential cumulative impacts. Section 8.5.4 presents proposed mitigation measures, and Section 8.5.5 presents the laws, ordinances, regulations, and standards (LORS) applicable to hazardous materials. Section 8.5.6 describes the agencies involved and provides agency contacts, and Section 8.5.7 describes permits required. Section 8.5.8 provides the references used to develop this section.

8.5.1 Affected Environment

The project site is located within the City of Hayward. Land use in the vicinity of the all three sites is zoned for industrial use. Industrial buildings and warehouses are located to the north, west, and east. There are no sensitive receptors (such as schools, hospitals, daycare facilities, convalescent centers, or emergency response facilities) within a 1-mile radius of the RCEC (see Figure 8.9-2 in Section 8.9, Public Health). The nearest residences are located 0.82 miles from the site.

Hazardous and acutely hazardous materials will be stored at the RCEC during operation of these facilities. Hazardous materials will also be stored at the AWT plant during operations. Storage locations are described in Tables 8.5-1 ands 8.5-2, respectively.

Acutely hazardous materials as defined under California's La Follette Bill (California Health and Safety Code 25531 et seq.) will not be used during construction of the RCEC, AWT plant, or the associated facilities or linear routes. Therefore, no discussion of acutely hazardous materials storage or handling during construction is included in Section 8.5.1.1.

8.5.1.1 Construction Phase

Hazardous materials used during construction of the RCEC, associated linear facilities, and the AWT plant will include gasoline, diesel fuel, motor oil, hydraulic fluid, certain solvents, cleaners, sealants, welding flux, various lubricants, paint, and paint thinner. No acutely hazardous materials will be used or stored on-site during construction. There are no feasible alternatives to motor fuels and oils for operating construction equipment. The types of paint required are dictated by the types of equipment and structures that must be coated and the manufacturer's requirements for coating.

The most likely incidents involving these hazardous materials would be associated with minor spills or drips. Impacts from such incidents will be mitigated by thoroughly cleaning up minor spills as soon as they occur. In the case of a large spill of hazardous material, any contaminated soil will be excavated and stored in drums or roll-off bins for off-site disposal as a hazardous waste.

8.5.1.2 Operation Phase

A number of hazardous materials, including acutely hazardous aqueous ammonia and cyclohexylamine mixture, will be stored at the generating site during operation of the RCEC and AWT plant. Some of these materials will be stored at the generating site continuously, others will be brought on-site, used and not brought back on-site for a number of years, while still others will be on-site at for startup purposes only.

Table 8.5-1. RCEC hazardous materials storage locations.

Chemical	Use	Storage Location[1]
Aqueous Ammonia (28% NH_3 +72% H_2O)	Selective catalytic reduction	Outdoors, in the ammonia unloading/storage area (6)
Sodium Hydroxide (NaOH)	pH neutralization of cooling tower	Water treatment building/laboratory (18)
Sulfuric Acid (H_2SO_4) (93%)	Cooling tower pH control	Outdoors, near cooling towers (33)
Disodium Phosphate (Na_2HPO_4)	HRSG drum solids control	Water treatment building/laboratory (18)
Trisodium Phosphate (Na_3PO_4)	HRSG drum solids control	Water treatment building/laboratory (18)
Sodium Hypochlorite (NaOCL)	Cooling tower biological control	Cooling tower circulating water pump house (33)
Sodium Tolytriazole (NALCO 8306)	Scale control in cooling tower	Cooling tower circulating water pump house (20)
Stabrex ST70	Biocide in cooling tower	Near cooling tower (20)
NALCO 356 or NALCO TRI-ACT 1800	Corrosion control of condensate piping	Near each HRSG (21)
NALCO 7280	Antiscalant for use in reverse osmosis (RO) unit	Water treatment building (18)
ELIMIN-OX	Oxygen scavenger for use in process feedwater to DA	Near each HRSG (21)
NALCO 7408	Oxygen scavenger for use upstream of RO unit	Water treatment building (18)
NALCO 22106 or NALCO 7213	Chelate; injected in suction of boiler feed pumps	Near each HRSG (21)
Hydrogen gas	Steam turbine generator cooling	Adjacent to steam turbine (1)
Lubricating oil	Rotating equipment	Contained within equipment
Mineral Insulating Oil	Transformers	Contained within transformers (4,5)
No. 2 Diesel Fuel	Emergency fire pump engine	Near emergency fire pump (23)
Various cleaning chemicals	Chemical cleaning of HRSG	Water treatment building/laboratory (18)
Various laboratory reagents	Laboratory analysis	Water treatment building/laboratory (18)

[1]Storage locations are depicted with numerical references on Figure 2.2-1.

Table 8.5-2. AWT plant hazardous materials storage locations.

Chemical	Use	Storage Location[1]
Sodium Hypochlorite (NaOCL)	Biofoul control in MF/RO and disinfection in AWT	Chemical and dewatering area
Sulfuric Acid (H_2SO_4) (93%)	RO feedwater pH control, cleaning sludge press, pH adjustment	Chemical and dewatering area and RO area day tank
Hypersperse MDC220 (phosphonic acid)	RO antiscalant	Chemical and dewatering area and RO area day tank
Sodium Hydroxide (NaOH)	MF membrane cleaning	RO area
Memclean C	MF membrane cleaning	RO area
Citric Acid	MF membrane cleaning	RO area
Lime	RO concentrate/MF backwash pH adjustment	Chemical and dewatering area
Ferric Chloride	RO concentrate/MF backwash clarifying agent	Chemical and dewatering area
Sodium Sulfide	RO concentrate/MF backwash copper precipitation	Chemical and dewatering area
KleenMCT103	RO membrane cleaning	RO area
KleenMCT411	RO membrane cleaning	RO area

[1]Storage locations are depicted on Figure 2.3-1.

RCEC Plant Site

The following hazardous and acutely hazardous materials will be used and/or stored at the RCEC site during the operation phase:

Continuously On-Site

- Aqueous Ammonia (acutely hazardous)—to control nitrous oxide (NOx) emissions through selective catalytic reduction (12,000 gallons, liquid)
- NALCO 356 (or NALCO TRI-ACT 1800)—cyclohexylamine (acutely hazardous) and morpholine (hazardous) for corrosion control in condensate piping (2,000 gallons, liquid, 20 to 40 percent solution)
- Sulfuric Acid—for circulating water pH control (cooling tower treatment) (5,000 gallons, liquid, 93 percent solution)
- Sodium Hypochlorite—biocide for condenser cooling water system (5,000 gallons, liquid, 10 percent solution)
- Sodium Hydroxide (NALCO 7383)—for pH control of cooling tower (5,000 gallons, liquid, 50 percent solution)
- Disodium Phosphate—for boiler water pH and scale control (500 pounds, granular solid)
- Trisodium Phosphate—for boiler water pH and scale control (500 pounds, granular solid)
- NALCO 7280 Scale Inhibitor—Sodium hexameta phosphates, organophosphonates, and poly-acrylates; used as a scale inhibitor in RO process (250 gallons, liquid)
- Scale Inhibitors (various)—typical inhibitor would be NALCO 8306 Plus containing sodium tolyltriazole. Used to reduce scale formation in circulating water system (3000 gallons, liquid)

- STABREX ST70—sodium hydroxide and sodium hypobromite-biocide in cooling tower water (2,000 gallons, liquid)
- ELIMIN-OX-carbohydrazide—oxygen scavenger in process feedwater to deaerator (2,000 gallons, liquid)
- NALCO 7408—sodium bisulfite-oxygen scavenger upstream of reverse osmosis unit (250 gallons, liquid)
- NALCO 22106—sodium polyacrylate and aryl sulfanate; chelate; injected in suction of boiler feed pumps (2,000 gallons, liquid) or NALCO 7213-tetrasodiumethylenediaminetetraacetate for boiler feedwater treatment (1,000 gallons, liquid)
- Hydrogen gas—used for cooling steam turbine generator (STG) (95,000 std. cubic feet [19,500 scf. in the generator caring and 75,000 scf. storage in tube trailer])
- Mineral Insulating Oil—contained in transformer systems (82,000 gallons, liquid)
- Lubrication Oil—for gas turbine and steam turbine bearings (19,500 gallons, liquid)
- No. 2 Diesel Fuel—for emergency fire pump engine (500 gallons, liquid)
- Various Detergents—combustion turbine compressor periodic cleaning (100 gallons, liquid)
- Various Laboratory Reagents—for water/wastewater analysis (10 gallons, liquid and 100 pounds, granular solid)

Periodically On-Site

- Hydrochloric Acid—for chemical cleaning of heat recovery steam generator (HRSG) (10,000 pounds initially, and once every 10 years, liquid, 30 percent solution)
- Ammonium Bifluoride—for chemical cleaning of HRSG (200 pounds initially, and once every 10 years, solid crystals)
- Citric Acid—for chemical cleaning of HRSG (100 pounds initially, and once every 10 years, solid powder)
- Sodium Carbonate—for chemical cleaning of HRSG and neutralization (500 pounds initially, and once every 10 years, solid powder)
- Sodium Nitrate—for chemical cleaning of HRSG (500 pounds initially, and once every 10 years, solid crystals)

On-Site During Commissioning Only

- Hydroxyacetic Acid—for chemical cleaning of HRSG feedwater system (1,000 pounds prior to start-up, solid crystals)
- Formic Acid—for chemical cleaning of HRSG feedwater system (600 pounds prior to start-up, liquid)

Information about these materials is presented in Table 8.5-3 including trade and chemical names, Chemical Abstract Service (CAS) numbers, maximum quantities on-site, hazardous characteristics, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA) Title III reportable quantities (RQ), La Follette Bill threshold planning quantities (TPQ) and Proposition 65 listing status. Proposition 65 chemicals are those known to be carcinogenic or cause reproductive problems in humans.

In addition to the chemicals noted in Table 8.5-3, small quantities (less than 5 gallons) of paints, oils, solvent, pesticides and cleaners, typical of those purchased at a retail hardware store, may also be used at the RCEC facility.

The hazardous materials to be stored include such incompatible chemicals as sodium hypochlorite and ammonia, or sodium hydroxide, sodium hypochlorite and sulfuric acid. Mixing of these chemicals could generate toxic gases. Measures to keep incompatible chemicals separated include separate storage and containment areas and/or berming.

One acutely hazardous material to be used on site is aqueous ammonia. Aqueous ammonia is a solution of ammonia and water, and is a common industrial chemical used in the Hayward Industrial Corridor. Pure ammonia (NH_3) is a volatile, acutely hazardous chemical that is stored under pressure as a liquid and becomes a toxic gas if released. Exposure to ammonia vapor at concentrations greater than 140 parts per million (ppm) will cause detectable effects on lung function even for short time exposures (0.5 to 2 hours). At higher concentrations of 700 to 1,700 ppm, the gas will cause severe effects. Concentrations of 2,500 to 7,000 ppm can be fatal.

Ammonia gas is very soluble in water. The aqueous ammonia concentration proposed for the RCEC is 28 percent ammonia (and 72 percent water). If the aqueous ammonia solution leaks or is spilled, the ammonia in solution will evaporate into the atmosphere. The rate of evaporation will depend on the temperature of the solution.

The second acutely hazardous material to be used on site is NALCO 356, which contains both cyclohexylamine (an acutely hazardous material) and morpholine (a hazardous material). Cyclohexylamine is corrosive to the eyes and skin and, depending on the length of exposure, can cause permanent eye damage and third degree burns to the skin. Morpholine is also a severe eye, skin, and mucous membrane irritant and can cause kidney damage. Neither of these chemicals is particularly volatile, however, and both are soluble in water, which constitutes 50 to 75 percent of NALCO 356. The maximum quantity of NALCO 356 stored on-site will be 2,000 gallons; the maximum quantity of pure cyclohexylamine in this solution will be 800 gallons, and the maximum quantity of pure morpholine in this solution will be 200 gallons. Because of the low volatility of these chemicals and the relatively small quantities stored, the off-site threat is considered small.

The hazard to facility workers for both of these acutely hazardous materials will be mitigated by facility safety equipment, hazardous materials training, and emergency response planning. A Risk Management Plan (RMP) as required under federal regulations (40 Code of Federal Regulations [CFR] 68) and the California Health and Safety Code (Sections 25531 to 25543.3) may be developed to describe these and other requirements (Section 8.5.6.4). An RMP is required for substances described in section 112(r)(5) of the Clean Air Act and listed in Appendix A of Part 355 of Subchapter J of Chapter I of Title 40 of the CFR and that are handled or stored in quantities in excess of certain levels.

The toxicity characteristics and exposure level criteria for these acutely hazardous material are shown in Table 8.5-4. The remaining materials in Table 8.5-3 are hazardous materials and pose a lesser threat to humans than the acutely hazardous material. The toxic effects and other characteristics of each hazardous material are summarized in Table 8.5-5.

Table 8.5-3. RCEC chemical inventory.

Trade Name	Chemical Name	CAS[a] Number	Maximum Quantity Onsite	Hazardous Characteristics	RQ[b]	TPQ[c]	Prop 65
Acutely Hazardous Materials:							
Aqueous Ammonia (28% solution)	Ammonium Hydroxide	7664-41-7 (for NH_3) 1336-21-6 (for $NH_3 - H_2O$)	12,000-gal. solution, 35,190 lb. NH_3	Corrosive Volatile	100 lb.	500 lb.	No
NALCO 356	Cyclohexylamine (20-40%) Morpholine (5-10%)	108-91-8 110-91-8	2,000 gal.	Corrosive	10,000 lb.	10,000lb	No
Or NALCO TRI-ACT 1800	Cyclohexylamine (10-20%) Ethanolamine (10-20%) Methoxypropyl amine (10-20%)	108-91-8 141-43-5 5332-73-0	2,000 gal.	Corrosive	10,000 lb.	10,000 lb	No
Hazardous Materials:							
Sulfuric Acid	Sulfuric Acid	7664-93-0	5,000 gal.	Corrosive	1,000 lb.	1,000 lb.	No
Bleach	Sodium Hypochlorite	7681-52-9	5,000 gal.	Corrosive	100 lb.		No
NALCO 7383	Sodium Hydroxide	1310-73-2	5,000 gal.	Corrosive	1,000 lb.		No
Disodium Phosphate	Sodium Phosphate	7558-79-4	500 lbs.	Toxic	[d]		No
Trisodium Phosphate	Tri-Sodium Phosphate	7601-54-9	500 lbs.	Toxic	[d]		No
NALCO 8306 Plus	Sodium Tolyltriazole	64665-57-2	3,000 gal.	Toxic	[d]		No
Hydrochloric Acid	Hydrochloric Acid	7647-01-0	10,000 lbs.	Corrosive	5,000 lb.		No
Citric Acid	Hydroxy-propionic-tricarboxylic Acid	77-92-9	100 lbs.	Corrosive	[d]		No
Hydroxyacetic Acid	Gyrolic Acid	None	1000 lbs.	Corrosive	[d]		No
Formic Acid	Methanoic Acid	64-18-6	600 lbs.	Corrosive	5,000 lb.		No

Table 8.5-3 (continued).

Trade Name	Chemical Name	CAS[a] Number	Maximum Quantity Onsite	Hazardous Characteristics	RQ[b]	TPQ[c]	Prop 65
STABREX ST70	Sodium Hydroxide (1-5%) Sodium Hypobromite (10-20%)	1310-73-2 13824-96-9	2,000 gal.	Corrosive/Toxic	30,800 lb.		No
NALCO 7280	Polyacrylic Acid (20-40%)	Trade Secret	250 gal.	Toxic	[d]		No
ELIMIN-OX	Carbohydra-zide	497-18-7	2,000 gal.	Non-Hazardous			No
NALCO 7408	Sodium Bisulfite (40-70%)	7631-90-5	250 gal.	Corrosive	12,000 lb.		No
NALCO 22106	Sodium Polyacrylate Aryl Sulfonate	N/A	2,000 gal.	Toxic	[d]		No
Or NALCO 7213	Tetrasodium ethylenedia-minetetraace-tate (10-20%)	64-02-8	2,000 gal.	Corrosive	[d]		No
Hydrogen Gas	Hydrogen	1333-74-0	95,000 scf.	Flammable	[d]		No
Mineral Insulating Oil	Oil	None	82,000 gal.	Combustible	42 gal.[e]		Yes
Lubrication Oil	Oil	None	19,500 gal.	Flammable	42 gal.[e]		Yes
No. 2 Diesel	Oil	None	500 gal.	Flammable	42 gal.[e]		Yes
Detergents	Various	None	100 gal.	Toxic	[d]		--
Lab Reagents (liquid)	Various	None	10 gal.	Toxic	[d]		--
Lab Reagents (solid)	Various	None	100 lbs.	Toxic	[d]		--
Ammonium Bifluoride	Ammonium Bifluoride	1341-19-7	200 lbs.	Toxic, Corrosive	100		No
Sodium Carbonate	Sodium Carbonate	497-19-8	500 lbs.	Corrosive	[d]		No
Sodium Nitrate	Sodium Nitrate	7631-99-4	500 lbs.	Corrosive	[d]		No

[a] Chemical Abstract Service.
[b] Reportable Quantity per CERCLA. Release equal to or greater than RQ must be reported. Under California law, any amount that has a realistic potential to adversely affect the environment or human health or safety must be reported.
[c] Threshold Planning Quantity. If quantities of acutely hazardous materials equal to or greater than TPQ are handled or stored, they must be registered with the local Administering Agency. For hazardous materials, the TPQ is 10,000 lb.
[d] No reporting requirement.
[e] Must report if does or will reach California state waters, or if quantity released is a "harmful quantity."

Table 8.5-4. RCEC acutely hazardous materials.

Name	Toxic Effects	Exposure Levels
Aqueous Ammonia 28% solution	Contact with liquid or vapor causes eye, nose, and throat irritation, skin burns, and vesiculation. Ingestion or inhalation causes burning pain in mouth, throat, stomach, and thorax, constriction of thorax, and coughing followed by vomiting blood, breathing difficulties, convulsions, and shock. Other symptoms include dyspnea, bronchospasms, pulmonary edema, and pink frothy sputum. Contact or inhalation overexposure can cause burns of the skin and mucous membranes, and headache, salivation, nausea, and vomiting. Other symptoms include labored breathing, bloody mucous discharge, bronchitis, laryngitis, hemmoptysis, and pneumonitis. Damage to eyes may be permanent, including ulceration of conjunctiva and cornea, and corneal and lenticular opacities.	Occupational Exposures PEL = 35 mg/m^3 OSHA TLV = 18 mg/m^3 ACGIH TWA = 25 mg/m^3 NIOSH STEL = 35 mg/m^3 Hazardous Concentrations IDLH = 300 ppm LD_{50} = 350 mg/kg - oral, rat ingestion of 3 to 4 mls may be fatal Sensitive Receptors ERPG-1 = 25 ppm ERPG-2 = 200 ppm ERPG-3 = 1,000 ppm
Cyclohexyla-mine	Caustic/corrosive to skin, eyes, and mucous membranes. Systemic effects include nausea, vomiting, anxiety, restlessness, and drowsiness.	Occupational Exposures PEL = 40 mg/m^3 OSHA TLV = 40 mg/m^3 ACGIH TWA = 40 mg/m^3 NIOSH STEL = None set Hazardous Concentrations LD_{50} = 779 mg/kg - oral, albino rats LD_{50} = 2,055 mg/kg – dermal, albino rabbits Sensitive Receptors ERPGs not available

PEL = OSHA Permissible Exposure Limit for 8-hr work-day

TLV = ACGIH Threshold Limit Value for 8-hr work-day

TWA = NIOSH time-weighted average for 8-hr work-day

STEL = Short term exposure limit, 15-min. exposure

IDLH = Immediately dangerous to life and health

LD_{50} = Dose lethal to 50 percent of those tested

LDLO = Lowest published lethal dose

OSHA = Occupational Safety and Health Administration

ERPG = Emergency Response Planning Guideline

TCLO = Lowest published toxic concentration

ERPG-1 = Maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects

ERPG-2 = Maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without developing irreversible or serious health effects

ERPG-3 = Maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing life-threatening health effects

mg/m^3 = milligrams per cubic meter

mg/kg = milligrams per kilogram

ppm = parts per million

ACGIH = American Conference of Government Industrial Hygienists

NIOSH = National Institute of Occupational Safety and Health

Table 8.5-5. Characteristics of RCEC hazardous and acutely hazardous materials.

Hazardous Materials	Physical Description	Health Hazard	Reactive & Incompatibles	Flammability
Ammonia	Colorless gas with pungent odor.	Corrosive. Irritation to permanent damage from inhalation, ingestion, and skin contact.	Acids, halogens, strong oxidizers, salts of silver and zinc.	Combustible, but difficult to burn.
Sulfuric Acid	Colorless, dense, oily liquid.	Strongly corrosive. Strong irritant to all tissue. Minor burns to permanent damage to tissue.	Organic materials, chlorates, carbides, fulminates, metals in powdered form. Reacts violently with water.	Not combustible.
Sodium Hypochlorite	Pale green; sweet, disagreeable odor. Usually in solution with H_2O or sodium hydroxide.	Corrosive. Toxic by ingestion. Strong irritant to tissue.	Ammonia and organic materials.	Fire risk when in contact with organic materials.
Sodium Hydroxide (NALCO 7383)	Clear yellow liquid.	Corrosive. Corrosive to tissue in presence of moisture. Strong irritant to tissue by ingestion.	Water, acids, organic halogens, some metals.	Noncombustible.
di-Sodium Phosphate	White powder.	Toxic. Toxic by ingestion.	None.	Non-flammable.
tri-Sodium Phosphate	Colorless crystals.	Toxic. Toxic by ingestion. Irritant to tissue.	None.	Non-flammable.
Scale Inhibitor (NALCO- 8306 Plus)	Yellow green liquid.	Slight to moderately toxic. Irritation to skin and eyes.	Strong acids.	Non-flammable.
Hydrochloric Acid	Colorless, pungent, fuming liquid.	Highly corrosive. Toxic by ingestion. Strong irritant to eyes and skin.	Metals, hydroxides, amines, alkalis.	Non-flammable.
Citric Acid	Translucent crystals.	None.	None.	Non-flammable.
Hydroxyacetic Acid	Colorless crystals.	Corrosive Toxic. Toxic by inhalation, ingestion, and dermal contact.	Strong bases, strong reducing and oxidizing agents.	Non-flammable.
Formic Acid	Colorless, fuming liquid.	Corrosive. Corrosive to skin and tissue.	Strong oxidizers, strong caustics, concentrated sulfuric acid.	Combustible.
STABREX ST70 Sodium Hydroxide (1-5%) Sodium Hypobromite (10-20%)	Clear, light yellow liquid.	Corrosive. Corrosive to eyes and skin. Harmful if ingested or inhaled.	Strong acids, organic materials, sodium hypochlorite.	Non-flammable.
NALCO 356 Cyclohexylamine (20-40%) Morpholine (5-10%) *or*	Clear, light yellow/green liquid.	Corrosive. Corrosive to eyes and skin. Can cause kidney damage.	Strong oxidizers and acids. SO_2 or acidic bisulfite products.	Flammable.
NALCO-TRI-ACT 1800 Cyclohexylamine (10-20%) Ethanolamine (10-20%) Methoxypro-pylamine (10-20%)	Clear, colorless to light yellow.	Corrosive. Corrosive to eyes and skin. Can cause liver damage.	Strong acids, inorganic nitrites or nitrous oxide.	Flammable.

Table 8.5-5. (continued).

Hazardous Materials	Physical Description	Health Hazard	Reactive & Incompatibles	Flammability
NALCO 7280 Polyacrylic acid	Clear to slightly turbid yellow.	Toxic. Kidney damage. Effects on bones.	Reactive salts (nitrites and sulfites)	Non-flammable.
ELIMIN-OX Carbohydrazide	Colorless liquid.	Slightly toxic. Low human hazard.	Mineral acids, nitrites, and strong oxidizers.	Non-flammable.
NALCO 7408 Sodium Bisulfite	Yellow liquid.	Corrosive. Irritation to eyes, skin, and lungs. May be harmful if digested.	Strong acids and oxidizers.	Non-flammable.
NAL 22106 Sodium Polyacrylate Aryl Sulfonate ***Or***	Clear to slightly yellow.	Toxic. Possibly harmful if swallowed.	None known.	Non-flammable.
NALCO 7213 Tetrasodium Ethylenediaminetetra-acetate (10-20%)	Clear, yellow to amber.	Toxic. Moderate health hazard. Moderate irritation to eyes and skin.	Strong acids.	Combustible. Flash point > 200°F.
Hydrogen Gas	Colorless, odorless gas	Simple asphyxiant, flammable.	None known.	Flammable gas.
Mineral Oil	Oily, clear liquid.	Minor.	Sodium hypochlorite.	May be combustible.
Lubrication Oil	Oily, dark liquid.	Ingestion hazardous.	Sodium hypochlorite.	Flammable.
Diesel Fuel	Oily, light liquid.	May be carcinogenic.	Sodium hypochlorite.	Flammable.
Ammonium Bifluoride	White crystals	May be fatal if swallowed or inhaled. Affects respiratory system, heart, skeleton, circulatory system, CNS, and kidneys.	Strong acids.	Non-flammable.
Sodium Carbonate	White powder or granules	Harmful if swallowed or inhaled. Irritation to skin and respiratory tract.	Acids.	Non-flammable.
Sodium Nitrate	White crystals	Toxic and corrosive. Irritation to eyes, skin, and lungs. Harmful if digested.	Strong acids.	Non-flammable.

Electric Transmission Line and Eastshore Substation Expansion—No hazardous or acutely hazardous materials will be stored at the electric transmission line or substation facilities during operations.

Natural Gas Pipeline—With the exception of the natural gas contained within the pipeline, no hazardous or acutely hazardous materials will be stored at the pipeline facilities during operations.

Wastewater Return Pipelines— There are no separate facilities associated with the wastewater return pipelines; therefore, no hazardous or acutely hazardous materials will be stored at this location during operations.

AWT plant

The following hazardous and acutely hazardous materials will be used and/or stored at the AWT plant site during the operation phase:

- Sodium Hypochlorite—for biofoul control in the MF/RO process and for disinfection in chlorine contact basin (7,000 gallons, 12.5% by weight solution)
- Sulfuric Acid—for RO feedwater pH control, cleaning sludge press, and pH adjustment (7,000 gallons, 93 percent solution)
- Hypersperse MDC220—phosphonic acid threshold inhibitor compound used to as a scale inhibitor in the RO feedwater (500 Gallons)
- Sodium Hydroxide—used for routine cleanings of the micro filtration membranes (500 gallons, 50percent solution)
- Memclean C—proprietary detergent used for routine cleanings of the MF membranes (500 Gallons)
- Citric Acid—used occasionally for routine cleanings of the MF membranes (250 gallons, 34percent solution)
- Lime—used for pH adjustment of RO concentrate and MF backwash streams, if necessary (6000 cubic feet)
- Ferric Chloride—used as clarifying agent for RO concentrate and MF backwash streams (10,000 gallons)
- Sodium Sulfide—used to aid in copper precipitation from RO concentrate and MF backwash streams, if necessary (2,000 pounds)
- KleenMCT103—nitrilotriacetic acid and phosphoric acid RO membrane cleaning solution (220gallons)
- KleenMCT411—sodium tripolyphosphate and sodium hydroxide RO membrane cleaner (2,000 pounds)

Information about these materials is presented in Table 8.5-6 including trade and chemical names, Chemical Abstract Service (CAS) numbers, maximum quantities on-site, hazardous characteristics, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA) Title III reportable quantities (RQ), La Follette Bill threshold planning quantities (TPQ) and Proposition 65 listing status. Proposition 65 chemicals are those known to be carcinogenic or cause reproductive problems in humans.

In addition to the chemicals noted in Table 8.5-6, small quantities (less than 5 gallons) of paints, oils, solvent, pesticides and cleaners, typical of those purchased at a retail hardware store, may also be used at the AWT plant.

The hazardous materials to be stored include such incompatible chemicals as sodium hydroxide, sodium hypochlorite and sulfuric acid. Mixing of these chemicals could generate toxic gases. Measures to keep incompatible chemicals separated include separate storage and containment areas and/or berming.

The toxic effects and other characteristics of each hazardous material are summarized in Table 8.5-7.

Table 8.5-6. AWT plant chemical inventory.

Trade Name	Chemical Name	CAS[a] Number	Maximum Quantity Onsite	Hazardous Characteristics	RQ[b]	TPQ[c]	Prop 65
Sulfuric Acid	Sulfuric Acid	7664-93-0	7,000 gal	Corrosive	1,000 lbs.	1,000 lb.	No
Bleach	Sodium Hypochlorite	7681-52-9	7,000 gal	Corrosive	100 lbs.		No
Sodium Hydroxide	Sodium Hydroxide	1310-73-2	500 gal	Corrosive	1,000 lbs.		No
Hypersperse MDC220	Phosphonic acid	2809-21-4	500 gal	Corrosive	[d]		No
Memclean C	Hydroxy-propionic-tricarboxylic Acid	77-92-9	500 gal	Corrosive	[d]		No
Citric Acid	Hydroxy-propionic-tricarboxylic Acid	77-92-9	250 gal	Corrosive	[d]		No
Lime	Calcium Hydroxide	1305-62-0	6,000 cu ft	Corrosive	[d]		No
Ferric Chloride	Ferric Chloride	7705-08-0	10,000 gal	Corrosive	1,000 lbs.		No
Sodium Sulfide	Sodium Sulfide	1313-82-2	2,000 lbs	Corrosive	[d]		No
KleenMCT103	Nitrilotriacetic Acid	5064-31-3	220 gal	Toxic	[d]		Yes
	Phosphoric Acid	7664-38-2			1,000 lbs.		No
KleenMCT411	Sodium Tripoly-phosphate	7758-29-4	2,000 lbs	Corrosive	5,000 lbs.		No
	Sodium Hydroxide	1310-73-2			1,000 lbs.		No

[a] Chemical Abstract Service.
[b] Reportable Quantity per CERCLA. Release equal to or greater than RQ must be reported. Under California law, any amount that has a realistic potential to adversely affect the environment or human health or safety must be reported.
[c] Threshold Planning Quantity. If quantities of acutely hazardous materials equal to or greater than TPQ are handled or stored, they must be registered with the local Administering Agency. For hazardous materials, the TPQ is 10,000 lb.
[d] No reporting requirement.

Table 8.5-7. Characteristics of AWT plant hazardous materials.

Hazardous Materials	Physical Description	Health Hazard	Reactive & Incompatibles	Flammability
Sulfuric Acid	Colorless, dense, oily liquid.	Strongly corrosive. Strong irritant to all tissue. Minor burns to permanent damage to tissue.	Organic materials, chlorates, carbides, fulminates, metals in powdered form. Reacts violently with water.	Not combustible.
Sodium Hypochlorite	Pale green; sweet, disagreeable odor. Usually in solution with H_2O or sodium hydroxide.	Corrosive. Toxic by ingestion. Strong irritant to tissue.	Ammonia and organic materials.	Fire risk when in contact with organic materials.
Sodium Hydroxide	Clear yellow liquid.	Corrosive. Corrosive to tissue in presence of moisture. Strong irritant to tissue by ingestion.	Water, acids, organic halogens, some metals.	Noncombustible.
Hypersperse MDC220 (Scale Inhibitor)	Light yellow to amber liquid.	Corrosive. Mild irritant.	Strong oxiders.	Combustible.
Memclean C (detergent)	Brown liquid, mild detergent odor.	Mild irritant.	None.	Non-flammable.
Citric Acid	Translucent crystals.	None.	None.	Non-flammable.
Lime	White crystals or powder.	Corrosive. Sever irritant to respiratory tract. Causes burns to tissue.	Acids	Non-combustible.
Ferric Chloride	Yellow brown deliquescent crystals.	Corrosive. Harmful if swallowed or inhaled. Causes burns on contact.	Metals, water.	Non-combustible.
Sodium Sulfide	White crystals.	Corrosive. May be fatal if swallowed or inhaled.	Acids, oxiders, aluminum.	Combustible.
Kleen MCT103	Clear yellow liquid.	Severe irritant.	Strong oxiders.	Combustible.
Kleen MCT411	White powder.	Severe irritant.	Strong oxiders.	Combustible.

8.5.2 Environmental Consequences

8.5.2.1 Offsite Consequences Analysis

An Off-Site Consequence Analysis (OCA) was performed, per CEC requirements, to assess the risk from a potential spill or rupture of the aqueous ammonia storage tank at the RCEC. The ammonia, which is used in the selective catalytic reduction (SCR) system to control nitrogen oxides (NO_X) emissions, will be delivered and stored on-site in the form of an aqueous solution (28 percent NH_3). If a release of aqueous ammonia were to occur, the quantity of ammonia gas released would be significantly less than that released by an anhydrous ammonia system failure; therefore, the potential off-site impact is greatly reduced by selecting this option.

The RCEC site will have one 15,000-gallon aqueous ammonia storage tank. As discussed in Section 8.5.4.2, the tank will be enclosed within a secondary containment structure. The analysis presented below is based on a scenario in which the inner tank fails and aqueous ammonia is released within the secondary containment structure. Ammonia vapor then escapes to the atmosphere through a one-foot diameter vent at the top of the secondary containment structure. This analysis includes modeling of ammonia vapor release and dispersion to assess the impact to off-site receptors at various distances from the site.

Methods

The mass release rate of ammonia vapor was calculated assuming failure of a full, 15,000-gallon tank of aqueous ammonia. Specific parameters used in the calculation are listed in Table 8.5-8. The aqueous solution flows into the surrounding containment enclosure until liquid levels within the tank and enclosure are equal. This release is assumed to occur over a ten-minute period, in accordance with the RMP Offsite Consequence Analysis Guidance (EPA 1996). Clean air is displaced and pushed out the vent in the enclosure ceiling as aqueous solution fills the bottom of the enclosure.

Table 8.5-8. Ammonia mass release rate calculation parameters.

Parameter	Value
Temp. within secondary containment enclosure	80 °F
NH_3 Partial pressure above 28% solution (80 °F)	11.6 psia
Diffusivity of ammonia in air	2.4 E-4 ft^2/sec
Ammonia vapor concentration at liquid surface	580 grams/m^3

To calculate the quantity of ammonia vapor released from the spill, it was assumed that the temperature of the stored ammonia and the air within the concrete secondary containment enclosure are 80 degrees Fahrenheit (°F), and remain constant throughout the event. The ammonia concentration in air directly above the liquid surface is calculated based on the vapor pressure of ammonia at 80°F above a 28% aqueous solution. Ammonia vapor diffuses through the air above the spill and is released through the 1-foot diameter vent. The rate of diffusion is controlled by the concentration gradient in the enclosure. A mass emission rate through the vent of 0.50 grams ammonia per second was calculated based on the rate of diffusion and the area of the opening.

As the ammonia diffuses through the headspace in the secondary containment enclosure, vapor is released through the one-foot diameter opening in the top of the enclosure. Worst-case downwind ammonia concentrations were determined using the EPA dispersion model TSCREEN. Model input parameters are listed in Table 8.5-9. The model assumes a wind speed of 1.0 meter per second and worst-case stability class to calculate downwind ammonia concentrations.

Table 8.5-9. TSCREEN dispersion modeling input parameters.

Parameter	Value
NH_3 emission rate	0.50 grams/sec.
Release height	12 feet
Vent diameter	1 foot
Exit velocity	.001 meters/sec.
Exhaust and ambient temperature	80 °F
Receptor height	1.5 meters
Terrain	Urban

Results

Based on the results of this analysis, ammonia concentrations generated from this type of release would be well below safe levels prior to reaching the property line. The distance from the ammonia storage area to the closest property boundary is 43 meters. The modeled ammonia concentration 43 meters from the release is 10.1 ppm. The EPA's toxic endpoint and Emergency Response Planning Guide Level 2 (ERPG-2) concentration for ammonia is 200 parts-per-million (ppm). This is the maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing life-threatening health effects. The CEC significance threshold is 75 ppm for ammonia. Therefore, potential offsite consequences from a failure in the ammonia storage tank would not be significant.

8.5.2.2 Fire and Explosion Risk

As shown in tables 8.5-5 and 8.5-7, many of the hazardous materials to be stored and used at the RCEC and the AWT plant are non-combustible. Aqueous ammonia, which constitutes the largest quantity of hazardous materials on-site (except for the mineral oil in the transformers and lubrication oil for the gas turbine and steam turbine bearings), can release ammonia vapor that is combustible within a very narrow range of concentration and is therefore not easy to burn. Both hydroxyacetic acid and formic acid are combustible, but will be used at the site only during commissioning, and will be handled by the HRSG chemical cleaning contractor. The lubrication oil and diesel fuel are both flammable and will be handled in accordance with a Hazardous Materials Business Plan to be approved by the City of Hayward Fire Department. With proper storage and handling of flammable materials in accordance with the plan, the risk of fire and explosion at the generating facility should be minimal.

The topics to be covered in the plan are:

- Facility Identification
- Emergency Contacts
- Inventory Information (for every hazardous material)
- Material Safety Data Sheets (MSDS) for every hazardous material
- Site Map
- Emergency Notification Data
- Procedures to Control Actual or Threatened Releases
- Emergency Response Procedures
- Training Procedures
- Certification

The natural gas fuel for the RCEC combustion turbines and duct burners is flammable, and could leak from the in-plant supply piping or from PG&E's pipeline. The risk of leakage will be minimized by proper design, construction, and maintenance of the in plant piping and supply pipeline in accordance with applicable LORS.

8.5.3 Cumulative Impacts

The primary potential cumulative impact from the use and storage of hazardous materials would be from a simultaneous release from two or more sites of a chemical or chemicals that would migrate offsite.

Potentially, the two or more migrating releases could combine and thereby pose a greater threat to the offsite population than would a single release by any one site.

Hazardous materials that do not migrate, such as sulfuric acid, would not present a potential cumulative impact. The only hazardous material that has the potential to migrate offsite from the RCEC is ammonia vapor released from spilled aqueous ammonia. Based on the results of the OCA, offsite ammonia vapor concentrations would only occur at very low levels (10.1 ppm or less). In the unlikely event that an aqueous ammonia spill occurred at the RCEC simultaneously to a chemical spill at another nearby industrial facility, offsite ammonia levels from the RCEC would not be sufficient to cause cumulative impacts.

Hazardous materials that will be stored at the AWT plant do not have the potential to migrate offsite; therefore, there are no potential hazardous materials cumulative impacts from the AWT plant.

8.5.4 Proposed Mitigation Measures

The following subsections describe measures that Calpine/Bechtel plan to take during both the construction and operating phases of the project to mitigate the risk in handling hazardous materials, particularly the risk of inadvertent spills or leaks that might pose a hazard to human health or the environment.

8.5.4.1 Construction Phase

During construction, hazardous materials stored on-site will be limited to small quantities of paint and thinner, solvents, cleaners, sealants, lubricants, and 5-gallon emergency fuel containers. Paint, thinner, solvents, cleaners, sealants, and lubricants will be stored in a locked utility building, handled per the manufacturer's directions, and replenished as needed. Non-hazardous paint will be used if possible. The emergency fuel containers will be Department of Transportation (DOT) approved 5-gallon safety containers secured to the construction equipment. The emergency fuel will be used when regular vehicle fueling is unavailable.

Fuel, oil, and hydraulic fluids will be transferred directly from a service truck to construction equipment tanks and will not otherwise be stored on-site. Fueling will be performed by designated, trained service personnel either prior to the start of the work day or at completion of the work day. Service personnel and construction contractors will follow standard operating procedures (SOPs) for filling and servicing construction equipment and vehicles. The SOPs are designed to reduce the potential for incidents involving the hazardous materials and include:

- Refueling and maintenance of vehicles and equipment will occur only in designated areas that are either bermed or covered with concrete or asphalt to control potential spills.
- Vehicle and equipment service and maintenance will be conducted only by authorized personnel.
- Refueling will only be conducted with approved pumps, hoses, and nozzles.
- Catch-pans will be placed under equipment to catch potential spills during servicing.
- All disconnected hoses will be placed in containers to collect residual liquids in the hose.
- Vehicle engines will be shut down during refueling.
- No smoking, open flames, or welding will be allowed in refueling or service areas.
- When refueling is completed, the service truck will leave the project site.

- Service trucks will be provided with fire extinguishers and spill containment equipment, such as adsorbents.
- In the event a spill contaminates soil, the soil will be containerized and disposed of as a hazardous waste.
- All containers used to store hazardous materials will be inspected at a minimum of once per week for signs of leaking or failure. All maintenance and refueling areas will be inspected monthly. Results of inspections will be recorded in a log book which will be maintained on-site.

Small spills will be contained and cleaned up immediately by trained, on-site personnel. Larger spills will be reported via emergency phone numbers to obtain help from off-site containment and clean up crews. All personnel working on the project during the construction phase will be trained in handling hazardous materials and the danger associated with hazardous materials.

An on-site health and safety person will be designated to implement health and safety guidelines and contact emergency response personnel and the local hospital, if necessary. Material Safety Data Sheets (MSDSs) for each on-site chemical will be maintained. Employees will be made aware of the chemicals and the location of MSDS sheets.

8.5.4.2 Operation Phase

Hazardous materials will be stored and handled at the RCEC and AWT plant in accordance with all local, state and federal regulations and codes. A safety program will be implemented including safety training programs for contractors and operations personnel, respectively. A Hazardous Materials Business Plan will be prepared for approval by the CEC CPM and the City of Hayward Fire Department, which is the local CUPA.

A fire protection system will be included to detect, alarm, and suppress a fire, in accordance with the applicable laws, ordinances, regulations, and standards.

During the operation phase of the RCEC, acutely hazardous materials will be stored on-site. A Risk Management Plan (RMP) for handling the acutely hazardous materials at the facility will be prepared before start of operations. The RMP process will identify and propose adequate mitigation measures to reduce the risk to the lowest possible level.

Tables 8.5-5 and 8.5-7 describe the toxicity of acutely hazardous and hazardous materials that will be stored at the RCEC and AWT plant, respectively. The two acutely hazardous materials that will be used at the RCEC are aqueous ammonia and cyclohexylamine. The following sections describe the mitigation measures to be implemented for these acutely hazardous materials.

Aqueous Ammonia

The aqueous ammonia storage and handling facilities will be equipped with continuous tank level monitors, temperature and pressure monitors and alarms, and excess flow and emergency block valves. Pressure-relief valves and excess flow control valves on the tank fill connections will also be provided. Secondary containment will be provided by a vented enclosure around the tank. Therefore any potential inadvertent release from the storage tank would be contained within the secondary containment structure. Additionally, the ammonia area will be bermed and sloped to an underground sump to contain any potential releases during aqueous ammonia unloading up to the contents of a full delivery tanker truck. Ammonia vapor detectors will be installed around the aqueous ammonia storage tanks and truck unloading area to generate alarm signals in the plant control room that will alert the operators to potential leaks.

Approximately every 2-3 days, an 8,000-gallon tanker truck will deliver aqueous ammonia to the RCEC. The 15,000-gallon tank which will have a maximum working capacity of 12,000 gallons, will not be drawn below 4,000 to 5,000 gallons remaining volume before it is refilled by the tanker truck.

Cyclohexylamine

Cyclohexylamine in the form of NALCO 356 will be fed into the condensate piping to control corrosion. The feed equipment will consist of a storage tank, pumps, leak detection system, alarm system, and a fire detection and protection system. The chemical will be stored in 500- to 700-gallon tanks that will be located near each of the HRSGs. The tanks will be located above concrete, epoxy-lined containment areas with sufficient capacity to contain the full quantity of a tank in the event of a spill or tank rupture. If exposed to rainfall, the containment areas will be sized additionally to contain the accumulated rainfall for 24 hours from a 25-year storm.

Other Hazardous Materials

Of the hazardous materials that are continuously on-site, two merit individual mention because of the quantity of material stored. Sodium hypochlorite (NaOCl) is used as a biocide for both the RCEC condenser cooling water (circulating water) system and at the AWT plant. The system at each facility will consist of a storage tank, two full capacity chemical feed pumps, a leak detection system, an alarm system, and a fire detection and protection system.

Sodium hydroxide (NaOH) will be used in the RCEC to control circulating water pH. The system consists of a 5,000-gallon storage tank, chemical feed pumps and a leak detection and alarm system. The 5,000-gallon tank will be contained within a concrete containment and collection bay that will have the capacity to contain the sodium hydroxide in the event of a spill. Sodium hydroxide may also be used to control the pH of the boiler feedwater. A maximum of 7 pounds per day of sodium hydroxide will be fed into the feedwater at the HRSGs from 300 to 400 gallon totes or portable tanks. Sodium hydroxide will also be used at the AWT plant for routine cleanings of the MF membranes.

All hazardous materials will be handled and stored in accordance with applicable codes and regulations. Incompatible materials will be stored in separate storage and containment areas. Areas susceptible to potential leaks and/or spills will be paved and bermed. Containment areas may drain to a collection area, such as an oil/water separator or a waste collection tank. Piping and tanks will be protected from potential traffic hazards by concrete or pipe-type traffic bollards and barriers.

A worker safety plan, in compliance with applicable regulations, will be implemented and will include training for both contractors and operations personnel. Training programs will include safe operating procedures, the operation and maintenance of hazardous materials systems, proper use of personal protective equipment, fire safety, and emergency communication and response procedures. All plant personnel will be trained in emergency procedures including plant evacuation and fire prevention. In addition, designated personnel will be trained as a plant hazardous material response team and receive first responder and hazardous material technical training as the Hazardous Materials Business Plan will describe (Section 8.5.6.4). However, in the event of an emergency, plant personnel will defer to the Alameda County Hazardous Materials Emergency Response Team.

8.5.4.3 Transportation/Delivery of Hazardous Materials

Hazardous and acutely hazardous materials will be delivered periodically to the RCEC and AWT plant. Transportation will comply with all DOT, U.S. Environmental Protection Agency (USEPA), California Department of Toxic Substances Control (DTSC), California Highway Patrol (CHP), and the California State Fire Marshal regulations for the transportation of hazardous materials. Under the California Vehicle Code, the CHP has authority to adopt regulations for the transportation of hazardous materials in California. The CHP can issue permits and specify the route for hazardous material delivery. The only acutely hazardous material posing an inhalation hazard that will be delivered to the RCEC is aqueous ammonia. The Vehicle Code has special regulations for the transportation of hazardous materials that pose an inhalation hazard (Vehicle Code Section 32100.5). The RCEC will comply with these regulations.

8.5.4.4 Hazardous Materials Plans

Hazardous materials handling and storage, and training in the handling of hazardous materials, will be set forth in more detail in hazardous materials plans that the applicant will develop.

Hazardous Materials Business Plan

An HMBP is required by the California Code of Regulations (Title 19) and the Health and Safety Code (Section 25504). The RCEC and AWT plant will have separate HMBPs. These plans will include an inventory and location map of hazardous materials on-site and an emergency response plan for hazardous materials incidents. The topics to be covered in the plans are:

- Facility Identification
- Emergency Contacts
- Inventory Information (for every hazardous material)
- Material Safety Data Sheets (MSDS) for every hazardous material
- Site Map
- Emergency Notification Data
- Procedures to Control Actual or Threatened Releases
- Emergency Response Procedures
- Training Procedures
- Certification

Risk Management Plan

Since acutely hazardous materials will be stored and used at the RCEC, a Risk Management Plan (RMP) will be required pursuant to the Clean Air Act (CAA) and its regulations (40 CFR 68 Subpart G) and under California's Accidental Release Prevention Program (CalARP) pursuant to the Health and Safety Code Sections 25331 through 25543.3. The California program is similar to the federal program but may be more stringent in some areas. There are three programs under 40 CFR, and the RMP requirements increase in stringency from Program 1 to Program 3. Program 1 applies to facilities where, under a worst-case release assessment, the distance to any public receptor cannot fall within the toxic endpoint release concentration for ammonia of 0.14 milligrams per liter, or 200 ppm. Whether the RCEC will qualify for Program 1 will not be known until the modeling is completed as described in Section 8.5.3. Program 3 applies where a chemical is stored at or above its threshold quantity (TQ). The TQ for ammonia concentrations of 20 percent or greater is 20,000 pounds of solution. Program 2 is for facilities that do not fit into Programs 1 or 3.

The RMP will be filed with and administered by the area's Certified Unified Program Agency (CUPA) which is the City of Hayward Fire Department. The RMP is in addition to the HMBP and covers acutely hazardous materials that can produce toxic clouds when inadvertently released. Included in the RMP is a hazard assessment to evaluate the potential effects of accidental releases, a program for preventing accidental releases, and a program for responding to accidental releases in order to protect human health and the environment. The basic elements of a RMP are:

Description of the Facility

- Accident History of the Facility
- History of Equipment Used at the Facility
- Design and Operation of the Facility
- Site Map(s) of the Facility
- Piping and Instrument Diagrams of the Facility
- Seismic Analysis
- Hazard and Operability Study
- Prevention Program
- Consequence Analysis
- Off-site Consequence Analysis
- Emergency Response
- Auditing and Inspection
- Record Keeping
- Training
- Certification

Spill Prevention Control and Countermeasure Plan

Federal and State of California regulations require a Spill Prevention Control and Countermeasure (SPCC) plan if petroleum products above certain quantities are stored in aboveground storage tanks (ASTs). Both federal and state laws apply only to petroleum products that might be discharged to navigable waters. If quantities equal to or greater than 660 gallons for a single tank, or equal to or greater than 1,320 gallons total are stored, a SPCC must be prepared. The key elements of a SPCC are:

- Name, location, and telephone number of the facility
- Spill record of the facility and lessons learned
- Analysis of the facility, including:
  - A description of the facilities and engineering calculations
  - A map of the site
  - Storage tanks and containment areas
  - Fuel transfer and storage and facility drainage

- Prediction and prevention of potential spills

- Spill response procedures
- Agency notification
- Personnel training and spill prevention

The RCEC will have up to 19,500 gallons of turbine lubrication oil on-site and will, therefore, have to prepare a SPCC plan.

8.5.4.5 Monitoring

An extensive monitoring program will not be required because environmental effects during the construction and operation phases of the facility are expected to be minimal. However, sufficient monitoring will be performed during both phases to ensure that the proposed mitigation measures are complied with and that they are effective in mitigating any potential environmental effects.

Visual monitoring during construction and operation will be performed to determine compliance with and the effectiveness of the proposed mitigation measures. Written records of all monitoring events will be kept, including observations, actions taken, persons involved, and any recommendations.

Applicable Laws, Ordinances, Regulations, and Standards

The storage and use of hazardous materials and acutely hazardous materials at the RCEC and AWT plant is governed by federal, sate, and local laws. Applicable laws and regulations address the use and storage of hazardous materials to protect the environment from contamination, and protection of facility workers and the surrounding community from exposure to hazardous and acutely hazardous materials. The applicable laws, ordinances, regulations, and standards (LORS) are summarized in Table 8.5-10.

8.5.5.1 Federal

Hazardous materials are governed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the CAA, and the Clean Water Act (CWA).

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

An amendment to CERCLA, the Superfund Amendments and Reauthorization Act of 1986 (SARA) governs hazardous materials. The applicable part of SARA for the NEC is Title III, otherwise known as the Emergency Planning and Community Right-To-Know Act of 1986 (EPCRA). Title III requires states to establish a process for developing local chemical emergency preparedness programs and to receive and disseminate information on hazardous materials present at facilities in local communities. The law primarily provides for planning, reporting and notification concerning hazardous materials. Key sections of the law are:

- Section 302—Requires that certain emergency planning activities be conducted when Extremely Hazardous Substances (EHS) are present in excess of their TPQs. EHSs and their TPQs are found in Appendices A and B to 40 CFR Part 355.
- Section 304—When there is a release of a hazardous material in excess of its RQ, Section 304 requires immediate notification to the local emergency planning committee (LEPC) and the state emergency response committee (SERC). If the release is of a RQ of a CERCLA-listed hazardous substance, notification must also be provided to the National Response Center in Washington,

D.C. (RQs are listed in 40 CFR Part 302, Table 302.4). These notifications are in addition to notification provided to the local emergency response team or fire personnel.

- Section 311—Requires that either MSDSs for all hazardous materials or a list of all hazardous materials be submitted to the SERC, LEPC, and the local fire department.
- Section 313—Requires annual reporting of hazardous materials released into the environment either routinely or as a result of an accident.

Clean Air Act (CAA)

Regulations (40 CFR 68) under the CAA are designed to prevent accidental releases of hazardous materials. These regulations require facilities that store a TQ or greater of listed hazardous materials to develop a RMP, including hazard assessments and response programs to prevent accidental releases of certain chemicals. Section 112(r)(5) of the CAA discusses the chemicals regulated. These chemicals are listed in 40 CFR 68.130 of the regulations. Aqueous ammonia is a listed substance and its TQ for solutions of 20 percent or greater is 20,000 pounds.

Clean Water Act (CWA)

The SPCC program under the CWA is designed to prevent or contain the discharge or threat of discharge of oil into navigable waters or adjoining shorelines. Regulations (40 CFR 112) under the CWA requires facilities to prepare a written SPCC if they have a single aboveground oil storage tank with a capacity greater than 660 gallons, total aboveground tank storage greater than 1,320 gallons, or underground storage capacity greater than 42,000 gallons, and that poses a threat to navigable waters.

Other related federal laws that address hazardous materials, but are either not relevant to the RCEC or do not specifically address the handling of hazardous materials, are the Resource Conservation and Recovery Act (RCRA), which is discussed in Section 8.13, and the Occupational and Safety Health Act (OSHA) which is discussed in Section 8.7.

8.5.5.2 State of California

California laws and regulations relevant to hazardous materials handling at the RCEC include the Waters Bill (hazardous materials), the La Follette Bill (acutely hazardous materials), and the Aboveground Petroleum Storage Act (petroleum in aboveground tanks).

Waters Bill

This law is found in the California Health and Safety Code, Section 25500 et seq. and the regulations to the law in 19 California Code of Regulations (CCR) Section 2620 et seq. The law requires local governments to regulate local businesses' storage of hazardous materials if in excess of certain threshold quantities. The law also requires that entities storing hazardous materials be prepared to respond to releases. Those using and storing hazardous materials are required to submit a HMBP to their local administering agency (AA) and to report releases to their AA and the Governor's Office of Emergency Services. The threshold quantities for hazardous materials are 55 gallons for liquids, 500 pounds for solids, and 200 cubic feet for compressed gases measured at standard temperature and pressure.

Table 8.5-10. LORS Applicable to hazardous materials management.

LORS	Applicability	Conformance (Section No.)
Federal:		
CERCLA/SARA		
Section 302	Requires certain planning activities when EHS are present in excess of TPQs. The RCEC will have ammonia in excess of its TPQ.	A Risk Management Plan (RMP) will be prepared which will describe planning activities. (Section 8.5.6.4).
Section 304	Requires notification when there is a release of hazardous material in excess of its RQ.	A HMBP will be prepared which will describe notification and reporting procedures. (Section 8.5.6.4).
Section 311	Requires MSDS for every hazardous material to be kept on-site and submitted to SERC, LEPC, and the local fire department.	The HMBP that will be prepared will include MSDSs and procedures for submission to agencies. (Section 8.5.6.4).
Section 313	Requires annual reporting of releases of hazardous materials.	The HMBP that will be prepared will describe reporting procedures. (Section 8.5.6.4).
CAA	Requires a RMP if listed hazardous materials at or above a TQ are stored.	A RMP will be prepared. (Section 8.5.6.4).
CWA	Requires preparation of SPCC plan if oil is stored above certain quantities.	A SPCC will be prepared. (Section 8.5.6.4).
California:		
Waters Bill	Requires preparation of a HMBP if hazardous materials are handled or stored in excess of threshold quantities.	A HMBP will be prepared. (Section 8.5.6.4).
La Follette Bill	Requires registration with local CUPA or lead agency and preparation of a RMP if acutely hazardous materials handled or stored in excess of TPQs.	A RMP will be prepared which will describe procedures for registration with local authorities. (Section 8.5.6.4).
Aboveground Petroleum Storage Act	Requires entities that store petroleum in ASTs in excess of certain quantities to prepare a SPCC.	A SPCC will be prepared. (Section 8.5.6.4).
Safe Drinking Water and Toxics Enforcement Act (Proposition 65)	Requires warning to persons exposed to list of carcinogenic and reproductive toxins and protection of drinking water from same toxins.	The site will be appropriately labeled for chemicals on the Proposition 65 list.

La Follette Bill

Found in the California Health and Safety Code, Section 25531 et seq., this law regulates the registration and handling of acutely hazardous materials. Acutely hazardous materials are any chemicals designated as an extremely hazardous substance by the USEPA as part of its implementation of SARA Title III.

Health and Safety Code Section 25531 expands the programs mandated by the Waters Bill and overlaps or may duplicate some of the requirements of SARA and the CAA. Facilities handling or storage of acutely hazardous materials at or above TPQs requires registration with local AA and preparation of a RMP, formerly known as a Risk Management and Prevention Program (RMPP). The TPQ for ammonia is 500 pounds.

Aboveground Petroleum Storage Act

This law is found in the Health and Safety Code at sections 25270 to 25270.13 and is intended to ensure compliance with the federal CWA. The law applies if a facility has an aboveground storage tank with capacity greater than 660 gallons or combined AST capacity greater than 1,320 gallons and there is a reasonable possibility that the tank(s) may discharge oil in "harmful quantities" into navigable waters or adjoining shore lands. If a facility falls under these criteria, it must prepare a SPCC. The law does not cover AST design, engineering, construction and other technical requirements, which are usually determined by local fire departments.

Safe Drinking Water and Toxics Enforcement Act (Proposition 65)

This law identifies chemicals that cause cancer and reproductive toxicity, informs the public, and prevents discharge of the chemicals into sources of drinking water. Lists of the chemicals of concern are published and updated periodically. The Act is administered by the state Office of Environmental Health Hazard Assessment. Some of the chemicals planned to be used at the RCEC are on the cancer causing and reproductive toxicity lists of the Act.

8.5.5.3 Local

Local AAs usually have the responsibility for administering hazardous materials requirements and insuring compliance with federal and state laws. The City of Hayward Fire Department is the AA for the RCEC and the AWT plant.

8.5.5.4 Codes

The design, engineering, and construction of hazardous materials storage and dispensing systems will be in accordance with all applicable codes and standards, including:

- California Vehicle Code, 13 CCR Section 1160 et seq.—provides the California Highway Patrol with authority to adopt regulations for the transportation of hazardous materials in California.
- The Uniform Fire Code, Article 80—Article 80 is the hazardous materials section of the Fire Code. Local fire agencies or departments enforce this code and can require that a Hazardous Materials Management Plan and a Hazardous Materials Inventory Statement be prepared. This requirement and the Waters Bill requirement for a Hazardous Materials Business Plan can usually be satisfied in a single combined document.
- State Building Standard Code, Health and Safety Code Sections 18901 to 18949—This code incorporates the Uniform Building Code, Uniform Fire Code, and Uniform Plumbing Code.
- The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section VIII.
- The American National Standards Institute (ANSI) K61.1

8.5.6 Involved Agencies and Agency Contacts

There are a number of agencies that regulate hazardous waste that would be involved in regulation of the waste generated by the RCEC project and the AWT plant. At the federal level is the USEPA, and at the state level is the California Environmental Protection Agency (CalEPA). The administration and enforcement of the hazardous materials laws, however, is primarily through a local agency. For the RCEC and the AWT plant, the local agency is the City of Hayward Fire Department. The person to contact is shown in Table 8.5-11.

Table 8.5-11. Agency contacts.

Type Material	Agency	Contact	Title	Telephone
All hazardous materials	City of Hayward Fire Department, Hazardous Materials Office	Hugh Murphy	Hazardous Materials Program Coordinator	(510) 583-4924
All hazardous materials RMP, HMBP	City of Hayward Fire Department, Hazardous Materials Office	Danny Galang	Environmental Specialist	(510) 583-4925
Hazardous Materials Emergency Response Team	Alameda County Hazardous Materials Emergency Response Team	Deputy Chief Mark Blanchard	Hazmat Response Team Supervisor	(510) 618-3490

8.5.7 Permits Required and Schedule

Applicable hazardous material permits and plans required for the project are listed below and in Table 8.5-12. Information required to obtain each permit is also included.

Welding and Cutting Operations Permit—to conduct welding and cutting operations in any occupancy or temporary job site involving construction permitted and regulated by the City. These permits will be obtained prior to initiation of welding or cutting operations. These permits are not submitted to an agency; however, they must be prepared an approved on-site prior to initiation of welding or cutting operations.

Consolidated Permit—will cover hazardous materials storage. A Hazardous Materials Business Plan must be submitted as part of the application for the permit. The permit will be obtained prior to storage of hazardous materials at the site.

Administrative Use Permit—The City of Hayward Zoning Ordinance specifies permitting requirements for the use of hazardous materials in areas zoned Industrial (I). Group B materials require an Administrative Use Permit for quantities used or stored above the threshold quantities of 5,000 pound (solid), 550 gallons (liquid), or 2,000 cubic feet (gas). Group B materials that will be stored in quantities above the threshold quantity at the RCEC and/or the AWT plant include non-fuming sulfuric acid, aqueous ammonia, cyclohexylamine, sodium hypochlorite, sodium hydroxide, and hydrogen gas.

In addition, several plans must be prepared, including a HMBP, a RMP, and a SPCC. It is possible that these plans could be combined into a single plan that would meet all requirements. The plan or plans will be developed after filing of the AFC and prior to start-up.

Table 8.5-12. Permits required and permit schedule.

Permit/Approval Required	**Schedule**
Welding and Cutting Operations Permit • Description of work to be performed • Name of company and person(s) performing the job • Availability of fire extinguishers or other fire suppression equipment • Checklist to ensure conditions are safe for the planned activity	Prior to initiation of construction welding or cutting operations
Consolidated Permit/HMBP • Business Owner/Operator Identification Unified Program Consolidated Form (UPCF). This form identifies owner and operator contact information. • Business Activities UPCF—Provides a summary of hazardous material usage and hazardous waste generation. • Hazardous Materials Inventory—Chemical Description UPCF. Provides detailed information for each hazardous material and hazardous waste on-site above threshold quantities. • Material Safety Data Sheets • Hazardous materials storage location map • Emergency contact information • Emergency response procedures • Training procedures	Prior to storage of hazardous materials at the site
Administrative Use Permit • Maximum hazardous material quantities (Group B Materials) • Hazardous material storage locations • Material Safety Data Sheets	Prior to storage of hazardous materials at the site
RMP • RMP Certification • Off-Site Consequences Analysis • Prevention Program information • Emergency Response Program information • Hazard assessment	Prior to start-up
SPCC • Facility location and site description • Petroleum storage quantities and areas • Spill scenarios • Spill containment measures • Spill response/contingency plan notification procedures • Emergency response actions • Training plan	Prior to start-up

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8.6 LAND USE

This section provides a discussion of land use at and within the vicinity of the proposed Russell City Energy Center (RCEC) and Advanced Wastewater Treatment (AWT) plant site and its linear facilities, and assesses the potential effects of the RCEC construction and operation on land use. Section 8.6.1 discusses the regional and local land use setting, focusing on land use within one mile of the project site and 0.25 mile of the project's linear facilities. It also discusses applicable land use plans/controls that apply to the project, and presents a brief summary of future land use projections for the region. Section 8.6.2 discusses potential environmental effects as they relate to land use compatibility and development. Section 8.6.3 discusses cumulative impacts and Section 8.6.4 presents proposed mitigation measures for any impacts determined to be significant. Section 8.6.5 presents applicable laws, ordinances, regulations, and standards related to land use, and Section 8.6.6 references agency contacts. Section 8.6.7 presents permit requirements and schedules, and Section 8.6.8 contains a list of references cited.

8.6.1 Affected Environment

8.6.1.1 Regional Setting

The project is located in the City of Hayward in Alameda County, which is situated in the East Bay Subregion of the San Francisco Bay Area in California. Alameda County encompasses approximately 472,000 acres (California Department of Finance [CDOF] 1999a). Incorporated cities in Alameda County include Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Oakland, Piedmont, Pleasanton, San Leandro, Union City, and Newark.

Regional land use is diverse, with portions of Alameda County including major urban centers. For example, the City of Oakland has a population of approximately 399,900 California Department of Finance 2001 (CDOF). San Leandro has a population of 76,700, Fremont has a population of 203,600, and the unincorporated areas of Alameda County have a population of 134,800. Hayward had a population of 129,600 in 2000, which is increasing slightly every year (CDOF 1999b).

In 1995, approximately 26 percent of Alameda County's land area was developed urban land (e.g., residential, commercial, and industrial), compared to 14.7 percent for the Bay Area as a whole (Association of Bay Area Governments [ABAG] 1997). Other land uses draw upon the area's close proximity to the San Francisco Bay, including coastal ports and harbors (e.g., Port of Oakland), military uses, and salt production. The strong military presence in the East Bay region has been reduced through implementation of the Base Realignment and Closure program on most of the military installations in the Bay Area, including the Mare Island Naval Shipyard; Oakland Army Base; Naval Air Station, Alameda; Oak Knoll Naval Hospital, Oakland; and the Naval Fleet Industrial Supply Center, Oakland. In the southern reaches of the county, a large salt production industry has developed. Large, flat coastal areas are diked to allow seawater to enter and eventually evaporate, leaving salt. Approximately 18 percent of the greater Bay Area is devoted to agricultural production (ABAG 1997). In 1997, the total value of agricultural production in Alameda County was $47.4 million, ranking 44th in the State (California Department of Food and Agriculture 1999). The top five crops, by value, were (wine) grapes ($10.39 million), (cut) flowers ($9.32 million), trees and shrubs ($8.29 million), bedding plants ($6.46 million), and cattle/calves ($5.66 million).

A significant portion of other undeveloped land in the region is designated protected open space; this is particularly true in the East Bay. The U.S. Fish and Wildlife Service (USFWS) administers the 21,500-acre Don Edwards San Francisco Bay National Wildlife Refuge, located along the edge of the Bay to the south of Hayward. The Hayward Area Recreation District (HARD) manages the 1,800-acre Hayward Regional Shoreline wetland open space area, located one-mile northwest of the project site. Numerous community parks also contribute to the open space landscape.

8.6.1.2 Local Setting

RCEC Plant Site

The power plant site is located in the City of Hayward Industrial Corridor, directly across Enterprise Avenue from the City's Water Pollution Control Facility (WPCF) (wastewater treatement plant), among heavy and light industrial and office uses. The RCEC is consistent with existing uses of neighboring properties, such as the Water Pollution Control Facility (WPCF), the Rohm and Haas paint polymers plant (located approximately 2,000 feet southeast), and a multi-company trucking warehouse facility (located immediately west). Figure 8.6-1 shows existing land uses within one mile of the project site. The Hayward Industrial Corridor extends to the north for about 1.5 miles to the Hayward Air terminal, and to the east for about the same distance. Large industrial facilities to the east include the Gillig bus manufacturing plant and Berkeley Farms dairy processing facility. A variety of smaller warehousing and industrial businesses line Enterprise Avenue, Whitesell Street, and Depot Road, the nearest streets. A pocket of unincorporated County land that contains a number of automobile salvage yards lies between Depot Road and the WPCF.

The nearest residential uses to the project consist of an apartment complex located northeast and approximately 0.82 miles from the project site, and a single-family dwelling located on Depot Road east of Clawiter Road, also about 0.82 miles away. There are several residences remaining within the Hayward and County Industrial zones on McCone Avenue and Dunn Road. These are approximately 0.8 miles or more from the project site. The amount of housing within a one-mile radius of the project is very small and, other than the McCone Avenue and Dunn Road residences, is confined to the Mt. Eden residential area east of Industrial Boulevard.

Open land lies to the south and west of the project site, between the project site and State Route 92. This area includes a stormwater retention pond that is owned by the City of Hayward. This pond is used to regulate stormwater flow into marshlands further south, including the HARD marsh and a salt marsh harvest mouse preserve that is located further south, along State Route 92. The HARD marsh is a reclamation project that involves the restoration of former salt evaporation ponds to brackish marsh using secondary treated wastewater from the Union Sanitary District (USD) Alvarado Treatment Plant. Other land uses to the south and west include recreational uses at the Hayward Shoreline Regional Park (managed by East Bay Regional Parks District) and the Shoreline Interpretive Center that is run by the HARD. The Shoreline Interpretive Center is located about 0.73 miles from the plant at the end of Breakwater Drive, adjacent to State Route 92. From that location, hiking trails extend further west to the bay and north along the bay shore.

Major surface roads within the vicinity of the proposed project include State Route 92, Clawiter Road, Enterprise Avenue, Industrial Avenue, and Depot Road. Union Pacific Railroad industrial spur tracks abuts the southern boundary of the project. Refer to Section 8.12 for further details regarding transportation facilities.

Nearby schools are located in the Mount Eden and Glen Eden areas at distances of approximately 1 mile or more from the RCEC site. More specifically, Chabot Community College is just over one mile east-northeast of the site. The Life Chiropractic West College is located east-northeast of the project site at the

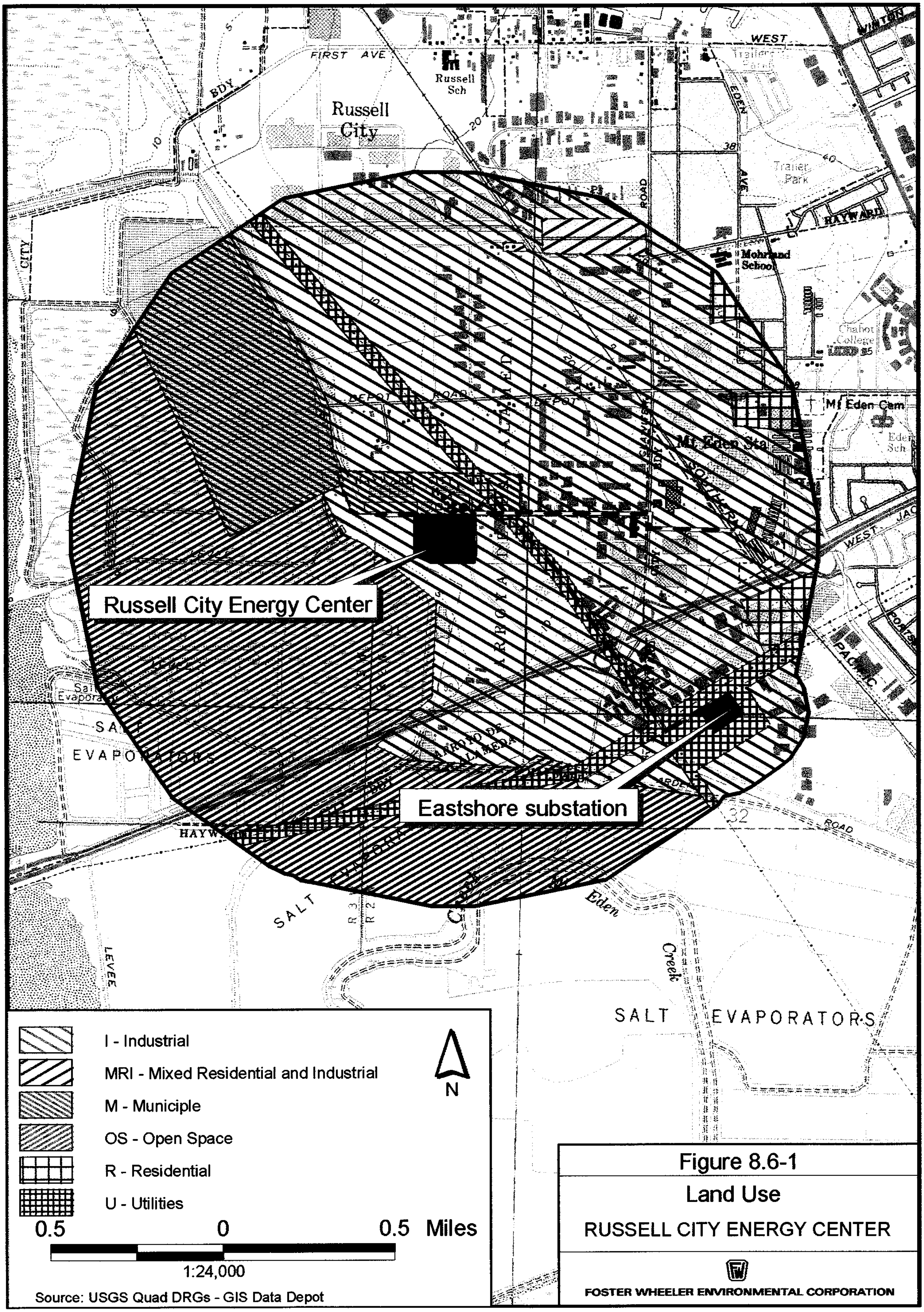

Figure 8.6-1

Land Use

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

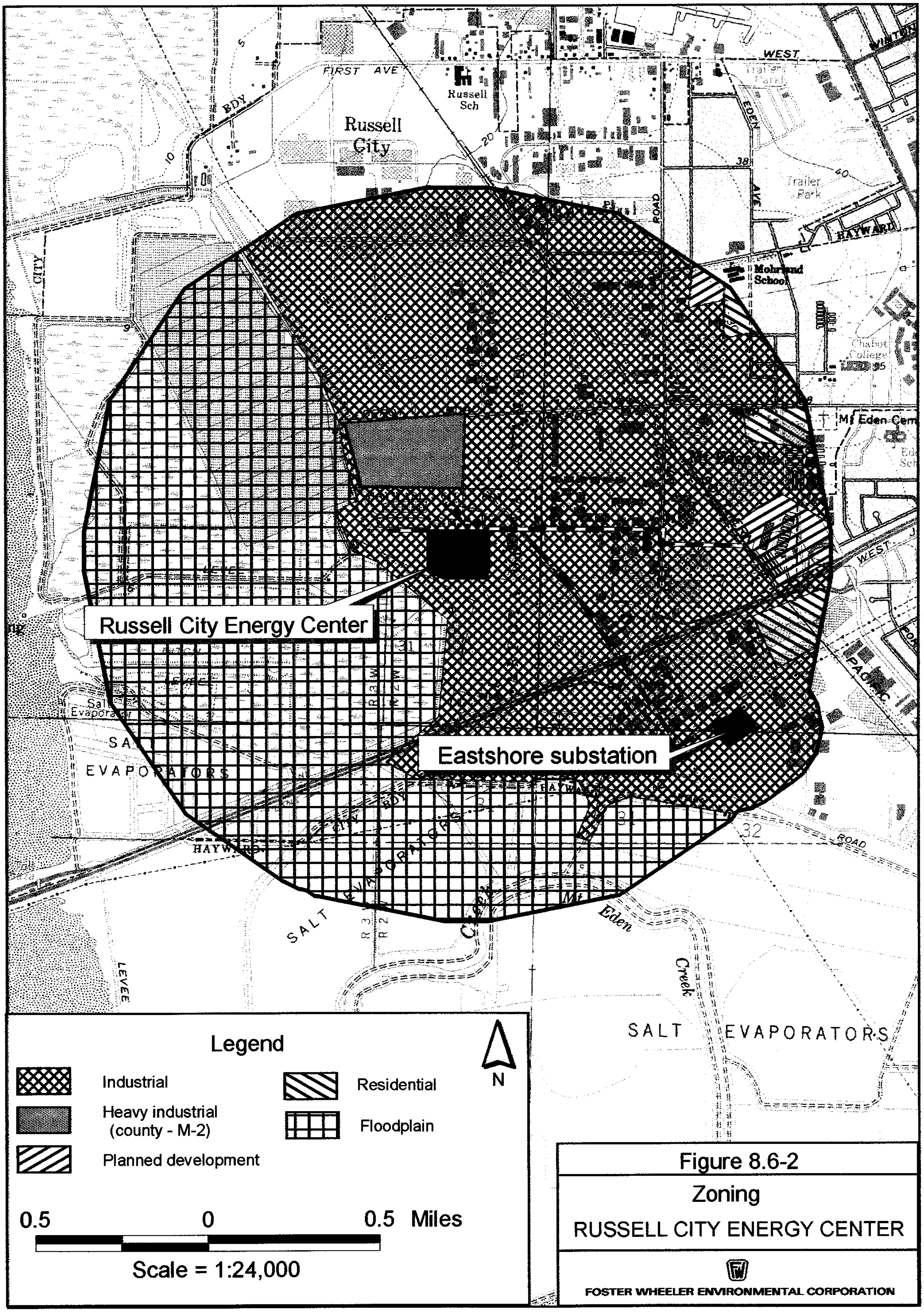

Figure 8.6-2
Zoning
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Russell City Energy Center AFC

May 2001

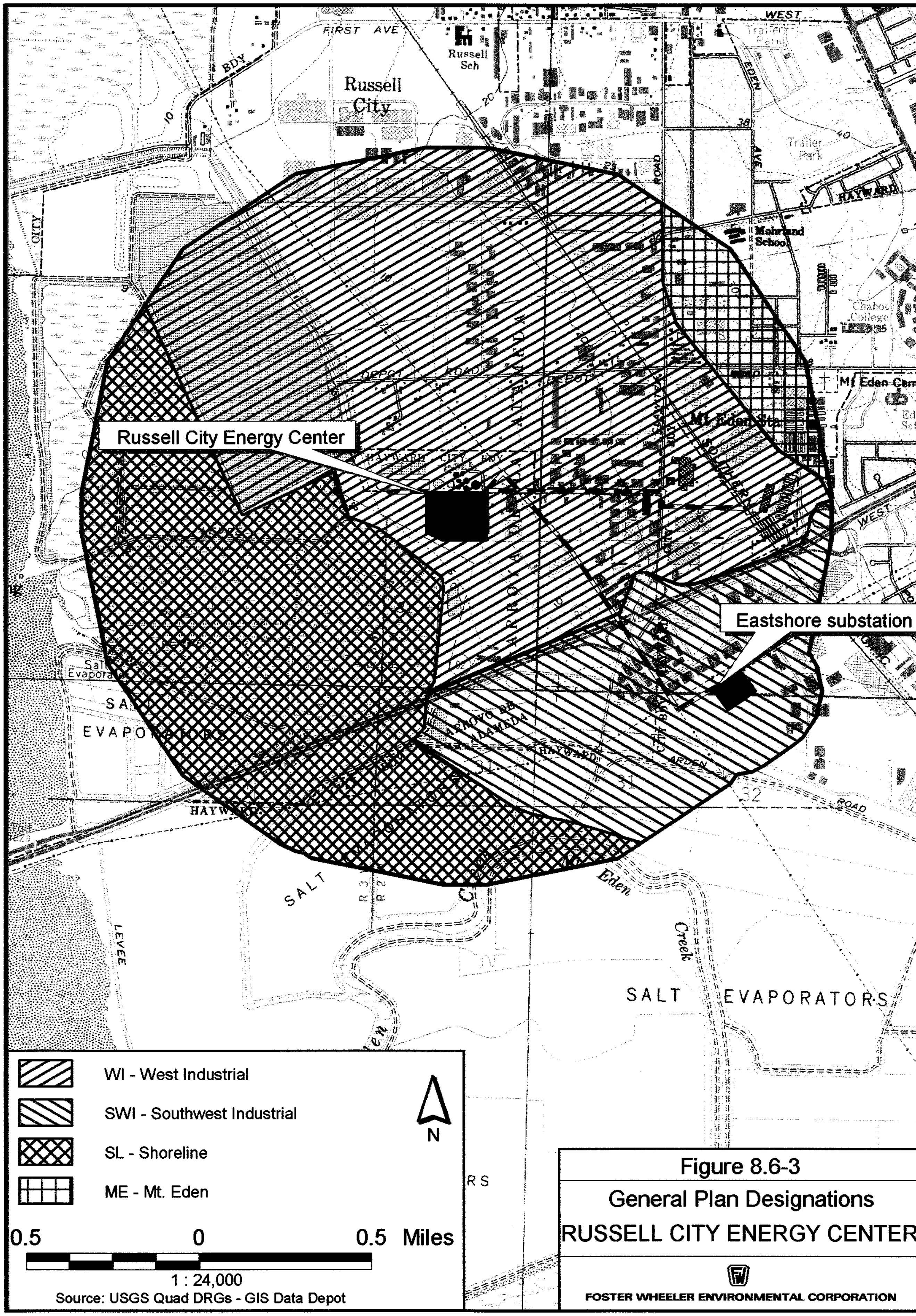

Figure 8.6-3
General Plan Designations
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Russell City Energy Center AFC

May 2001

corner of Clawiter and Depot Road, a distance of 0.75 mile from the RCEC site. For a discussion of sensitive receptors within one mile of the proposed project site, refer to Section 8.9 (Public Health).

Electric Transmission Line and Eastshore Substation Expansion—There are 4 existing transmission line towers between the project site and State Route 92, and 2 towers between State Route 92 and PG&E Eastshore Substation. These towers will be replaced, at the same locations, with new tubular towers. The first tower is located at 3458 Enterprise Avenue at Bay Cities Rebar Company, while a second tower is located on the Tuscarora Corporation's property at 3440 Enterprise Avenue. A third tower is located on the property of Johnson Controls. The fourth tower is located in a Caltrans parking lot within the State Route 92 right-of-way overpass embankment. The two towers south of State Route 92 are also situated in areas that are zoned and used for industrial purposes. The electrical transmission line route covers 1.1 miles and connects with the Eastshore Substation, south of State Route 92 off Arden Road. The PG&E substation and surrounding area lies within the Hayward Industrial Corridor and is also zoned for industrial use, but this area contains more office and light industrial uses compared with the heavy industrial uses near the RCEC site (e.g., the City of Hayward's WPCF, and the Rohm and Haas paint polymers plant), north of State Route 92. Industrial developments near the PG&E substation and off Eden Landing Road were constructed more recently than those near the RCEC.

Natural Gas Pipeline—The pipeline route lies entirely in the Hayward Industrial Corridor. The proposed route will run east from the RCEC site along Enterprise Avenue, across Clawiter Road to the Berkeley Farms facility, and then continue east along the southern property line of Berkeley Farms to the east side of the Union Pacific Railroad right-of-way, where PG&E's gas distribution Line 153 is located. Land use along Enterprise Avenue consists of a large truck terminal, the City of Hayward WPCF, automotive and metal fabricating, and other light industrial uses.

Wastewater Return Pipeline—The wastewater discharge pipeline will extend across Enterprise Avenue to the City of Hayward's WPCF. Current use nearby includes the KFAX radio station transmitter, the WPCF, and the warehouse-truck terminal immediately west of the RCEC site.

AWT Plant

The local setting of the AWT plant is substantially the same as that of the RCEC plant site.

8.6.1.3 Land Use Planning and Controls

The City of Hayward General Plan provides a general and comprehensive statement of land use policies that will guide the future growth of cities and counties. The City's ordinances, in contrast, provide a specific regulatory mechanism used by the City to implement its land use policy. Zoning ordinances give jurisdictional properties a zoning designation, which corresponds to a set of "permitted" and "conditional" uses. The City's land use zones, or districts, are each subject to specific development standards and restrictions. Zoning and general plan designations for the project area are shown in Figures 8.6-2 and 8.6-3, respectively. In addition to these basic land use policies, there may be regional land use controls in a particular area that must also be considered prior to development.

General Plan Designation and Zoning

RCEC Plant Site

The project is located in the City of Hayward and hence is subject to policies stipulated in the Hayward General Plan (City of Hayward, 1998). Specifically, the Land Use Element of the General Plan defines Planning Areas and establishes the descriptions, limits, and directions for growth (Section 8.6.5).

The project site is part of the West Industrial Planning Area (WIPA) and has been designated a part of the Hayward Industrial Corridor in the General Plan. As one of several Planning Areas in Hayward, the WIPA has potential for office, warehouse, and other industrial growth.

The project site is zoned Industrial (I) (Figure 8.6-2) under the City of Hayward zoning ordinance. The purpose of this designation is to encourage the development of industrial uses in suitable areas while minimizing effects to other areas. Manufacturing, warehousing, printing, publishing, research and development, research laboratories, and wholesale business uses are permitted as primary uses in the Industrial District when not adjacent to a residentially zoned property, when not specified as an administrative or conditional use, and when the use is conducted completely within an enclosed building(s). Pertinent restrictions in the Industrial zone include a minimum lot size of 10,000 sq. ft., minimum frontage of 35 ft., and an average lot width of 70 ft. There is no maximum lot coverage limit for industrial facilities, and no limit on the height of industrial buildings.

Other predominant zoning designations within one mile of the project site are Industrial (I), Single-Family Residential (RS), and Flood Plain (FP) (City of Hayward Zoning Ordinance 1999). Also within one mile of the project site are two unincorporated areas of Alameda County that are entirely surrounded by the City of Hayward. An area along Depot Road north of the project, for example, is zoned Heavy Industrial (M-2) under the County's zoning system. This area contains several automobile salvage businesses. Areas further north along Clawiter Road and Industrial Boulevard are also under the County's zoning jurisdiction including both residential and industrial zones.

Electrical Transmission Line and Eastshore Substation Expansion—From the new RCEC switchyard, power will be transmitted through new overhead transmission lines to PG&E's existing Eastshore Substation. Lands adjacent to the transmission wires are zoned Industrial and are designated Industrial Corridor in the General Plan. The transmission line will cross State Route 92.

Natural Gas Pipeline—The natural gas pipeline will be installed within Enterprise Avenue, across Clawiter Road, and in a pipeline right-of-way within the Berkeley Farms facility. Zoning designations do not apply to city street rights-of-way. The City's General Plan designates properties adjacent to the proposed pipeline as part of the Industrial Corridor. They are zoned as Industrial (Figure 8.6-2). Zoning designations for all parcels adjacent to the pipeline corridor are also Industrial.

Wastewater Return Pipeline—The wastewater return pipeline lies within the General Plan's Industrial Corridor. The zoning designations for parcels adjacent to the wastewater discharge pipeline are Industrial.

AWT Plant

The General Plan and zoning designations for the AWT plant are the same as to those for the RCEC plant site.

Other Applicable Land Use Plans

San Francisco Bay Plan

Various regional land use controls are operative in portions of the project area. The Bay Conservation and Development Commission (BCDC), as the local coastal management agency, administers the local coastal management program including the San Francisco Bay Plan. Created in 1968, the Bay Plan is an enforceable regulatory framework to guide the future protection and use of the San Francisco Bay and its shoreline. Key features of the Bay Plan include regulation of filling and dredging in the Bay and new development within 100 feet of the shoreline, and protection of shoreline areas suitable for high priority water-orientated uses (i.e., ports and harbors). In order to carry out the Bay Plan, a permitting system has been established for certain activities on lands within the BCDC's jurisdiction, which includes the following areas:

- The open water, marshes, and mudflats of greater San Francisco Bay, including Suisun, San Pablo, Honker, Richardson, San Rafael, San Leandro and Grizzly Bays, and the Carquinez Strait
- The first 100 feet inland from the shoreline around San Francisco Bay
- The portion of the Suisun Marsh including levees, waterways, marshes and grasslands below the 10-foot contour line
- Portions of most creeks, rivers, sloughs and other tributaries flowing into San Francisco Bay
- Salt ponds, duck hunting preserves, game refuges, and other managed wetlands that have been diked off from San Francisco Bay (BCDC 1999)

A permit from the BCDC is required if there are plans to perform any of the following activities within the BCDC jurisdictional area:

- Place solid material; build or repair docks, pile-supported or cantilevered structures; or dispose of material or moor a vessel for a long period in San Francisco Bay or in certain tributaries that flow into the Bay
- Dredge or extract material from the bottom of the Bay
- Substantially change the use of any structure or area
- Construct, remodel, or repair a structure
- Subdivide property or grade land (BCDC 1999).

According to the BCDC (Lisa Bennett, personal communication, February 13, 2001), the RCEC site does not lie within BCDC jurisdiction. The marshlands (Hayward Area Recreation District [HARD] marsh) to the south of the RCEC site are not within the Bay shoreline zone, because they are not tidally influenced. These are instead freshwater marshlands fed by runoff, treated wastewater from the Union Sanitary District, and periodic infusions of Bay water intentionally released into the area to create a brackish marsh. The BCDC jurisdiction under the McAteer-Petris Act and the San Francisco Bay Plan extends 100 feet from the actual Bay shoreline, about one mile west of the RCEC site.

Hayward Area Shoreline Plan

The Hayward Area Shoreline Plan was developed in 1974 and updated in 1993 by the Hayward Area Shoreline Planning Agency (HASPA) (HASPA 1993). HASPA is a joint cooperative planning agency with representatives from the City of Hayward, East Bay Regional Parks District, Hayward Area Recreation District, Hayward Unified School District, and San Lorenzo Unified School District. HASPA's Planning Area consists of all land in the City of Hayward west of the Union Pacific Railroad tracks to the bayshore. HASPA's purpose is long-range planning of the shoreline area and the enhancement and environmental restoration of wetlands in public ownership near the shoreline. One of the key purposes of HASPA is to coordinate the management and development of land held in public ownership within the Planning Area. HASPA is an advisory, rather than a jurisdictional or regulatory body.

HASPA's Planning Area includes about one-third of the City of Hayward Industrial Corridor. Much of this land, particularly in the western and southern areas, however, consists of marshland, landfill, and salt evaporation ponds. Open land north of State Route 92, about one-quarter of the HASPA Planning Area, is mostly in public ownership (City of Hayward, East Bay Regional Parks, State of California). Open land south of State Route 92 within the Planning Area is mostly privately held, and much of this is owned by the Cargill Corporation and operated as salt evaporation ponds.

HASPA is coordinating open space development in the HASPA Planning Area through implementation of the Hayward Area Shoreline Plan. As of 1998, HASPA had acquired 1,800 acres of shoreline property, sponsored marsh restoration (HARD Marsh, Triangle Marsh), and developed 8 miles of shoreline trails. The Shoreline Interpretive Center is a key educational outreach facility for HASPA. The key program objectives of HASPA are:

- Protect environmental resources such as wetlands and habitat for endangered and threatened species
- Preserve historical resources, such as landings and salt production sites
- Promote education and research
- Provide recreational opportunities, particularly through the shoreline trail system
- Encourage industrial development and traffic circulation improvements and promote industrial in-fill development in areas designated for industrial and public utilities
- Support land management efforts (mosquito abatement, shoreline erosion control, alien species management, etc.)

8.6.1.4 Future Land Use Trends

A considerable increase in East Bay area growth is expected over the next decade. Alameda County's population is expected to increase by approximately 22 percent from 2000-2020 (ABAG Projections 2000) with a population of 1,654,485 by the year 2010. Increases in population will undoubtedly spur further residential development in Hayward and elsewhere in the county. This growth is expected to continue well into the future. An overflow of high technology activities from Silicon Valley into the Hayward area has caused significant industrial expansion and this trend is expected to continue into the future. Hayward has become an attractive location for high technology manufacturing and research and development facilities because of appropriately zoned land and accessibility to affordable housing.

One of the effects of the Silicon Valley spillover has been the increased use of the Hayward Industrial Corridor for business and office-related uses, leading to a higher density of employees than is usual for a light and heavy industrial area and resulting in higher than planned traffic congestion, shortages of parking, and the conversion of warehousing space to office space within the Industrial Corridor. The City of Hayward has addressed these issues in a background paper developed as part of the General Plan Update that will be completed during 2001 (City of Hayward 2001a). Recommendations have included: 1) greater segregation of uses within the Industrial Corridor (for example, more separation of manufacturing, warehousing, and business park uses or rezoning the district for greater segregation of uses); 2) allowing automobile parking on the street under certain circumstances, 3) imposing a minimum lot size to prevent the excessive subdivision of parcels, and 4) placing a high priority on increased transit access within the Industrial Corridor.

As part of the General Plan update, the City has also addressed "smart growth" principles (City of Hayward 2001b). Smart growth principles are intended to counteract what contemporary planners see as problems associated with urban sprawl. Higher density housing that is served by public transit, mixed development of housing and commercial uses, pedestrian-friendly neighborhoods, and open space preservation and development are seen as planning principles that will help to coordinate development and retain a strong sense of place, better quality housing, and higher quality of life. Examples of transit-oriented development include the new housing complex located adjacent to the Hayward City Hall and Bay Area Rapid Transit station. The City has examined smart growth principles in relation to five key "change areas" in the City, one of which is the Industrial Corridor. Future planning efforts for the Industrial Corridor may include a better mix of residential, retail commercial, and housing uses where appropriate, in portions of the Industrial Corridor that are occupied primarily by business parks and office uses.

Within the last eighteen months (11/15/99 – 5/5/01), the City of Hayward has conducted discretionary reviews and approved the following projects within 2 miles of the RCEC project site:

- Use permit for a two-story office building at 25700 Industrial Boulevard near Depot Road
- Staples and Walgreens commercial development at West Winton Avenue and Hesperian Boulevard
- Industrial development (50,000 square feet) at 24600 Industrial Boulevard, adjacent to residential area

8.6.2 Environmental Consequences

Potential impacts to land use are evaluated by comparing project characteristics with the regional and local land use environment. A summary of effects to land use and zoning designations within one mile of the power plant site and within 0.25 mile of the project's linear routes is presented in Table 8.6-1.

Table 8.6-1. General Plan/zoning amendment matrix.

Project Features	General Plan Designation	GP Amendment?	Zoning Designation	Rezone Required?	Other Requirements
Electric transmission line	Industrial Corridor	No	Industrial	No	Encroachment permit
Natural gas pipeline	Industrial Corridor	No	Industrial	No	Encroachment permit
Water supply and wastewater return pipelines	Industrial Corridor	No	Industrial	No	Encroachment permit
AWT plant	Industrial Corridor	No	Industrial	No	Encroachment permit

8.6.2.1 Significance Criteria

Criteria used in determining whether project-related land use impacts are significant are consistent with standard industry practice and California Code of Regulations Title 14, §15065. An impact is determined to be significant if it:

- Physically divides an established community

- Conflicts with any applicable land use plans, policies, or regulations 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

- Conflicts with any applicable habitat conservation plan or natural communities' conservation plan

8.6.2.2 Potential Effects on Land Use

This section discusses the general project effects on land use, followed by specific potential effects of each project element. As shown in Table 8.6-1, neither the project nor any of its associated facilities will require a General Plan amendment or zoning re-designation. An encroachment permit from the City of Hayward will be required for the natural gas pipeline, or utility easement.

Consistency with the General Plan and Zoning Ordinance

The proposed RCEC project is consistent with and furthers in many respects the goals and policies of the City of Hayward General Plan. Specifically, the RCEC is an industrial land use within a designated Industrial Corridor, consistent with the General Plan.

The Russell City Energy Center would further key goals and policies stated in the General Plan's Land Use, Economic Development, and Growth Management Elements, and is consistent with the goals and policies of the other elements, as noted below:

- The Housing and Neighborhood Preservation section of the General Policies Plan identifies the West Industrial area of the City as representing great potential for industrial growth in Hayward.

- The Economic Development portion of the Hayward General Policies Plan recognizes the importance of the economic health of the City. This element states that the City's fiscal health is dependent upon maintaining a dynamic economic climate and points out the importance of developing or increasing the Hayward tax base and employment opportunities in the City of Hayward. The Economic Development Element lists a number of policies based on these issues. The RCEC would promote achievement of Policy II ("create a sound local economy which attracts investment, increases the tax base, creates employment opportunities for residents, and generates public revenues"), Policy III ("facilitate the development of employment opportunities for residents"), and Policy V ("attract new businesses").

- The Circulation Element of the General Policies Plan sets forth concerns about increased traffic generation from economic development. The RCEC is consistent with the Plan's goal of improving traffic circulation in that the RCEC is a relatively low traffic generator compared to other types of industrial development.

RCEC Plant Site

The proposed project site will not have a significant impact on the surrounding area under the CEQA thresholds presented above. The project will be located in an industrial area that is separated by design from the rest of the community, including residential developments found to the east. The nearest residential area is approximately 0.82 miles from the RCEC property line. Since the project is industrial in nature and will be located in an industrial area, it is consistent with surrounding land uses and would not physically divide any elements of the local community. The proposed architectural design of the RCEC would contribute to an enhanced appearance of the City's western gateway area. The project is sited in an area where the neighboring land uses are mostly light and heavy industrial, including the City's wastewater treatment plant, Rohm and Haas paint polymers plant, Gillig bus manufacturing facility, and Berkeley Farms dairy products processing facility.

Section 10 of the City of Hayward's General Policies Plan states that determination of conformance of a proposed use or zone with the General Plan should include consideration of the following questions:

1) Is the use specifically designated on the Policies Plan Map in the area where its location is proposed?

   Answer: Yes, the proposed RCEC is an industrial use, to be located in the area designated Industrial Corridor.

2) Are conditions in the area safe from potential flooding and geologic hazards not common to the entire Hayward Planning Area?

   Answer: Yes. According to the Federal Emergency Management Agency (FEMA) flood insurance rate map (Community Panel Nos. 065033-0019E and 065033-018E), the RCEC is located in Zone C (area of minimal flooding) and is not within a 100-year or 500-year floodplain.

3) Will community facilities and streets be available at City standards to serve the proposed property use?

   Answer: Yes. City streets and City utilities serve the location. Water is available from the City of Hayward, and treated wastewater would be available from the Hayward Water Pollution Control Facility.

4) Is the proposal consistent with policies, principles and standards contained in the General Plan?

   Answer: Yes. The Energy Center furthers important goals and policies in the General Plan, including the Economic Development and Growth Management elements. Conditions of certification specified in the California Energy Commission license for the RCEC, if granted, would ensure that environmental, noise, and conservation element policies would be attained.

5) Do social and economic conditions indicate that the proposed zoning or development is needed at this time?

   Answer: Yes. California is currently facing a significant energy shortage. Governor Gray Davis is encouraging the development of new energy facilities. Hayward, and the San Francisco Bay Area in general, require additional local electric energy generation to avoid a decline in the reliability and quality of electric power service.

6) Does an evaluation of required environmental impact reports and any potential public benefit analyses indicate that the use or zone justifies any adverse impact the proposal may have on the area involved?

   Answer: The CEC licensing process provides a thorough evaluation of environmental impacts and analyses of potential public benefit. The CEC licensing process, under the Warren-Alquist Act, is equivalent to CEQA review at the level of an Environmental Impact Report.

The RCEC is consistent with the City of Hayward Zoning Ordinance as a planned industrial use located in the Industrial Corridor, which is an Industrial District. As a manufacturing use, or a use very similar to manufacturing, the RCEC would be considered a permitted use, not requiring a General Plan Amendment, rezone, or variance. City of Hayward Department of Community and Economic Development Staff have prepared a Staff Report offering their opinion that the RCEC should be considered a permitted use similar to manufacturing (Appendix 8.6-A).

Land uses south and west of the project consist mainly of natural resource conservation. There is a vacant lot owned by the Waste Management Corporation immediately south of the RCEC site. Further south lies City property used as a stormwater retention basin. Still further south, across the flood control channel, is a natural brackish marshland owned by the City of Hayward, which connects with the salt marsh harvest mouse preserve along State Route 92. Further west is the HARD marsh, jointly managed by the East Bay Regional Parks District and Hayward Area Recreation District. These areas lie outside of the Industrial zone in the Floodplain zone. The RCEC will not significantly conflict with these land uses. Noise levels from the energy center will be low such that wildlife can easily adapt (see Section 8.7, Noise). There are no significant levels of vibration from a facility such as the RCEC. Though the project could provide perching sites for predatory raptors, this could be easily mitigated. Recreational and educational use of the shoreline area will take place at a sufficient distance from the RCEC such that there will be no significant visual or noise impacts on recreational users in this zone (see Section 8.13, Visual Resources). Other potential effects on wildlife and, in general, the use of the neighboring area as a natural resources conservation area, would not be significant and would not conflict with these uses, with appropriate mitigation measures (see also Section 8.2, Biological Resources).

Electrical Transmission Line and Eastshore Substation Expansion—Construction of the new transmission towers will be performed segment by segment, so as to disrupt traffic as little as possible. Most of the tower replacement sites are located in parking lots or industrial lots of existing businesses. The electric transmission line will not conflict with local zoning regulations or with the goals of the General Plan for the City of Hayward.

Natural Gas Pipeline—The proposed natural gas pipeline will be placed in Enterprise Avenue, across Clawiter Road, and in a pipeline corridor near the south boundary of the Berkeley Farms property. Since the pipeline will be buried, it will not directly or permanently affect surrounding land uses. Temporary, indirect impacts to nearby businesses will occur due to standard construction practices that may slow and/or re-route traffic. Pipeline construction will take two to three months or less. Affected areas will only experience short-term impacts since the pipeline will be constructed on a segment-by-segment basis. Once the pipeline is completed, there will be no impacts to local transportation patterns.

The City of Hayward's General Plan does not specifically address regulation of underground utilities. The City's Industrial Corridor Plan governs land adjacent to the proposed pipeline route; pipeline construction and operation will not conflict with the goals and policies of this particular plan. Since local zoning regulations do not apply to street rights-of-way, the proposed natural gas pipeline will not conflict with local zoning regulations. The only permit required for construction of the gas pipeline will be an encroachment permit issued by the City of Hayward.

Wastewater Return Pipeline—The wastewater return line will cross under Enterprise Avenue to the City of Hayward Water Pollution Control Facility. There will be minimal impacts to local transportation patterns due to construction of the new pipeline. Since local zoning regulations do not apply to street rights-of-way, the proposed wastewater pipeline will not conflict with local zoning regulations.

AWT Plant

Consistency of the AWT plant with the General Plan and zoning ordinances will be substantially similar to that of the RCEC plant site.

8.6.3 Cumulative Impacts

Since the project will not cause significant land use impacts, it will not contribute to significant cumulative impacts on land use.

8.6.4 Proposed Mitigation Measures

There are no significant land use impacts related to the project site and the natural gas pipeline. An encroachment permit will be obtained prior to construction of any project facilities, and all mitigation measures stipulated in any such permit will be followed.

8.6.5 Applicable Laws, Ordinances, Regulations, and Standards

All applicable laws, ordinances, regulations, and standards and their conformance measures are detailed in the text below. Table 8.6-2 summarizes this information and provides agency contacts. Table 8.6-3 presents the land use permit schedule.

8.6.5.1 Federal

The Federal Aviation Administration Act and its implementing regulations (14 CFR 77) apply to any structure taller than 200 feet above ground surface at the site of the structure, within three nautical miles of the nearest runway. The RCEC exhaust stacks will be 145 feet tall and thus a permit from the FAA will not be required.

8.6.5.2 State

State LORS that apply to this project include:

Warren-Alquist Energy Resources Conservation and Development Act

Provisions in the Warren-Alquist Energy Resources Conservation and Development Act (Public Resources Code [PRC] 25000 et seq.) are directly and indirectly related to land use. The provisions state, among other things, that:

> *The following areas of the state shall not be approved as a site for an energy generating facility, unless the commission finds that such use is not inconsistent with the primary uses of such lands and that there will be no substantial adverse environmental effects and the approval of any public agency having ownership or control of such lands is obtained: (a) State, regional, county and city parks; wilderness, scenic or natural reserves; areas for wildlife protection, recreation, historic preservation; or natural preservation areas in existence on the effective date of this division; and (b) Estuaries in an essentially natural and undeveloped state. In considering applications for certification, the commission shall give the greatest consideration to the need for protecting areas of critical environmental concern, including, but not limited to, unique and irreplaceable scientific, scenic, and educational wildlife habitats; unique historical, archaeological, and cultural sites; lands of hazardous concern; and areas under consideration by the state or the United States for wilderness, or wildlife and game reserves.* (PRC §25527)

The proposed project will conform to PRC §25527 since project lands are not located in either of these areas.

Table 8.6-2. Laws, ordinances, regulations, and standards (LORS).

LORS	Document/Section	Applicability	AFC Section Where Conformance is Discussed
Federal	No permits required	—	—
State			
Encroachment permit for excavation in public roadway	CA Streets and Highways Code, Division 2, Chapter 5.5, Sections 1460-1470	Encroachment permit will be necessary for construction of portions of the natural gas and water and wastewater return pipelines	Section 8.6.2.2
Local			
General Plan Designations	Hayward General Plan	Development within the jurisdiction of the city is subject to provisions in the General Plan	Section 8.6.2.2

McAteer-Petris Act

The McAteer-Petris Act (California Government Code Title 7.2, §66600 et seq.) established the Bay Conservation and Development Commission to administer the Federal Coastal Zone Management Act in the San Francisco Bay Area, and to implement the San Francisco Bay Plan. The BCDC's requirements are discussed above, as incorporated in the Warren-Alquist Act and as they apply specifically to power plants. BCDC's jurisdiction is the San Francisco Bay, some adjoining drainage areas, and the bay's shoreline band. As mentioned above, BCDC jurisdiction does not apply to the project.

California Streets and Highways Code

Under the California Streets and Highways Code, Division 2, Chapter 5.5, Sections 1460-1470, an encroachment permit is required if there is an opening or excavation for any purpose in any county highway. The RCEC will conform to Section 1460-1470 by obtaining an encroachment permit from the Hayward Public Works Department prior to natural gas pipeline construction.

8.6.5.3 Local

Local LORS that would apply to the project include the following:

General Plan(s)

Land use provisions must be included in every California city and county General Plan (Government Code §65302). Local governments may also adopt plans for sub-areas such as communities and neighborhoods, and may adopt "special area plans" that detail implementation measures for an area requiring concentrated planning attention (e.g., an historical district).

Since the project is located entirely within an Industrial area and is consistent with the intended uses, plans, and policies of the Industrial Corridor land use designation, it will conform to the Hayward General Plan. The generation facility will be the only use visible after construction (since the pipeline will be buried under city streets). The tallest structures at the project site (145 feet) would be considerably lower than the existing KFAX radio towers (228 feet) and also would be lower than the stack at the Rohm and Haas paint polymers plant nearby (180 feet). The project will not effect existing uses or opportunities in the Industrial Corridor since it will be on land that is currently industrial.

Zoning Ordinance

Zoning is the regulatory mechanism used to implement land use policy. Most city planning and building departments enforce zoning ordinances. The proposed project is subject to the Hayward Zoning Ordinance and will comply with it. Hayward zoning designations in the project area are shown on Figure 8.6-2. The project site is currently zoned Industrial District, a use that allows a broad range of industrial activities. The City staff have offered their opinion that the RCEC would be a permitted use in the Industrial District (see Appendix 8.6).

San Francisco Bay Plan

The San Francisco Bay Plan applies to all areas under the jurisdiction of the BCDC. The Plan is an enforceable regulatory mechanism to guide the future protection and use of the San Francisco Bay and its shoreline. The RCEC and AWT plant site are not within BCDC jurisdiction or maritime priority use areas.

8.6.6 Involved Agencies and Agency Contacts

Table 8.6-3 contains a list of agencies and contact persons.

Table 8.6-3. Agencies and contact persons.

Agency	Contact	Title	Telephone
City of Hayward	Dan Garcia	Development Review Engineer	(510) 583-4208
City of Hayward	Gary Calame	Sr. Planner	(510) 583-4226

8.6.7 Permits Required and Schedule

Table 8.6-4 outlines the permit schedule related to land use issues for the RCEC and AWT plant project. Information required to obtain each permit is also included.

Table 8.6-4. Permit/application schedule for land use.

Permit/Application	Schedule
Encroachment permit for water and natural gas pipelines: • Site specific plan • Pipeline routes • Road rights-of-way where pipelines will be constructed	1 to 2 weeks from application submittal to approval by Public Works Department

8.6.8 References

Association of Bay Area Governments (ABAG). 1997. Bay Area futures: Where will we live and work? Internet site: www.abag.ca.gov/planning/bayareafutures/

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California Department of Finance. 1998. County population projections with race/ethnic detail. Internet site: www.dof.ca.gov/html/Proj_race.htm

California Department of Finance. 1999a. California county profile: Alameda County. Internet site: www.dof.ca.gov/html/fs_data/profiles/alameda.xls

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California Department of Food and Agriculture. 1999. Alameda county information. Internet site: www.cdfa.ca.gov/counties/Counties/co-01.htm

City of Hayward. 1998. *Hayward General Policies Plan, adopted 1986 and as amended through February 24, 1998.*

City of Hayward. 2001a. *The new economy and the transformation of the industrial corridor.* City of Hayward Agenda Report. Prepared by Gary Calame, Senior Planner, City of Hayward Community and Economic Development Department. Background paper for the General Plan Update. Available on Internet site: www.ci.hayward.ca.us.

City of Hayward. 2001b. *Smart growth principles and the General Plan.* City of Hayward Agenda Report. Prepared by Gary Calame, Senior Planner, City of Hayward Community and Economic Development Department. Background paper for the General Plan Update. Available on Internet site: www.ci.hayward.ca.us.

Hayward Area Shoreline Planning Agency. 1993. *Hayward Area Shoreline planning program: A shared vision.* Hayward Area Shoreline Planning Agency, Hayward.

8.7 NOISE

This section presents an assessment of potential noise and vibration effects related to the Russell City Energy Center (RCEC) and adjacent Advanced Water Treatment (AWT) Plant. This assessment includes an evaluation of the potential effects to the nearest sensitive receptors and to plant operations personnel. Conference of the project to the City of Hayward's noise impact criteria for the Industrial Zone was also assessed. Section 8.7.1 discusses the affected environment, including baseline noise level survey methodology and results. Section 8.7.2 discusses the environmental consequences from construction and operation of the AWT plant and associated facilities. Section 8.7.3 discusses cumulative impacts. Section 8.7.4 discusses mitigation measures. Section 8.7.5 presents applicable laws, ordinances, regulations, and standards. Section 8.7.6 presents agency contacts, and Section 8.7.7 presents permit requirements and schedules. Section 8.7.8 contains references.

8.7.1 Affected Environment

The proposed site of the RCEC and AWT plant is located within the Hayward Industrial Corridor. The nearest residences are on the east side of Industrial Boulevard, about 0.82 miles from the RCEC property line. The area between the site and the nearest residential areas contains large concrete and metal buildings which help to obstruct noise. Land uses surrounding the project site include the City of Hayward Water Pollution Control Facility (WPCF) to the north, trucking terminals to the east and west, heavy industrial uses (Rohm and Haas paint polymers plant) and offices to the southeast, and open space to the south. Primary sources of noise in the area include equipment at the WPCF, and truck traffic noise on local streets. There is also some noise from airplanes in the flight paths of the Oakland, Hayward, and San Francisco airports.

The Hayward shoreline area and Hayward Shoreline Regional Park are located west of the site. This marshy area also contains the City of Hayward's WPCF oxidation ponds. A system of nature trails has been developed along the San Francisco Bay shoreline and through the Cogswell Marsh, and the Hayward Shoreline Interpretive Center is located at the end of Breakwater Avenue adjacent to the Hayward-San Mateo Bridge approach (State Route 92).

The CEC's power plant certification regulations require that noise measurements be made at noise-sensitive locations where there is a potential for an increase of 5 dBA or more over existing background noise levels during construction or operation of a proposed power plant. Although it was not anticipated that plant noise would increase the ambient levels at the nearest residences by 5 dBA, an ambient noise survey was conducted adjacent to these residences, because there are no other noise-sensitive uses nearer to the site. Measurements were also made at one location along the bay trail system, at the Hayward Shoreline Interpretive Center, in the wildlife refuge, and at one location on the power plant site boundary near the WPCF.

The survey was conducted at four of the locations on February 27 and 28, 2001 and at a fifth location on March 25 and 26, 2001. The five monitoring locations and receptor locations are shown in Figure 8.7-1. A brief description of each monitoring location and the types of sounds heard during the survey are presented below. Photographs of each location are presented in Figure 8.7-2.

Location 1—This site is located at the north boundary of the proposed site, across the street from the WPCF. The microphone was mounted on the chainlink fence beside the entrance gate to the existing KFAX radio transmitter site at 3636 Enterprise Avenue. The primary source of ambient noise in this location is the WPCF, which produced a near-constant level of noise during the monitoring period. Trucks and jet aircraft produced higher levels of intermittent noise.

Location 2—This monitoring site is adjacent to the nearest residence, which is located east of Industrial Boulevard at 2773 Depot Road, just east of Linda's Flower Shop. The microphone was positioned on the lower branch of a tree at the western edge of the resident's vegetable garden, about 50 feet from Depot Road and 100 feet from Industrial Boulevard. Traffic on Industrial Boulevard was the primary source of ambient noise in this location.

Location 3—This site is at the entrance to the Waterford Apartments, which are located at 25800 Industrial Boulevard, south of Depot Road. The microphone was attached to the apartment fence about 60 feet from the street. Traffic on Industrial Boulevard was the primary source of ambient noise in this location.

Location 4—This monitoring site is at the Hayward Shoreline Interpretive Center adjacent to the Hayward-San Mateo Bridge (State Route 92) approach at the edge of the bayshore marshlands area. The microphone was attached to a post on the observation deck behind the center about 150 feet from the highway. Traffic on State Route 92 was the primary source of ambient noise at this location. Aircraft noise was a secondary noise source.

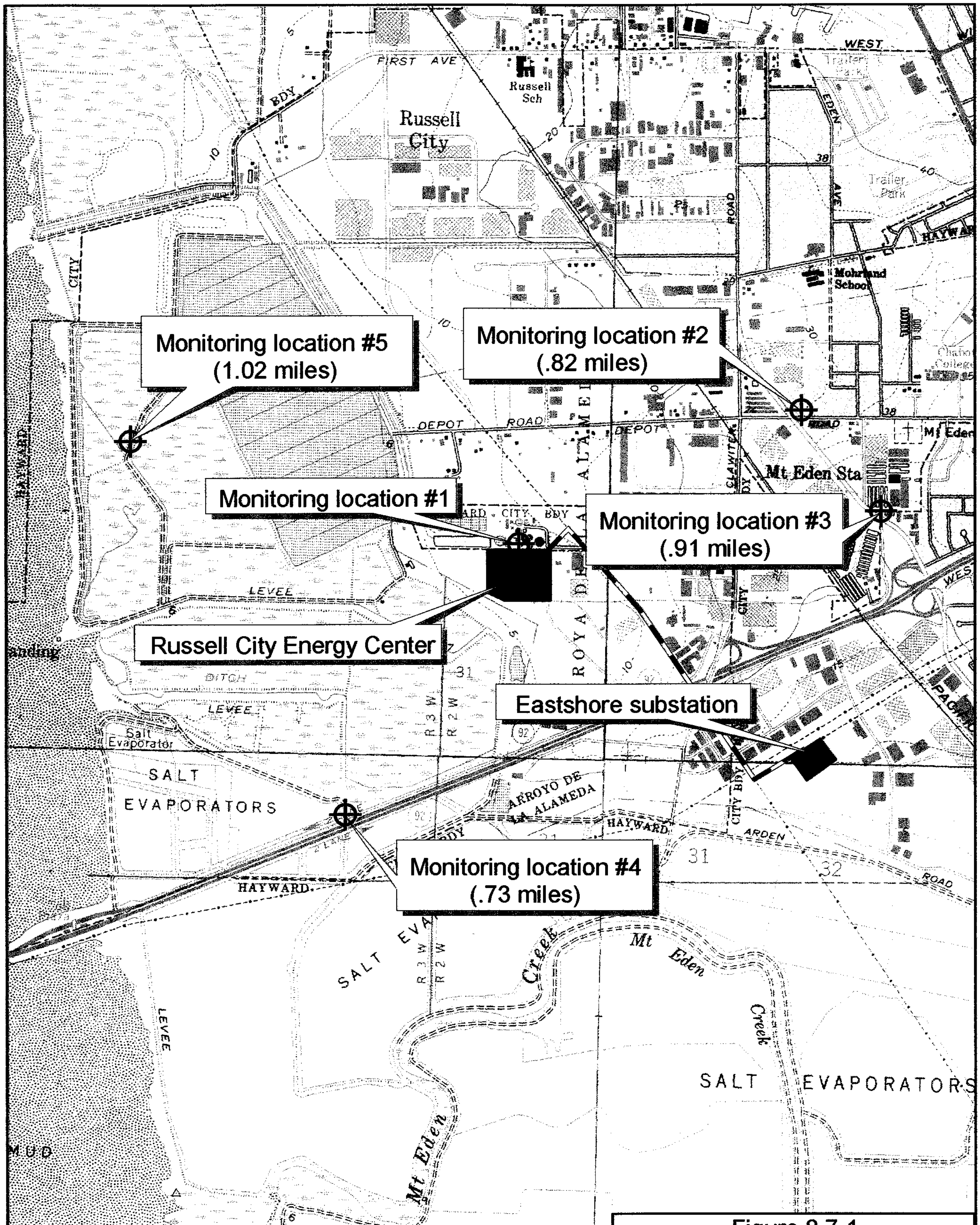
Location 5—This site is on the footbridge crossing the Cogswell Marsh on the bay trail about 1.12 miles west of the project site. The microphone was mounted on a temporary steel post attached to the bridge railing at the north end of the bridge. Jet aircraft were the primary source of ambient noise on the trail. Industrial noise and traffic noise could only be heard under certain atmospheric conditions. Wind, birds, and waves lapping on the shore of the marsh also produced noise at the bridge.

8.7.1.1 Noise Survey Methodology

Continuous measurements of the A-weighted sound levels were made simultaneously over a complete 25-hour period using four (4) Larson-Davis Laboratories Model 700 sound level meters (LDL 700) with integral data loggers. The instruments were equipped with optional circuitry and microphones to permit them to meet the requirements of ANSI S1.4-1983 for Type I precision sound level meters. The Bruel & Kjaer (B&K) Type 4176 ½" prepolarized random incidence microphones were remotely mounted (via a 10-foot microphone extension cable and preamplifier) at a height of about 5 feet above the ground. Foam windscreens, 3½ inch in diameter, were used to reduce wind-generated noise.

The calibration levels of the instruments were checked before and after the 25-hour monitoring period using a B&K Type 4230 sound level calibrator. The analyzers were internally timed to turn on and off automatically on the start and stop days, respectively. They were generally unattended during the monitoring period, but the monitoring technician did visit each site four times to make observations about sounds heard and general weather conditions. Observations were made during the first hour between 1600 and 1700, in the evening between 2100 and 2200, late at night between 0300 and 0400, and mid-morning between 1000 and 1100.

The LDL 700s were programmed to measure and record the equivalent sound level (L_{eq}) for each minute of the 25-hour period as well as compute and store the statistical sound levels exceeded 10, 50, and 90 percent of each hour (L_{10}, L_{50} and L_{90}). The L_{eq} for each hour of the period was also computed and recorded. At the end of the 25-hour period, the data was downloaded directly into a laptop computer for storage and further analysis, including computation of the 24-hour L_{eq}, day/night level (L_{dn}), and the community noise equivalent level (CNEL). A spreadsheet program was used to generate graphs of the



Sources: Geographic Data Technology, Environmental Systems Research Institute, USGS Quad DRGs - GIS Data Depot

Figure 8.7-1

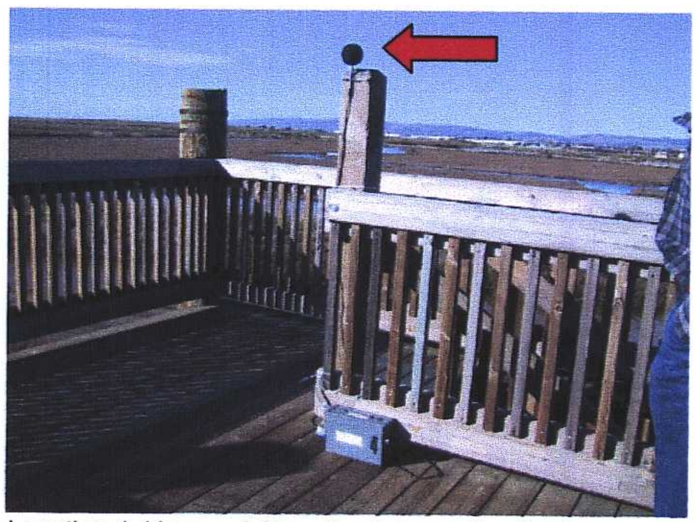
Noise Monitoring Locations

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Location 2: 2773 Depot Road.

Location 3: Waterford Apartments, 25800 Industrial Boulevard.



Location 4: Hayward Shoreline Interpretive Center.

Location 5: footbridge crossing Cogswell Marsh

Figure 8.7-2. Noise monitoring locations (arrow indicates microphone).

data. One graph was produced of the 1-minute L_{eq} levels to show the often rapid variation in sound levels experienced in outdoor environments. Another graph was produced of the hourly L_{eq} levels and the L_{50} and L_{90} statistical sound levels, showing all three curves in the same plot.

8.7.1.2 Noise Survey Results

Weather conditions during both surveys were similar, with mild to cool temperatures, calm to moderate winds, and clear skies. Daytime temperatures ranged from about 50 degrees in the early morning to about 75 degrees in mid-afternoon. Nighttime temperatures ranged from about 48 to 55 degrees. Wind speeds varied from calm to about 8 mph at locations 1 through 3. Winds were generally higher, with gusts up to 25 mph, at Locations 4 and 5 in the open wildlife refuge. Average wind speeds were about 8 to 10 mph along the bay trail. The wind was generally out of the west to north from across the bay during the day and out of the north to east during the early morning hours. Relative humidity varied from about 50 to 65 percent during the surveys. Skies were clear and there was no precipitation during either survey period.

The hourly L_{eq} levels along with the three commonly used 24-hour composite noise descriptors of the continuous A-weighted sound levels are presented in Table 8.7-1 for the five monitoring locations. The average nighttime L_{90} for the locations is also presented on the bottom row of the table. This descriptor has no regulatory basis but is useful for comparison with continuous sources of industrial noise such as power plants, and for assessing noise impacts.

The City of Hayward Planning Department's Noise Element Policies document (1977) indicates that CNEL or L_{dn} levels of up to 55 dBA are acceptable for outdoor residential spaces. Higher levels up to 70 dBA are considered to be conditionally acceptable. The measured levels at the 5 locations monitored are within the conditionally acceptable level. The lowest levels, as expected, were measured on the nature trail (Location 5), which is the furthest of the monitoring stations from sources of man-made noise. This is the only location monitored that had L_{dn} and CNEL ambient noise levels that were clearly acceptable for residential use at 56.7 and 57.0 dBA, respectively. All of the residential areas monitored are significantly impacted by traffic noise and have L_{dn}/CNEL levels ranging from 66.0 to 69.1 dBA, which are at the upper end of the City's Conditionally Acceptable category (55 to 70 dBA).

The usefulness of this energy-averaged data is somewhat limited in describing the noise environment, however, because of the disproportionate influence that a few high sound level intervals can have on the 24-hour averages. This is due to the logarithmic nature of the averaging process whereby, for example, a level of 60 dBA contains ten times the energy of a 50 dBA level and counts ten times as much in the average. Placement of the microphones near roadways further skews the data to the high side. Ideally, the microphone would be placed the same distance from roads as the houses of interest. However, this is seldom practicable. Using the statistical L_{50} and L_{90} levels (sound levels exceeded 50 percent or 90 percent of the time, respectively, at a given location) overcomes these problems by eliminating these short-duration intrusive events from the record. Graphs of the continuous data using these statistical measures present a much more accurate description of the noise environment against which noise from the proposed project should be considered. The most important time period is late at night during normal sleep hours when ambient noise levels are low because human activity is at a minimum, and wind speeds have generally diminished.

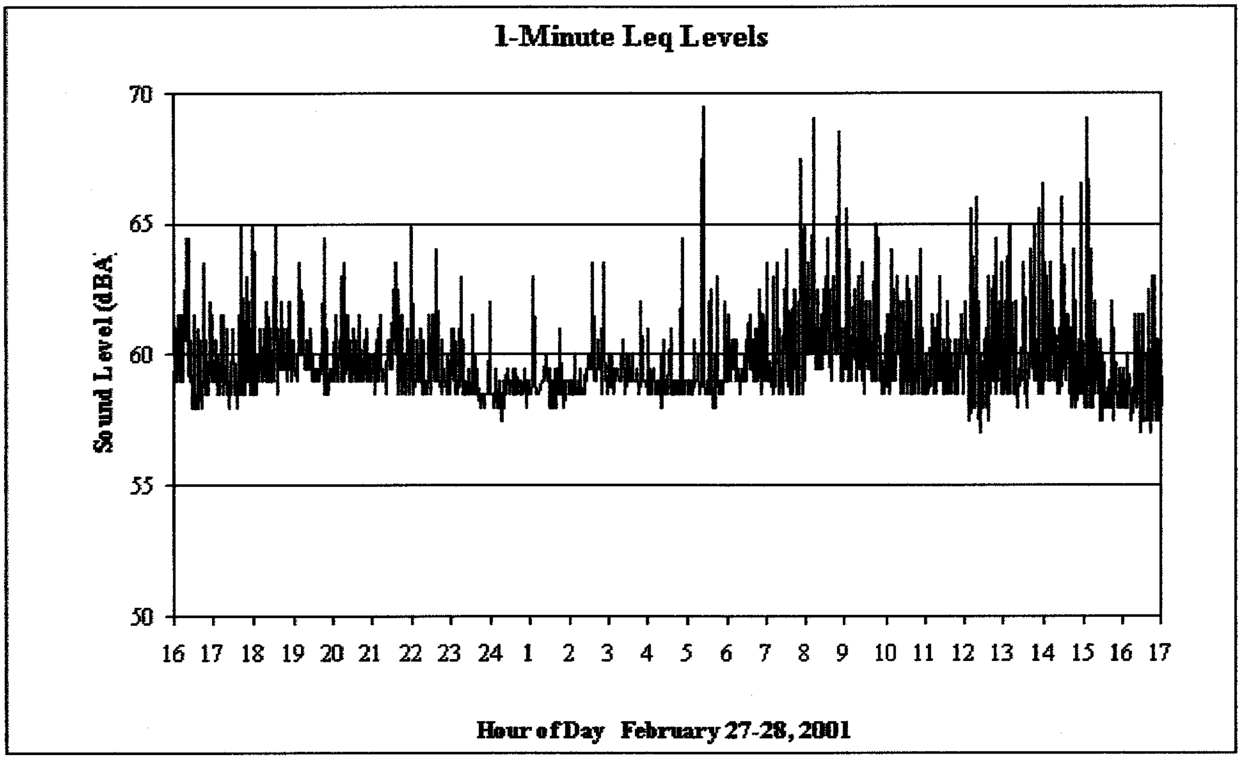
Table 8.7-1. Hourly L_{eq} and composite noise levels.

Date	Hour Beginning	Location 1 L_{eq} (dBA)	Location 2 L_{eq} (dBA)	Location 3 L_{eq} (dBA)	Location 4 L_{eq} (dBA)	Location 5 L_{eq} (dBA)
2/27/01	1600	60.0	66.5	67.0	60.5	52.5
2/27/01	1700	60.0	64.0	65.5	60.5	53.5
2/27/01	1800	60.0	62.5	65.0	60.5	54.0
2/27/01	1900	60.0	60.0	62.5	59.5	48.5
2/27/01	2000	60.0	60.5	61.5	60.0	50.0
2/27/01	2100	60.0	60.5	62.5	60.0	52.0
2/27/01	2200	59.5	59.5	61.0	58.5	50.5
2/27/01	2300	59.0	56.0	58.0	57.5	51.5
2/28/01	2400	58.5	52.0	56.0	55.0	50.0
2/28/01	0100	59.0	51.0	55.5	55.0	50.0
2/28/01	0200	59.5	52.0	55.0	53.0	48.0
2/28/01	0300	59.5	56.5	57.0	55.0	44.5
2/28/01	0400	59.0	56.5	58.5	58.5	47.5
2/28/01	0500	60.5	61.5	63.0	60.0	49.0
2/28/01	0600	60.0	63.5	65.5	59.5	48.5
2/28/01	0700	60.5	65.0	66.0	59.0	51.0
2/28/01	0800	61.5	63.5	75.0	57.5	49.0
2/28/01	0900	60.5	63.0	66.0	74.0	49.5
2/28/01	1000	60.5	64.0	65.0	63.5	50.0
2/28/01	1100	59.5	62.5	70.0	60.0	50.0
2/28/01	1200	60.5	62.5	66.0	60.0	55.5
2/28/01	1300	60.5	63.0	66.5	57.5	58.0
2/28/01	1400	60.5	63.5	66.0	57.0	55.0
2/28/01	1500	60.5	63.5	66.0	57.0	51.5
2/28/01	1600	59.0	63.5	66.5	57.0	51.0
	L_{eq}(24)	60.0	62.0	66.0	62.6	51.8
	L_{dn}	66.0	66.0	68.8	65.7	56.7
	CNEL	66.3	66.3	69.1	66.0	57.0
	Average Night L_{90}	58.1	45.8	49.5	51.2	44.5

Notes:
1. L_{eq}(24), L_{dn} and CNEL were computed from the first 24 hours of the 25-hour survey.
2. Average night L_{90} is the arithmetic average of L_{90} levels for the hours 2200 to 0600.
3. Location 5 measurements were made between 1700 on March 25 and 1800 on March 26, 2001.

Graphs showing noise levels at the five monitoring stations are presented in Figures 8.7-3 through 8.7-7. The first graph in each figure is a plot of the 1-minute L_{eq} levels. The effects of individual noise events, such as the passage of heavy trucks and trains, can be seen as tall spikes in these graphs. The second graph for each location shows the hourly equivalent noise levels and the statistical levels exceeding 50 and 90 percent of each hour (L_{eq}, L_{50} and L_{90}). Of the three lines on these graphs, the L_{90} background or residual sound levels are the most important for impact assessment purposes. The L_{90} level would be most affected by a new facility such as a power plant that generally produces a constant level of noise, effectively raising the background noise level (L_{90}) near the plant.

The L_{90} pattern at Location 1 (Figure 8.7-3, lower curve of the lower graph) is typical of a location near such a source. In this case, it is the Hayward Water Pollution Control Facility producing a nearly constant noise level throughout the day and night. As seen in the upper graph of the figure, the levels never drop below about 55 dBA. The range of hourly noise levels at the site is also very narrow, indicating that intrusive sounds are not significant contributors to the overall noise. A comparison of the



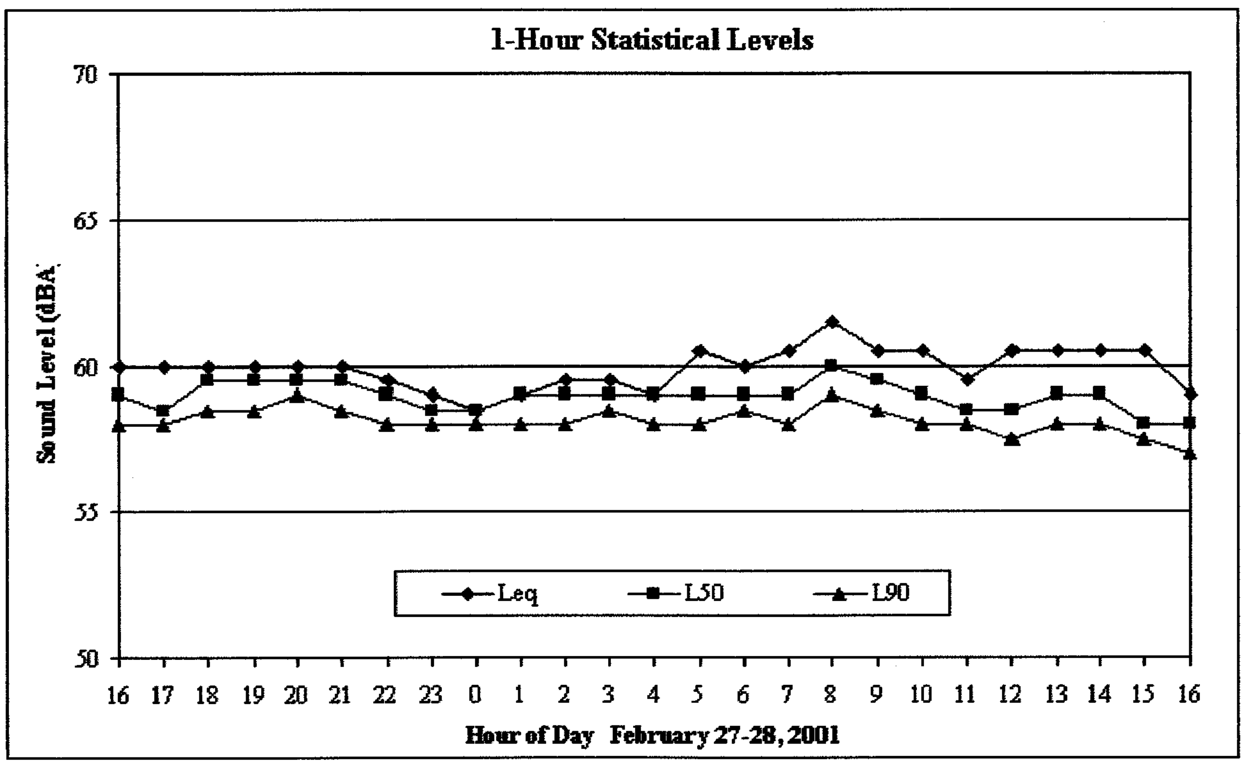


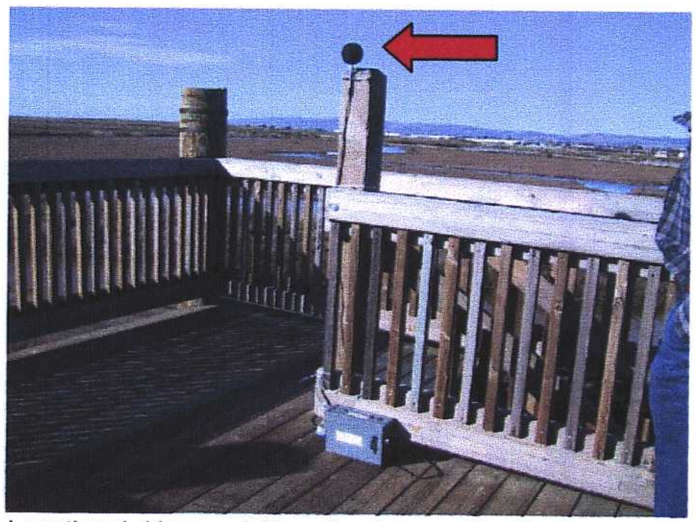
Figure 8.7-3

Monitoring Location 1
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Location 2: 2773 Depot Road.

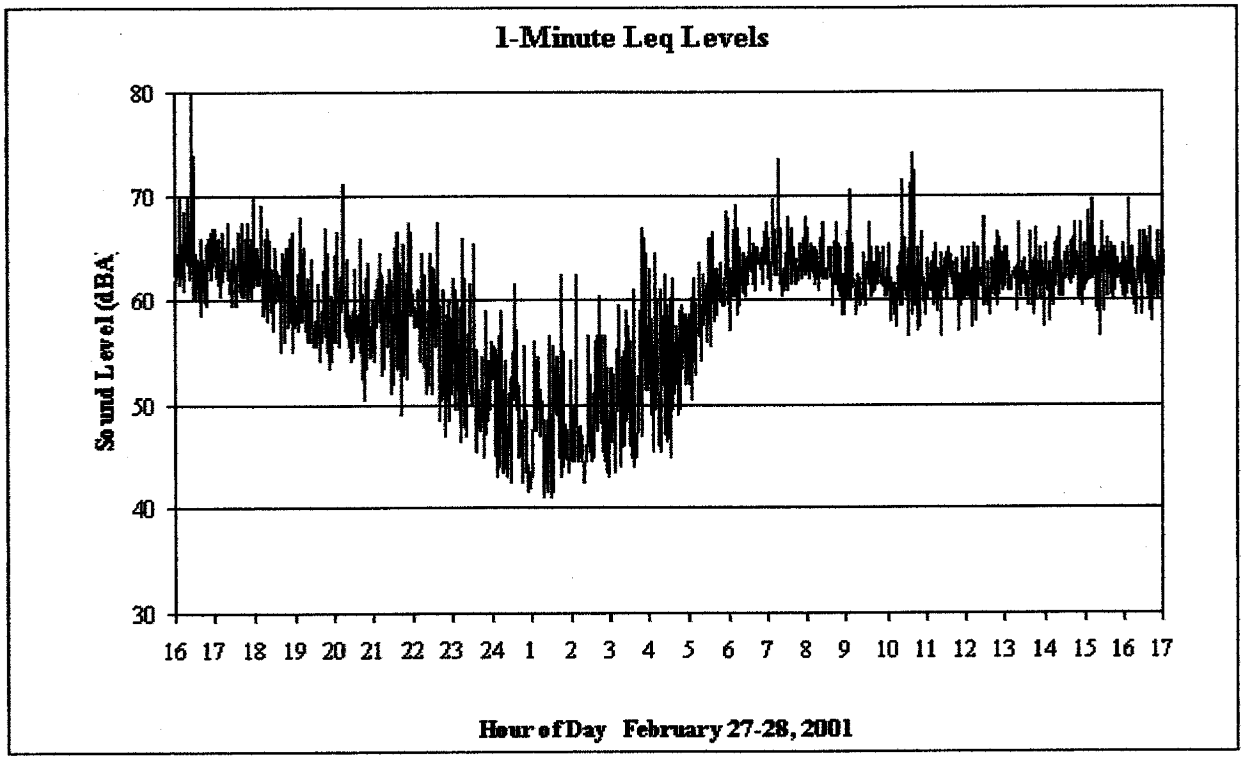
Location 3: Waterford Apartments, 25800 Industrial Boulevard.



Location 4: Hayward Shoreline Interpretive Center.

Location 5: footbridge crossing Cogswell Marsh

Figure 8.7-2. Noise monitoring locations (arrow indicates microphone).



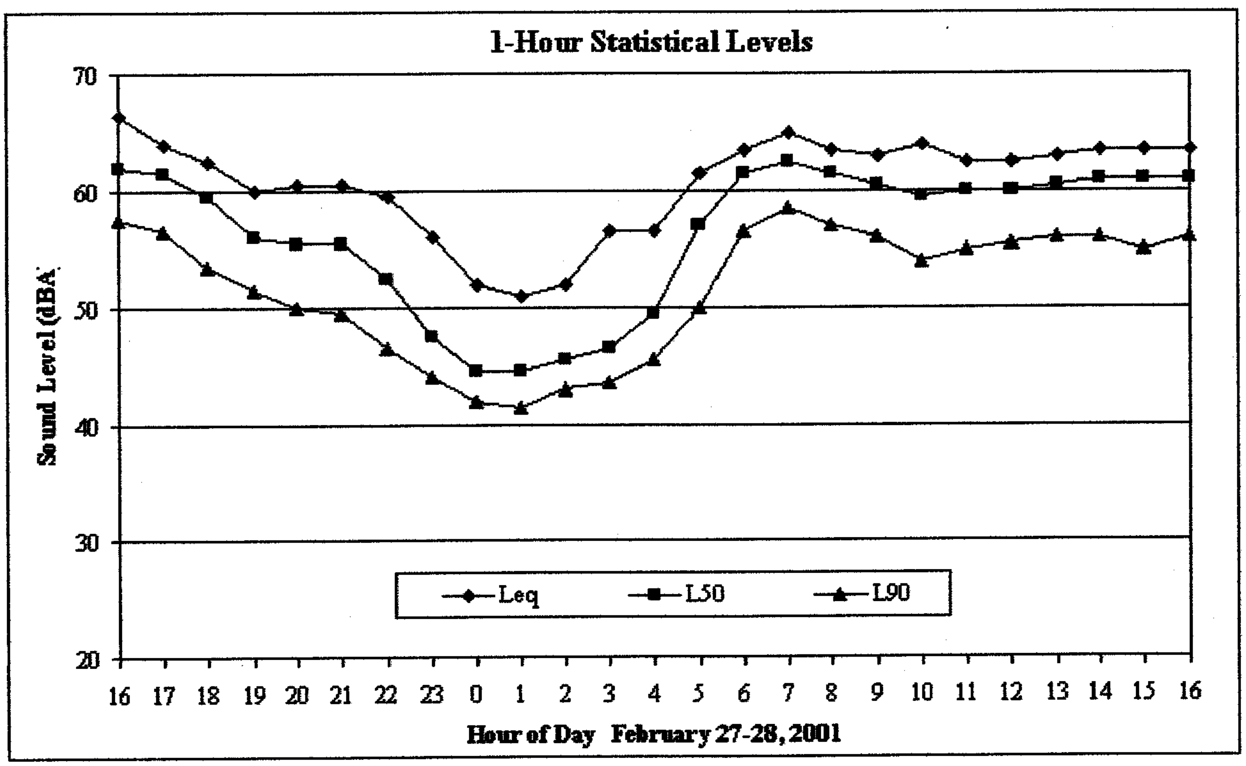


Figure 8.7-4

Monitoring Location 2
RUSSELL CITY ENERGY CENTER

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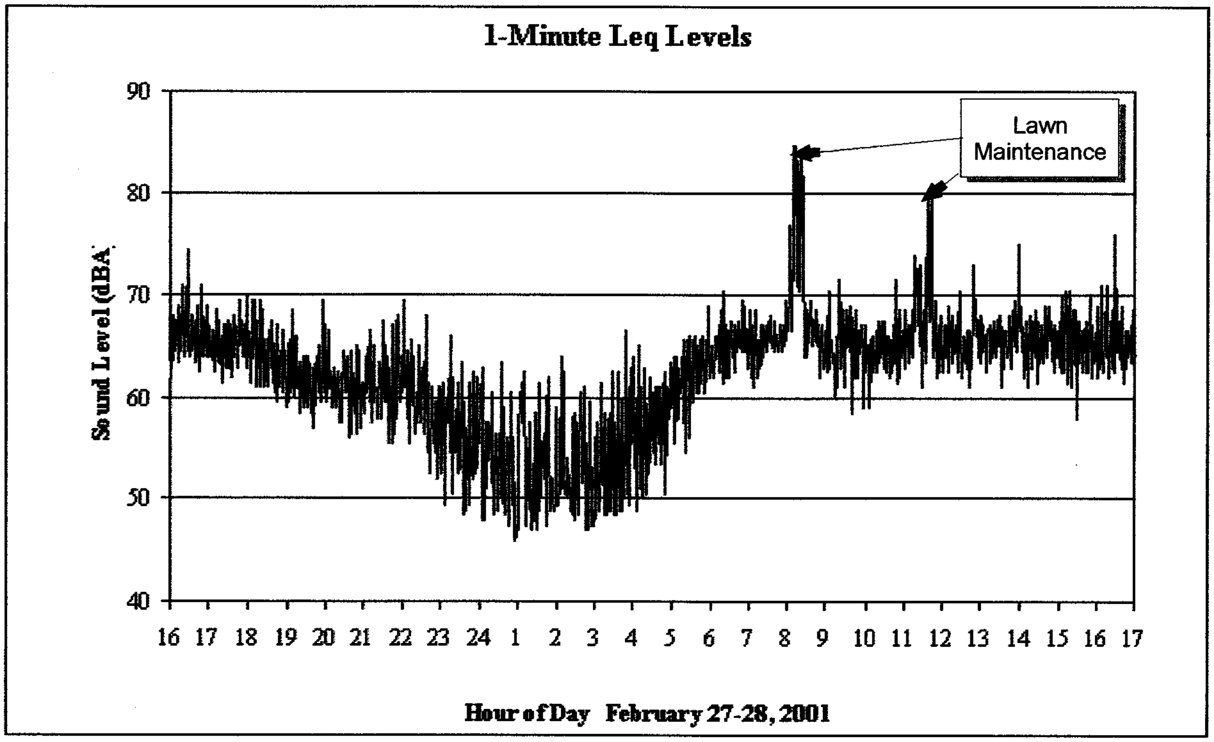

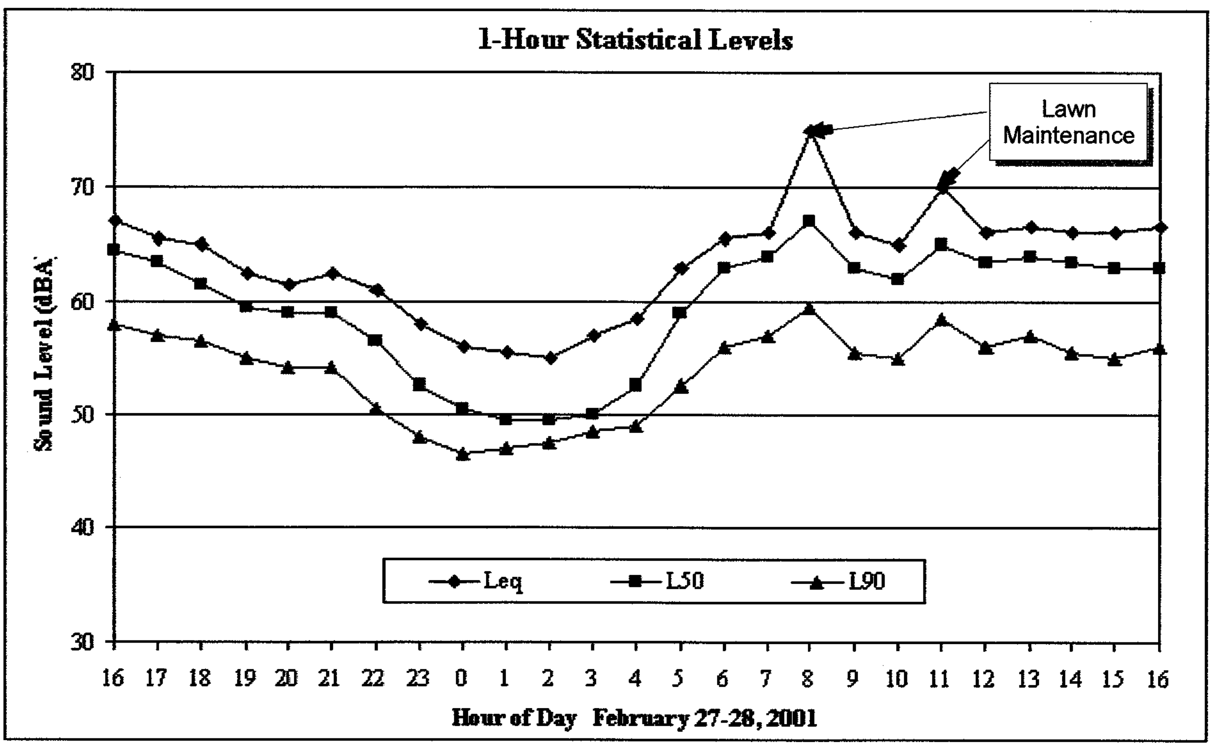

Figure 8.7-5

Monitoring Location 3
RUSSELL CITY ENERGY CENTER

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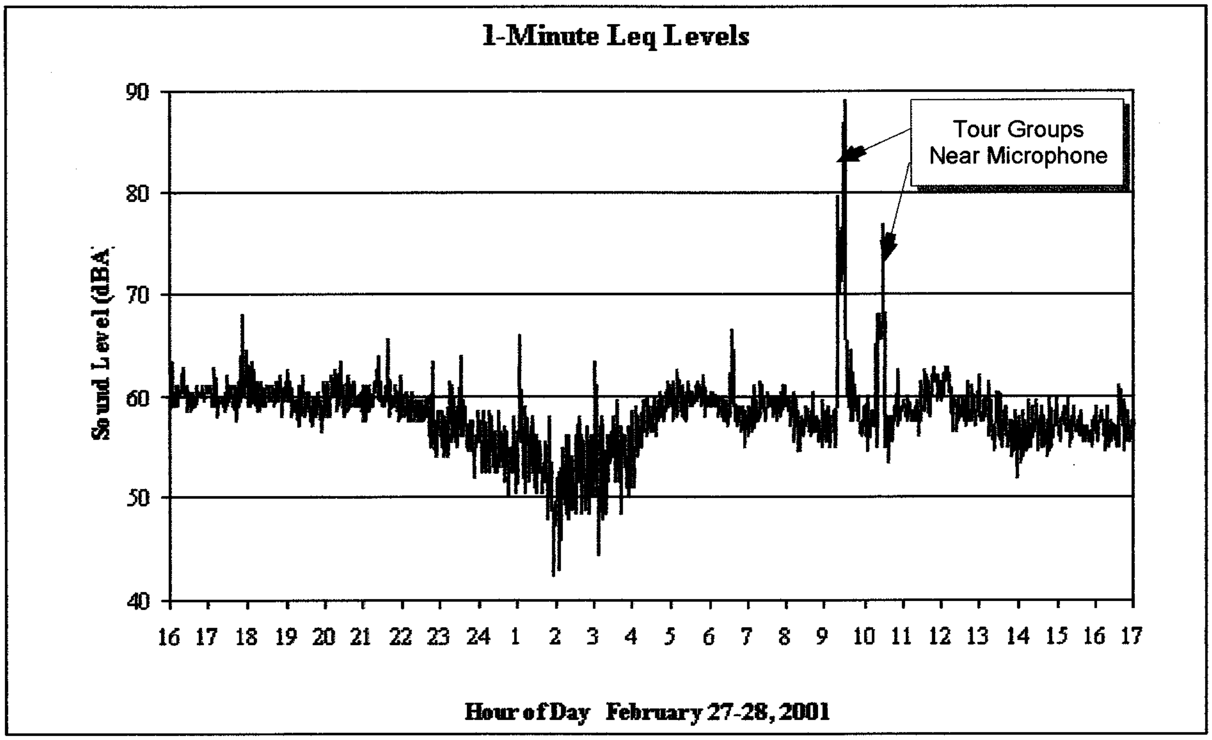


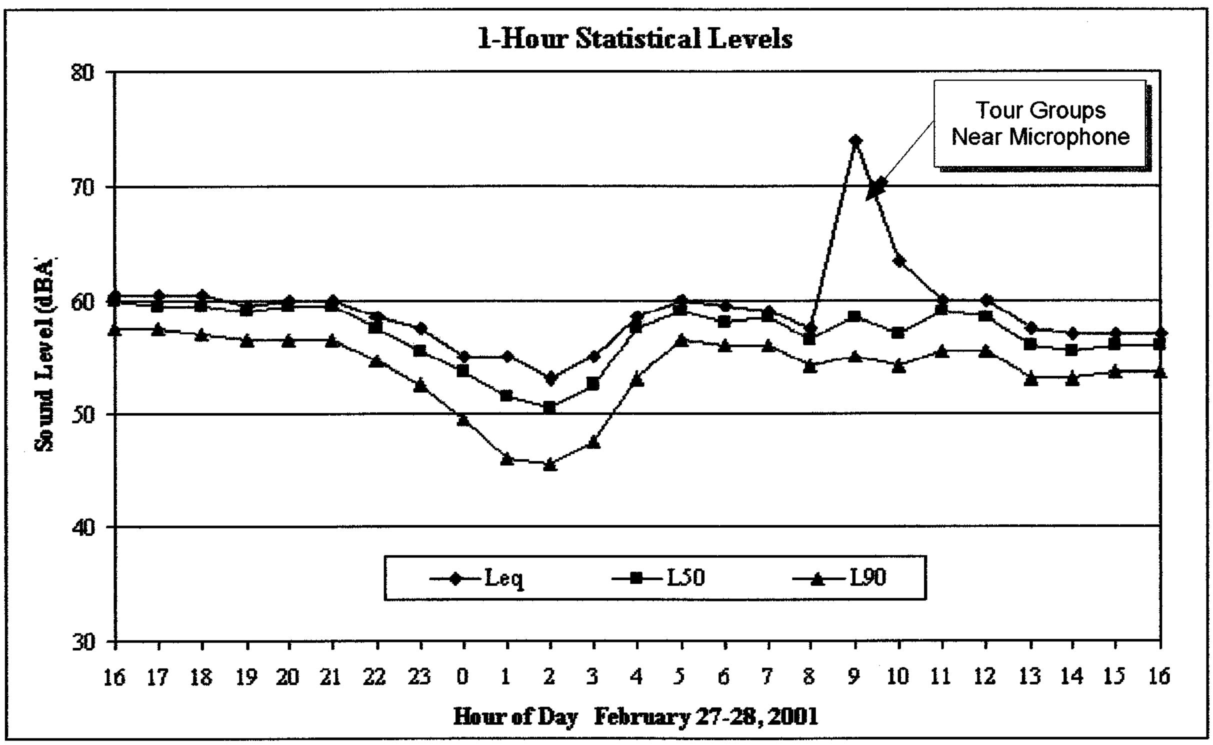
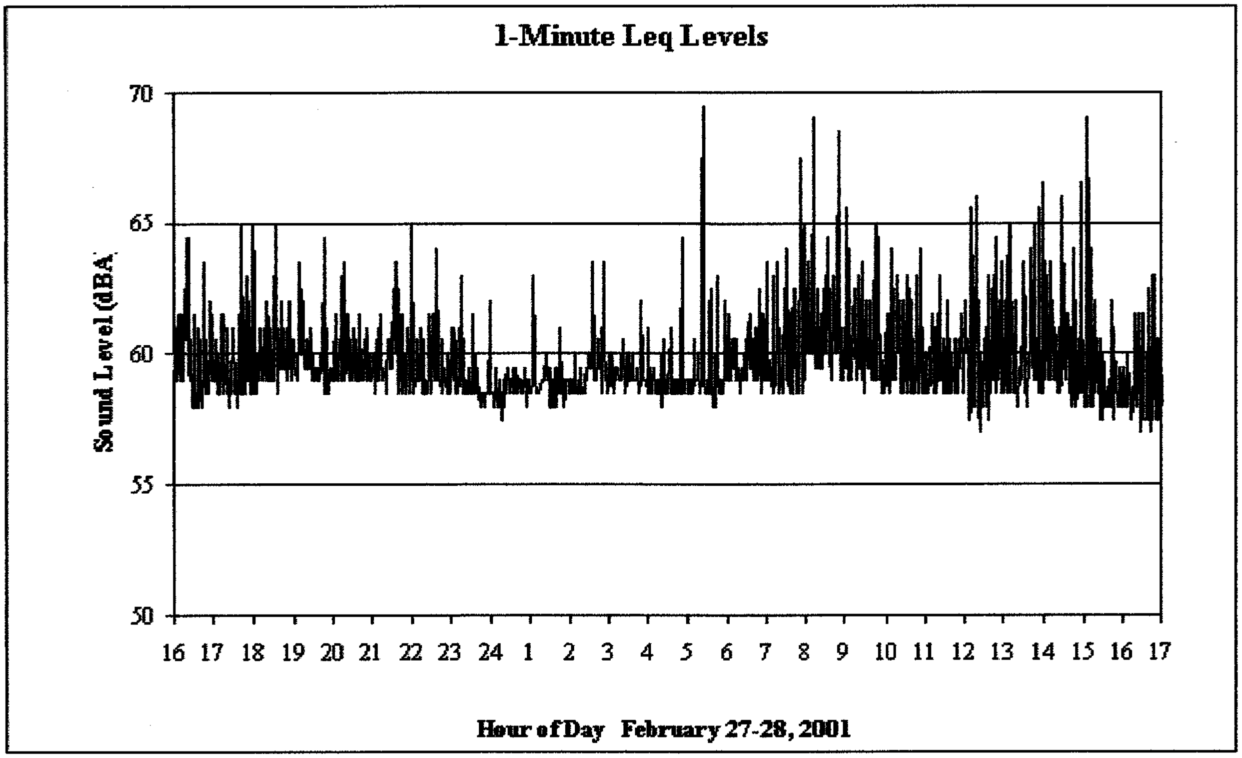


Figure 8.7-6

Monitoring Location 4
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION



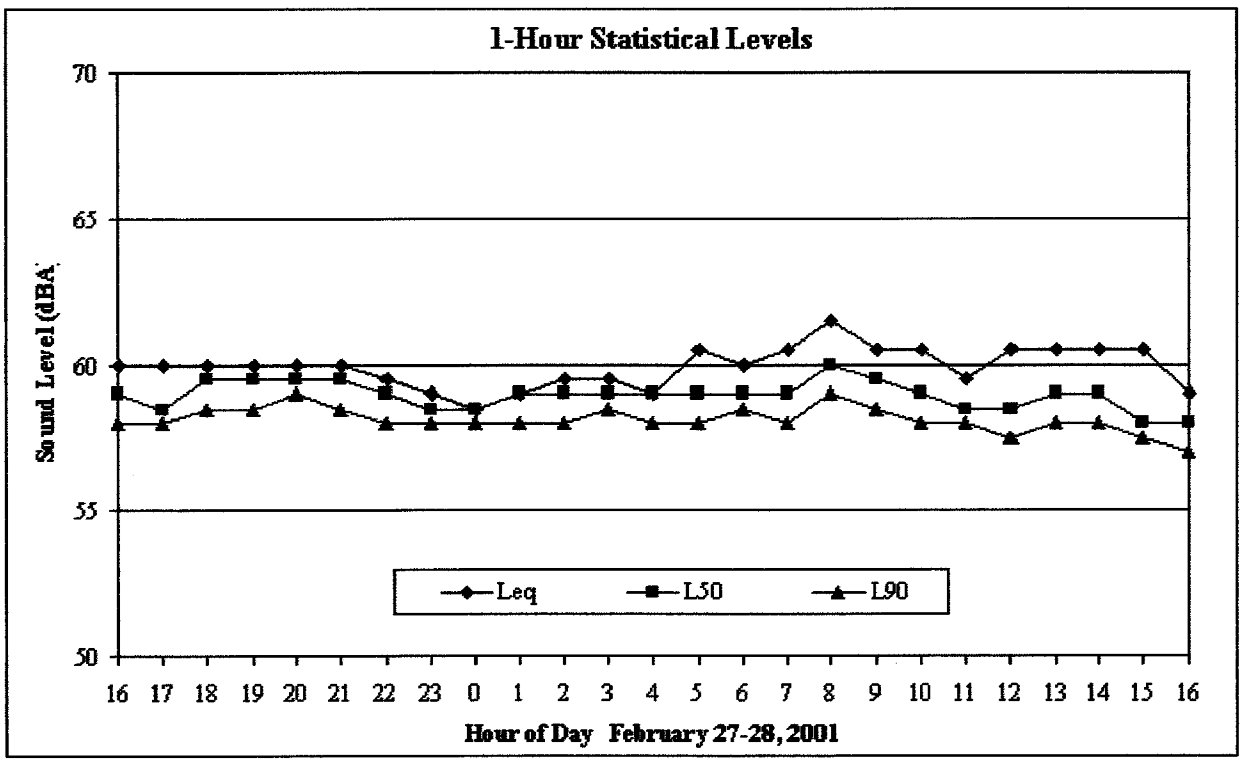


Figure 8.7-7

Monitoring Location 5
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Average Nighttime L_{90} level (bottom row of Table 8.7-1) of 58.1 dBA with those from the other four locations, which range from 44.5 to 51.2 dBA, shows that of the five monitoring locations, this location is the loudest at night. The CNEL for the location is 66.3 dBA.

The graphs for Location 2 (Figure 8.7-4) demonstrate the classic diurnal pattern of lower levels at night related to man-made noise. These noise levels are directly related to the amounts of traffic on Depot Road and Industrial Boulevard. Nighttime levels reached a minimum of about 41 dBA between 1 and 2 am. Daytime levels were typically around 60 dBA. The average nighttime L_{90} level from Table 8.7-1 was 45.8 dBA. Predicted noise levels from the power plant will be compared with this level. The CNEL is 66.3 dBA.

Noise levels at Location 3, at the entrance to the Waterford Apartments complex, exhibit the same pattern as at Location 2 because of nearby traffic (Figure 8.7-5). The levels are slightly higher, however, at about 64 dBA during the day and 49.5 dBA at night. This is probably because the microphone was closer to traffic on Industrial Boulevard, which was the primary source of noise. The CNEL was 69.1 dBA or about 3 dBA higher than at Location 2. Fan noise from some of the commercial and industrial buildings to the west could be heard at night in this location.

At Location 4 on the observation deck of the Hayward Shoreline Interpretive Center, noise levels generally varied with the level of traffic on the Hayward-San Mateo Bridge approach. Daytime noise levels were generally in the upper 50s dBA. The CNEL was 66.0 dBA. The spikes as high as 89 dBA in Figure 8.7-6 are due to tour groups near the microphone at the Interpretive Center and indicate that the tour guide had to raise her voice to be heard over the traffic noise. Wind noise and birds were also heard at this location. Since the Interpretive Center and nearby trails close at night, nighttime noise levels are not relevant in this analysis.

Most of the sounds heard at Location 5, on the foot bridge on the Hayward Shoreline Nature Trail, were natural, produced by birds, the wind, waves lapping on the shore, etc. The primary manmade sounds were jet aircraft approaching Oakland or San Francisco airports. The charts shown in Figure 8.7-7 indicate a noise environment in which the background level rises and falls with some regularity. This pattern is very unusual and may be related to the tides, winds, or wildlife cycles. Noise levels at the bridge ranged from about 40 to 60 dBA and the CNEL was the lowest of any of the locations at 57.0 dBA.

In summary, the City of Hayward WPCF dominates the existing noise environment at the project site (Location 1), producing a level of about 60 dBA at the site boundary. The nearest noise-sensitive receptors are located are 0.82 and 0.91 miles away, respectively (Locations 2 and 3), where the ambient noise mostly varies with the traffic on Industrial Boulevard. Nighttime background levels at these two locations are 45.8 and 49.5 dBA, respectively. Noise levels near the Shoreline Interpretive Center are variable, with higher levels on the south end adjacent to the Hayward-San Mateo Bridge approach, with a CNEL of 66 dBA, and lower levels to the north at the foot bridge where the CNEL is 57 dBA.

8.7.1.3 Vibration

The RCEC will be a combined cycle facility which produces electricity by rotating combustion turbines and a steam turbine which uses steam produced in heat recovery steam generators (HRSGs) from the combustion turbine waste heat. As a side benefit, the HRSGs reduce the noise intensity emanating from the combustion turbines. The equipment that would be used in the RCEC is well-balanced and is designed to produce very low vibration levels that would be maintained throughout the life of the plant. Any imbalance could contribute to ground vibration levels in the vicinity of the equipment. Vibration monitoring systems installed in the equipment are designed, however to ensure that the equipment remains balanced. Should an imbalance occur, the event would be detected and the equipment would be automatically shut down for repair and re-balancing.

This section concludes that the air and ground vibration that would be produced by the proposed RCEC would be less than those that presently exist in the local urban environment. Vibration-sensitive facilities in the urban community surrounding the RCEC are suitably designed for the expected vibrations from the RCEC.

Site and Subsurface Conditions

Site-specific geologic and geotechnical characteristics underlying the site are not yet fully known. However, it can be generally assumed that the primary foundation support system will consist of deep foundations installed through the upper loose and compressible soils, reaching a bearing level in the underlying competent materials. The deep foundation system will be used to support virtually all equipment that could generate vibration during the plant operation.

Waves Generated by Vibrating Foundations

Energy generated by vibrating and/or rotating equipment and construction activities is transmitted through surrounding soils in three principle wave forms: compression (P-waves), shear (S-waves), and surface waves. P- and S-waves are referred to as body waves. The primary type of surface wave is the Rayleigh wave. Of the three types of waves, approximately 70 percent of the energy is transmitted as a Rayleigh wave and therefore the wave propagation characteristics of the Rayleigh wave largely govern the vibration effects.

The Rayleigh wave propagates radially outward from the source of the vibration. All waves lose energy as they travel outward and pass through an increasingly larger volume of material. This loss energy is called geometrical damping. The decrease in energy (attenuation) for Raleigh waves is inversely proportional to the square root of the distance from the source. Since soils are not perfectly elastic, internal friction also reduces the energy of the wave vibration, increasing the attenuation predicted by just geometrical damping alone. This factor is called the material damping coefficient and its value is somewhat dependent on the soil types.

For practical applications, considerations of geometrical and material damping, as well as the type of wave and the wave's energy attenuation characteristics, have been combined into a single expression:

$$A = A_o \ (r_o/r)^{\gamma}$$

where:

A = Wave amplitude at distance "r"
A_o = Wave amplitude at source, "r_o"
r = Distance
γ = Dimensionless damping coefficient with an approximate value of 1.5 forsoft soil sites and 1.0 for firm soil sites

As a simple example, the vibration from a source on a site with firm soils is approximately 100 times less at a distance from the source of 100 feet and 1,000 times less at a distance of 1,000 feet. As can be seen from the relationship, the position of the water table does not affect the attenuation of seismic waves to a measurable extent. In addition, attenuation is greater for sites built on soft soil than for sites built on firm soils.

Foundation Design Principles

Several key principles need to be satisfied to assure that machine foundations meet the operating requirements of the plant. For static loading, the foundations must be safe against bearing capacity failure and excessive settlement. For dynamic loading, the foundation should not resonate, the amplitudes of motion should not exceed permissible values, the natural frequency of the foundation-soil system should not be a multiple of the operating frequency of the machine, and the vibrations caused by the machine should not affect equipment or machinery in the facility or neighboring facilities.

In general, the permissible amplitudes of motion control the machine foundation design and affect the vibration levels at the surrounding structures. For modern power plants, the permissible levels of motion, expressed in terms of peak particle velocity, are set in the range of 0.10 to 0.20 inches per second. For the major components of the plant, such as the combustion turbines, the permissible vibration levels are set even lower, at a maximum of 0.06 inches per second.

Vibration perception levels, which range from "imperceptible" to "very disturbing," are a commonly used human response rating system. Immediately adjacent to the power plant equipment, vibration levels range from "slightly perceptible" to "strongly perceptible" to persons. At distances from 300 to 1,000 feet from the equipment (at the site boundary or neighboring facilities), the vibration levels would be 300 to 1,000 times less than at the source, due to attenuation. Vibration levels at 300 to 1,000 feet are not expected to be perceptible to persons or machinery and are expected to be less than the normal road-generated vibrations. For comparison, the vibration generated by a moving truck on a typical city street at a distance of 10 feet is approximately 0.60 inches per second peak particle velocity (approximately 10 times the vibration level anticipated for major RCEC plant components).

International organizations have also set standards for permissible vibration levels. The Swiss have set the most restrictive standards and the most restrictive level of induced vibration is called "Swiss IV." This criteria limits the vibration induced in buildings that are "very sensitive to vibrations" to a level of 0.12 to 0.20 inches per second. The vibration levels anticipated at the RCEC are significantly below even this most restrictive threshold level.

Structural Vibration Induced by Airborne Noise

Gas turbines in simple cycle operation commonly produce airborne low frequency noise emissions that are capable of inducing perceptible vibration in nearby structures with lightweight frame construction. Gas turbines in combined cycle installations, on the other hand, rarely, if ever, cause this type of problem. The expansion of the combustion turbine exhaust gases inside the large cavity of the HRSG (which has dimensions that are comparable with the wavelength of sound in the typically problematic 20 to 30 Hz region of the spectrum) and the subsequent contraction in the exhaust stack act to dissipate acoustic energy. The ability of HRSG's to attenuate turbine exhaust noise, even when no specific silencing measures are incorporated into the design, is a well-established phenomenon.

American National Standards Institute (ANSI) B133.8 (1989 Gas Turbine Installation Sound Emissions) recommends limiting the noise emissions of new gas turbine facilities to 75 to 80 dBC at the nearest private residence in order to avoid any annoyance. C-weighting is used since it puts a greater emphasis on the lower end of the frequency spectrum and a range of values are given because the threshold is not sharply defined.

A generally equivalent criterion has been developed for use in the design of HVAC systems where thresholds for the perception of noise-induced vibration have been roughly determined in the lowest octave bands. Specifically, in the 31.5 Hz octave band, sound levels with magnitudes in the region between 65 and 75 dB are considered likely to cause moderately perceptible vibrations in lightweight, frame structures and levels above 75 dB are associated with clearly perceptible vibrations. The same sound level would be less perceptible in a structure of more substantial construction.

In view of these criteria, a representative sampling of noise levels produced by typical combined cycle plants at fairly short distances is given below in Table 8.7-2.

Table 8.7-2. Noise levels produced by typical combined cycle plants at short distance.

	Octave Band Center Frequency, Hz										
Description	**31**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**	**dB(C)**
500-MW CC plant[1/], 120 m from nearest HRSG	72	71	65	59	59	55	61	52	37	64	74
500-MW CC plant, 120 m from GT inlets	71	70	65	52	53	54	50	42	30	58	72
130-MW CC plant, 120 m from nearest HRSG	72	72	67	59	57	56	58	56	43	63	75
130 MW CC plant, 120 m from GT inlets	72	70	66	60	58	57	57	54	42	63	74
500-MW CC Plant, 150 m from nearest HRSG	71	70	62	60	59	57	53	48	46	62	73
700-MW CC plant, 80 m from nearest HRSG	77	76	73	62	61	60	57	52		65	79
700-MW CC plant, 200 m from GT inlets	70	68	63	52	53	50	46	39		55	71
Threshold of moderately perceptible noise-induced vibration	65	69									75
Threshold of clearly perceptible noise-induced vibration	75	79									80

[1/] CC = combined cycle

Whether noise vibration from any given plant exceeds a particular threshold depends on the distance to the measurement location and the nature of the structure at that location. It is intuitively obvious that a building with light frame construction would probably experience some perceptible vibrations only 80 m from a 700-MW plant, where a noise level of 79 dBC exists, but a structure with a more substantial construction would probably remain unaffected.

The nearest residence to the RCEC is 0.82 miles away from the facility and, therefore, will not be affected. Commercial facilities much closer to the plant may see levels near this lower threshold for residential disturbance, but are not expected to be adversely affected.

8.7.2 Environmental Consequences

The power plant equipment and construction equipment will generate noise at known levels and the noise generated will dissipate at a predictable rate over distance. Modeling the expected noise levels at sensitive receptor locations involves calculating the combined noise levels from the power plant equipment (operations phase) or construction equipment (construction phase) at a given sensitive receptor and comparing this noise level to applicable regulatory standards.

8.7.2.1 Significance Criteria

The project would cause a significant impact if it were to violate a local noise ordinance, regulation, or standard, or would increase by 5 dB or more the ambient noise levels in a residential area that currently exceeds General Plan guidelines for residential area noise levels.

8.7.2.2 Construction Phase Impacts

Noise will be produced at varying levels during the 18 to 21-month-long construction period, depending upon the construction phase. Construction of power plants and other industrial facilities can generally be divided into five phases, which involve different types of construction equipment and produce different amounts of noise. The phases are: 1) excavation, 2) concrete pouring, 3) steel erection, 4) mechanical, and 5) cleanup. Two activities, pile driving and steam blowing, will be analyzed separately because of their potential for producing higher noise impacts. Pile driving would occur during Phase 1 and steam blowing would occur during Phase 5. Construction of the natural gas pipeline, electrical transmission line, water supply and wastewater return pipelines, and the AWT plant were also analyzed.

RCEC Plant Site

Both the Environmental Protection Agency Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have extensively studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities (EPA, 1971 and Barnes et al., 1976). Since specific information on types, quantities, and operating schedules of construction equipment is not available for the project at this point in the project development, information from these documents for similar-sized industrial projects will be used. Use of this data, which is between 25 and 30 years old, is conservative since construction equipment has moved toward more effective noise abatement.

The noisiest equipment types generally operating at a site during each phase of construction are presented in Table 8.7-3. The composite average or equivalent site noise level, representing noise from all equipment, is also presented in the table for each phase. Rock drills, at 98 dBA, produce the highest noise levels of any individual piece. The use of rock drills is very unlikely at the RCEC site, however, due to the lack of bedrock in the construction zone. Heavy trucks operating at maximum engine speed are the second loudest equipment items, at 91 dBA.

Pile driving will be necessary to provide a solid foundation for the power plant equipment. There are several types of pile drivers, but the most common is the impact type that lifts a heavy hammer, then drops it on the pile repeatedly until the pile arrives at the desired depth. This type of driver produces peak noise levels upon impact ranging from 95 to 106 dBA. The pile driver's diesel engine operates at a lower noise level similar to the other diesel-powered construction equipment.

Table 8.7-3. Construction equipment and composite site noise levels.

Construction Phase	Loudest Construction Equipment	Equipment Noise Level at 50 feet (dBA)	Composite Site Noise Level at 50 feet (dBA)
Site Clearing and Excavation	Dump Truck	91	89
	Backhoe	85	
Concrete Pouring	Truck	91	78
	Concrete Mixer	85	
Steel Erection	Derrick Crane	88	87
	Jack Hammer	88	
Mechanical	Derrick Crane	88	87
	Pneumatic Tools	86	
Clean-Up	Rock Drill	98	89
	Truck	91	
Pile Driving	Pile Driver	95-106	Not Applicable
Steam Blow	Steam Blow (unmuffled)	110 @ 1,000 feet	Not Applicable

Source: USEPA 1971, Barnes, et al., 1976.

The steam blow, with a level of 110 dBA at 1000 feet, is an activity, rather than a piece of equipment. This activity is designed to clean scale and other debris from the boiler tubes and steam lines prior to admitting any steam to the steam turbines where the foreign material would damage the blades. A temporary bypass line to the atmosphere is welded into the main steam line upstream of the steam turbines to divert the steam. Several short blows of about two minutes duration each will be performed per day and the entire process generally takes several weeks. It has become relatively common in recent years to fit the steam blow pipe with a temporary silencer at sites near populated areas. These silencers have the capability to reduce levels by about 30 dBA. Such a silencer will be employed at the RCEC.

Average or equivalent construction noise levels projected for five sensitive receptor monitoring sites are presented in Table 8.7-4.

These results are conservative since the only attenuating mechanism considered was divergence of the sound waves over the distances traveled. In actuality, the large buildings that surround the RCEC site will muffle and reduce the sound. Levels during the loudest normal construction activities are projected to be between 37 dBA and 49 dBA at the residences located at distances ranging from 0.82 miles to 0.88 miles. These levels are lower than the existing daytime L_{90} levels. Thus, average construction noise generally will be inaudible at the residences. Levels of 65 to 66 dBA during pile driving and muffled steam blowing will be similar to levels created by traffic and will not create an impact. However, unmuffled steam blowing could be as high as 96 dBA at the residences and would create a temporary impact.

Table 8.7-4. Average expected construction noise levels at receptor locations.

Construction Phase	Site 1 North site boundary 50 ft.	Site 2 Nearest nesidence 0.82 miles	Site 3 Waterford Apartments 0.91 miles	Site 4 Interpretive Center 0.731 miles	Site 5 Nature Trail Bridge 1.02 miles
Excavation	89	49	48	52	48
Concrete Pouring	78	38	37	41	37
Steel Erection	87	47	46	50	46
Mechanical	87	47	46	50	46
Clean-up	89	49	48	52	48
Pile Driving*	106	66	65	69	65
Steam blow* (unmuffled)	136	96	95	99	95
Steam blow* - (muffled)	106	66	65	69	65

* Pile driving and steam blow levels are instantaneous rather than averaged.

Construction noise levels will also be below existing ambient levels within the wildlife preserve to the west. Thus, no noise impacts are expected, except for unmuffled steam blowing, which would cause a temporary impact.

Construction Vibration— This section addresses the potential for construction of the RCEC to produce vibration that may affect the local area. Construction vibrations can be divided into three classes, based on the wave form and its source:

- Wave form: impact. Example source: impact pile driver or blasting
- Wave form: steady state. Example source: vibratory pile driver
- Wave form: pseudo steady state Example source: double acting pile hammer

The pile driver to be used in pile installation for the RCEC project would impart a relatively limited energy to the surrounding soil and this activity would occur at a significant distance from neighborhood structures and facilities. Therefore, it is not expected that there will be any significant vibration effects during construction of the RCEC. However, vibration and noise monitoring will measure the vibration produced during construction and ensure that it is less than the criteria appropriate for the neighboring facilities.

Electrical Transmission Line and Eastshore Substation Expansion

Transmission line construction equipment will include excavators, backhoes, concrete trucks, cranes, line trucks, and miscellaneous other equipment. Tower placement may be aided by the use of a helicopter. All of this equipment produces between about 80 dBA and 91 dBA at 50 feet. The potential for noise impacts will be greatest at each of the tower sites. However, since none of the tower sites are near noise-sensitive receptors, no noise impact is expected from this daytime only activity.

Natural Gas Pipeline

Natural gas pipeline construction equipment will include concrete saws, backhoes, trenchers, pipe layers, dump trucks, pavers, compactors, and other miscellaneous equipment. All of this equipment produces noise levels between about 80 dBA and 91 dBA at 50 feet. Workers operating the equipment and other workers within about 50 feet of the equipment will wear hearing protection. Persons outside the work area should never be exposed to levels above about 85 dBA. This activity may be conducted at night to minimize disruption to daytime traffic, but it should only be conducted during the day when adjacent to residential areas at the eastern end of the pipeline. Daytime noise levels near residential areas could increase to about 70 dBA, which is only about 5 to 10 dBA above existing daytime noise levels. Since this activity is short-duration at any given location, and will only occur during the day in noise-sensitive areas, the noise impact created will not be significant.

Wastewater Return Pipeline

The construction equipment and methods used for the wastewater return pipeline will be the same as for the natural gas pipeline, and the maximum levels of noise generated will be the same. This pipeline will cross Enterprise Avenue between the power plant site and Water Pollution Control Facility and construction will be of short duration. Construction noise levels at residential areas will be lower than for the natural gas pipeline, because the water pipeline is further from residential areas. As with the natural gas pipeline, the noise levels at sensitive receptors will not cause a significant impact.

AWT Plant

Construction equipment and methods used for the AWT plant will be similar to those used for the RCEC plant site, although on a smaller scale. As with the RCEC plant site, no significant noise impacts are expected.

8.7.2.3 Operational Phase Impacts

Operational noise will result from the operation of the power plant equipment including the gas and steam turbines, cooling towers, and HRSGs. A noise modeling program, Cadna/A, ver. 3.0, developed by the German firm DataKustik specifically for power plant applications, was used to evaluate the noise emissions of the facility. Based on the sound power levels input for each source, the program maps the noise contours of the overall plant in accordance with a variety of European standards, primarily VDI 2714 *Outdoor Sound Propagation* and ISO 9613. All sound propagation losses such as geometric spreading, air absorption, ground absorption, and barrier blockage are calculated automatically in accordance with these recognized standards. Internal shielding within the plant such as by the large HRSG structures is realistically accounted for in the model since the physical dimensions of each source are also input into the program and considered in the calculations. Shielding beyond the plant by the numerous intervening warehouse and commercial structures in the direction of Receptors 2 and 3 has been accounted for very conservatively—to the extent that the predicted levels at these receptors are virtually unaffected.

The key to the accuracy of this model is the accuracy of the sound power levels used to represent each source. All inputs to the current model have been derived exclusively from first-hand field measurements of similar or identical equipment in actual operation at combined-cycle facilities. In general, the initial baseline power levels used are representative of the normal in-situ performance of standard equipment, i.e., equipment that has not been upgraded or specially improved to reduce noise. Only noise abatement measures that are always supplied as a part of the standard system are assumed to be present. Noise suppression devices such as combustion turbine inlet silencers, and turbine weather enclosures are not included in the model.

The source power levels and the modeling results in general have been verified by comparing the predicted far field levels of specific plants to direct measurements. In all cases, the analytical results have been found to yield plant noise levels that are equal to or slightly higher than the true performance.

Noise Modeling Summary

Noise modeling results for the RCEC are summarized in Table 8.7-5. These results indicate that noise produced by a standard plant will be at or below the City of Hayward Noise Element Policies Document standard. This document identifies an L_{dn} level of 55 dBA as acceptable for residential and other noise-sensitive receptors. An L_{dn} of 55 dBA is equivalent to a continuous noise level of 49 dBA for 24 hours a day. The levels are also below the quietest measured ambient at all sensitive receptors. Consequently, no impact from steady state plant noise is anticipated at any of the receptors and no special or upgraded noise controls appear to be needed to protect noise-sensitive receptors around the site.

Table 8.7-5. Summary of noise modeling results.

Receptor Position	City of Hayward Noise Element Policies Document Levels (L_{dn} as Leq 24 (dBA)	Average measured background Level, L_{90} (10 p.m. - 7 a.m.) dBA	Expected baseline plant noise level, dBA
Depot Road & Industrial Boulevard	49	45.8 dBA	44
Waterford Apartments, Industrial Boulevard	49	49.5 dBA	42
Hayward Shoreline Interpretive Center	49	53 to 56 (Typical daytime when facility in use) 51.2 dBA night when closed	48
Cogswell Marsh trail bridge	49	49 to 58 (Typical daytime when trail in use) 44.5 dBA night when closed	40

In order to realize this performance, the equipment will be specified at the baseline values assumed in the model (per measurements of standard in-situ equipment). Special provisions to mitigate tonal sources will probably not be required because of the large distances to the receptors. Some attention will be given, however, to start-up transient noise. Vent silencers with reasonable performance will be needed to prevent any impact at the nearest residences. Detailed spreadsheets showing the modeling parameters and results for each of the locations are presented in Appendix 8.7-A.

The City of Hayward Noise Element Policies Document also identifies an L_{dn} level of 75 dBA as acceptable for industrial boundaries. An L_{dn} of 75 dBA is equivalent to a continuous level of 69 dBA 24 hours a day. With appropriately placed sound attenuation equipment, the 69 dBA noise contour is located entirely within the property boundary (Figure 8.7-8). The project is thus in compliance with the City's Policies Document.

Noise levels within the adjacent advanced wastewater treatment plant will range from about 50 dBA to 65 dBA, which are comparable to existing noise levels within the RCEC plant. The nearest office/warehouse and other light industrial neighbors should experience noise levels no greater than about 60 dBA due to operation of the RCEC. This level will not create any interference with normal activities at these nearby businesses.

Noise attenuation equipment that Calpine/Bechtel will install to meet the City's standard includes the following:

- Acoustical cladding on the south and east sides of the STG support structure
- Attenuated HRSG burner control skis
- Acoustically lagged gas lines and throttling valves on the HRSG
- Noise barrier wall on the south side of the circulating water pumps
- Low noise gas compressor building with masonry construction

In conclusion, no significant noise impacts are expected to result at any noise-sensitive receptor around the plant because of the large distances between the plant and the sensitive receptors. The highest level predicted at any residence is 44 dBA east-northeast of the site on Depot Road (monitoring location 2). In other directions, the predicted levels range from 40 to 48 dBA at the other receptors. Thus, no significant unavoidable adverse impact on noise resources is anticipated as a result of the construction and operation of the RCEC.

Vibration Impacts

As discussed in Section 8.7.1.3, the air and ground vibration levels that would be produced by the RCEC would be less than those that presently exist in the local urban environment (e.g., truck traffic). All urban facilities are designed to accommodate this level of vibration. Therefore, vibration sensitive facilities in the urban community surrounding the RCEC are suitably designed for the expected vibrations from the RCEC.

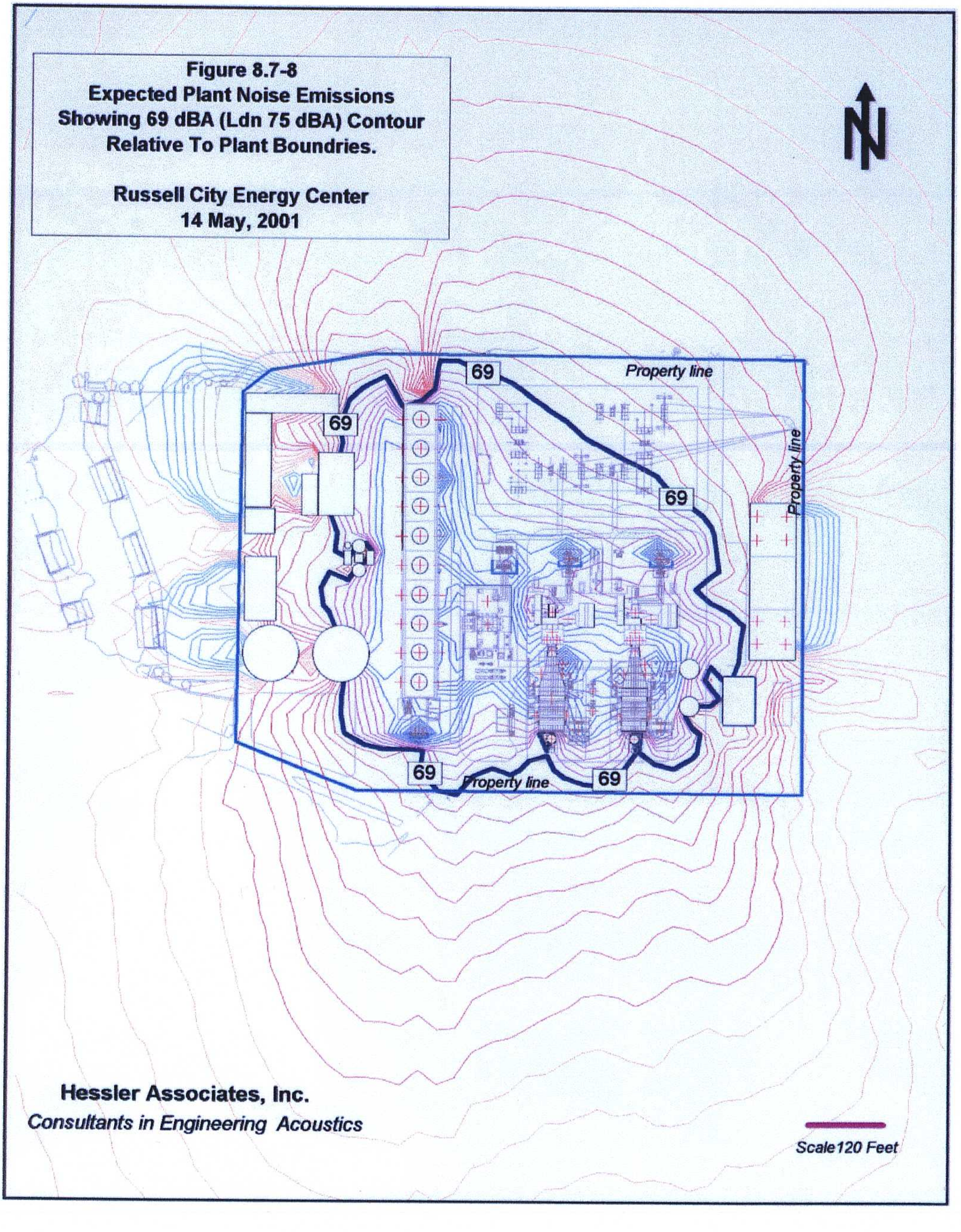
8.7.3 Cumulative Impacts

Increases in noise levels above existing ambient levels during construction and operation will generally not be noticeable beyond one mile from the site. Thus, direct cumulative impacts with other projects will only occur if the other new projects are located within a one-mile radius of the site. No similar projects are known to be planned in the area, and so no direct cumulative noise impacts will occur.

Very small increases in highway traffic noise will occur throughout a large area extending beyond the one-mile radius described above during construction and operation of the project. Increased traffic noise will exist from the origination point of each individual trip to the RCEC as well as on the return trip. Some overlap with traffic due to other new and planned projects will undoubtedly occur at distant locations. However, due to the logarithmic nature of decibel addition, significant changes in the volume of traffic are required to affect even minor changes in noise levels. For example, a doubling of the volume of traffic is required to increase the traffic noise level by the barely noticeable amount of 3

Figure 8.7-8
Expected Plant Noise Emissions
Showing 69 dBA (Ldn 75 dBA) Contour
Relative To Plant Boundries.

Russell City Energy Center
14 May, 2001



Hessler Associates, Inc.
Consultants in Engineering Acoustics

decibels. The cumulative increase in traffic volumes will not be doubled at any location, near or far. Thus, there will be no noticeable indirect cumulative noise impact due to highway traffic.

8.7.4 Mitigation Measures

A complaint resolution procedure presented in the following paragraphs will provide an efficient and effective means of receiving and resolving any noise complaints. An outline sample form for the procedure is provided in Appendix 8.7-B.

Any noise complaints received by the facility switchboard operator will be entered in a "Noise Complaint Logbook" kept at the switchboard desk. The date, time, name, address and phone number of complainant, nature of the complaint and name of the switchboard operator (or other person receiving the call) will be recorded. The logbook entries will always be chronological in order and simply provide evidence that a complaint was received. The caller will then be transferred to the plant manager or shift supervisor who will obtain a thorough understanding of the complaint so that appropriate action can be taken. The manager will briefly explain the resolution procedure to the caller and provide assurance that the problem will be investigated in a timely manner and corrected to the fullest extent practicable.

The manager will then record the information from the logbook on a blank "Noise Complaint Resolution" form presented below. This form provides additional space for a description of the problem and measures taken to resolve the problem. These loose-leaf-preprinted forms will be kept in a three-ring binder maintained by the plant manager or a designee.

The plant manager or designee will investigate the reported noise problem. The offending equipment or activity will be identified and noise levels documented by taking near- and far-field measurements prior to applying any treatment. Near-field noise levels are to be taken at a distance of 3 feet from the equipment and far-field measurements are to be taken at the complainant's property. Appropriate treatment will be determined to reduce or eliminate the noise and, after application of the treatment, additional noise measurements will be taken at the same locations to document the improved condition.

To the extent practicable, full resolution of small problems which can be corrected through a minimal change in procedure or by application of noise control materials costing less than $2,000, including installation, will occur within 30 days of the receipt of the complaint. For larger problems requiring measures which cannot be completed in 30 days, the plan and schedule for completion will be established within 30 days after receipt of complaint. After the initial investigation and determination of the schedule for correction, a letter will be sent to the complainant detailing the findings and expected date of completion of any modification. After the correction has been fully implemented and reduced noise levels documented, a second letter will be sent to the complainant explaining that the problem has been corrected.

In a situation where the complaint does not appear to be justified, as based on measured levels or other criteria, or where the plant manager believes the problem to be corrected but the complainant is not satisfied, additional recourse measures will be provided to the complainant. These will include the name and phone number of the City of Hayward noise code enforcement official responsible for ensuring compliance with conditions of certification of the project. The Noise Complaint Logbook, the loose-leaf book of noise forms, copies of letters sent to complainants, and any other material documenting changes in procedure or installation of noise control materials will be made available to the county officials, as requested.

8.7.5 Applicable Laws, Ordinances, Regulations, and Standards

The controlling criterion in the design of the noise control features for the project is the minimum, or most stringent, noise level required by any of the applicable LORS. Since the site is in the City of Hayward, it must satisfy the City regulations; and because the CEC will license the facility, it must also comply with CEC requirements. The CEC defines the area impacted by the proposed project as that area where there is a potential increase in existing noise levels of 5 dBA or more during construction or operation. The day/night level (L_{dn}) of 55 dBA, applicable to outside space at single-family residences, as specified in the City of Hayward Noise Element Policies Document (City of Hayward 1977), is applicable at residential receptors around the RCEC site. An L_{dn} of 75 dBA is applicable to commercial and industrial receptor locations.

Continuous 24-hour operation of the proposed facility may increase nighttime noise levels at nearby receivers, while remaining within the City's normally acceptable range. Since the project will be designed to be in compliance with this lowest applicable noise level from all the LORS, project-related noise levels will be in compliance with all LORS.

The following are the LORS that apply to noise generated by the RCEC and the AWT plant. These LORS are also summarized in Table 8.7-6.

8.7.5.1 Federal

The federal government has no standards or regulations applicable to off-site noise levels from the project. However, guidelines are available from the USEPA (1974) to assist state and local government entities in development of state and local LORS for noise.

On-site noise levels are regulated, in a sense, through the Occupational Safety and Health Act of 1970 and through the Occupational Safety and Health Administration (OSHA). The noise exposure level of workers is regulated at 90 dBA over an 8-hour work shift to protect hearing (29 Code of Federal Regulations [CFR] 1910.95). On-site noise levels will generally be in the 70 to 85 dBA range. Areas above 85 dBA will be posted as high noise level areas and hearing protection will be required. The power plant will implement a hearing conservation program for applicable employees and maintain exposure levels below 90 dBA.

8.7.5.2 State

Two state laws address occupational noise exposure and vehicle noise and apply to the RCEC. The California Department of Industrial Regions, Division of Occupational Safety and Health enforces California Occupation Safety and Health Administration (Cal-OSHA) regulations which are the same as the federal OSHA regulations described above. The regulations are contained in 8 California Code of Regulations (CCR), General Industrial Safety Orders, Article 105, Control of Noise Exposure, Sections 5095, et seq. Noise limits for highway vehicles are regulated under the California Vehicle Code, Sections 23130 and 23130.5. The limits are enforceable on the highways by the California Highway Patrol, the Alameda County Sheriff's Office, and the City of Hayward Police Department.

8.7.5.3 Local

The California State Planning Law (California Government Code Section 65302) requires that all cities, counties, and entities such as multi-city port authorities prepare and adopt a General Plan to guide community change. The day/night level (L_{dn}) of 55 dBA, applicable to outside space at single-family residences, as specified in the City of Hayward Noise Element Policies Document (City of Hayward

1977), is applicable at residential receptors around the RCEC site. An L_{dn} of 70 dBA is applicable to commercial and industrial receptor locations.

Table 8.7-6. LORS applicable to noise.

Law, Ordinance, Regulation, or Standard	Applicability	Mitigation Effective?	AFC Reference
Federal Offsite: USEPA	Guidelines for state and local governments	Not applicable	Not applicable
Federal Onsite: OSHA	Exposure of workers over 8-hour shift limited to 90 dBA	Yes	Section 8.7.6.1. See also Worker Safety section of AFC.
State Onsite: Cal-OSHA 8 CCR Article 105, Sections 5095 et seq.	Exposure of workers over 8-hour shift limited to 90 dBA	Yes	Section 8.7.6.2. See also Worker Safety section of AFC.
State Offsite: California Vehicle Code, Sections 23130 and 23130.5	Regulates vehicle noise limits on California highways.	Yes	Delivery trucks and other vehicles will meet Code requirements.
Local: California Government Code, Section 65302	Requires local government to prepare plans which contain noise provisions.	Yes	City of Hayward conforms.
City of Hayward Noise Element Policies Document	Limits noise to 55 dBA Ldn at single family residences, and 70 dBA L_{dn} at commercial and industrial locations.	Yes	Section 8.7.6.3.

8.7.6 Involved Agencies and Agency Contacts

The agency responsible for enforcement of noise levels at the RCEC is the City of Hayward Planning Department. The person to contact regarding noise emission levels from the RCEC is shown in Table 8.7-6.

Table 8.7-7. Involved agencies and agency contacts.

Permits/Reason for Involvement	Contact	Title	Telephone
Information regarding City Noise Policy.	Dyana Anderly City of Hayward Community and Economic Development Department	Planning Manager	510-583-4710

8.7.7 Permits Required and Permit Schedule

No noise permits are required.

8.7.8 References Cited

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8.8 PALEONTOLOGICAL RESOURCES

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants. This section assesses the potential that earth-moving associated with construction of the proposed Russell City Energy Center (RCEC) and the Advanced Water Treatment (AWT) Plant would impact scientifically important fossil remains. Section 8.8.1 discusses the existing environmental setting. Section 8.8.2 discusses the environmental effects of construction and subsequent operation. Section 8.8.3 evaluates any cumulative impacts to paleontological resources due to other simultaneous projects. Section 8.8.4 includes any proposed mitigation measures during construction and operation. Section 8.8.5 presents applicable laws, ordinances, regulations and standards (LORS). Section 8.8.6 references agency contacts. Section 8.8.7 presents permit requirements and schedules. Section 8.8.8 contains a list of references cited.

The analysis presented in this section meets all requirements of the CEC (CEC 1999) and incorporates the Society of Vertebrate Paleontology (SVP 1995, 1996) standard measures for mitigating adverse construction-related environmental impacts on paleontological resources.

8.8.1 Affected Environment

8.8.1.1 Geographic Location and Physiographic Environment

The project area, including the RCEC and AWT plant site and the associated electrical transmission line, natural gas pipeline, water supply and wastewater return lines are located along the gently sloping southeastern shore of San Francisco Bay (Bay), which is centrally located within the Coast Ranges Physiographic Province, in west-central California. The Bay fills a north-northwest-trending structural depression in the central Coast Ranges and lies between the San Andreas Fault, to the southwest, and the Hayward Fault, to the northeast (see Section 8.4, Geology). The project area is bounded on the east by foothills of the Diablo Range, which is divided into two separate blocks, with the Berkeley Hills forming the western-most ridges. On the west and southwest, the project area is bounded by the Bay, and the sloughs and tidal channels of Alameda and Mt. Eden creeks.

The project area consists of a gently sloping alluvial fan and floodplain with an average elevation of only 10 to 15 feet above mean sea level (msl). The low alluvial fan and flood basins surrounding the Bay have frequently been referred to as the Bay plain (Robinson 1956). Technically, however, the Bay plain, as defined by Finlayson et al. (1967), is "that area surrounding San Francisco Bay which has an elevation between lower low tide and higher high tide." In other words, the Bay plain is intertidal and distinct from adjacent areas of higher relief which are not affected by tides. Some authors, however, have used the term Bay plain to include all that area that lies between the Bay tidal flats and the foothills of the Berkeley Hills.

There are two major physiographic units in the immediate project area: tidally influenced Bay plain, and the adjacent non-tidally influenced alluvial fans. The project facilities are on the Ward Creek alluvial fan. The Ward Creek alluvial fan is composed of stream-deposited sediments from Ward Creek, which exits the adjacent Berkeley Hills and flows to the bay. Additionally, the project area is just north of the margin of the Alameda Creek alluvial fan which is also referred to as the "Niles Cone" (Finlayson et al. 1967, 1968). In this section, the terms "Ward Creek alluvial fan," "Niles Cone" and "Alameda Creek alluvial fan" apply to all that area that lies between the Bay tidal flats and the foothills of the Berkeley Hills. The apex of the Ward Creek alluvial fan is at an elevation of less than 100 feet and the surface of the fan slopes gently westward at about 10 feet per mile and merges imperceptibly with the Bay plain. The distinction between the Bay plain and the alluvial fans, following Finlayson et al. (1967,1968), is easily made based on tidal influence. The north and south boundaries of the Ward Creek alluvial fan are marked by topographic lows which separate that alluvial fan from adjacent alluvial fans of Alameda Creek and San Lorenzo Creek with which it coalesces to the south and north, respectively. Small intermittent streams that empty into tidal sloughs drain the gently sloping Ward Creek alluvial fan, Niles Cone and Bay plain. The Ward Creek alluvial fan and Bay plain fill consist of medium- to fine-grained sediment, eroded primarily from sedimentary rocks in the adjacent Berkeley Hills. Poorly sorted, lenticular, alluvial sand, silt, gravel, and clay that range from Pleistocene to Recent in age underlie the Ward Creek alluvial fan and adjacent Bay plain on the east side of the Bay.

The project area is located entirely within Alameda County and primarily within the U.S. Geological Survey (USGS) Hayward and Newark Quadrangles (1:24,000).

8.8.1.2 Regional Geologic Setting

Project facilities will encounter one major geological formation: the Late Pleistocene-Early Holocene Temescal Formation. The proposed RCEC plant site, electrical transmission line, and the natural gas and water supply and discharge pipeline routes are located on unconsolidated, Holocene-age alluvial fan deposits, equivalent to Lawson's (1914) Temescal Formation, although that formation also includes Recent Bay mud and "salt-marsh deposits" (see also Trask and Rolston 1951, Atwater et al. 1977). Older, Pleistocene-aged alluvial fan and mud deposits called Alameda Formation underlay the Temescal formation at the project site, beginning at a depth of approximately 12-15 feet (see Atwater et al. 1977).

Lawson (1914) mapped a complex of Quaternary formations along the eastern shore of San Francisco Bay including, from oldest to youngest, the Alameda Formation, San Antonio Formation, Merritt Sand, and Temescal Formation. Later geological mapping (Helley et al. 1979, Dibblee 1980, Helley and Miller 1992) depicted geological facies, mapping units which reflect depositional processes, rather than Lawson's named formations, which are lithologically and chronologically distinctive units. Many of the units mapped by Helley et al. (1979) and Helley and Miller (1992) are gradational, with alluvial fans grading westward to alluvial plains, which grade imperceptibly into Bay muds. These facies subdivisions make it difficult to compare descriptions of fossil sites, which typically refer to named stratigraphic units.

Therefore, despite the fact that many engineering geologists and hydrogeologists prefer to use informal stratigraphic units such as "older Bay mud" and "younger Bay mud", the analysis presented in this AFC uses the formally named stratigraphic units of Lawson (1914). Lawson (1914), Trask and Rolston (1951), Treasher (1963), and Atwater et al. (1977) have all assigned various names to the sediments in the vicinity of the RCEC site and AWT plant (Table 8.8-1). Both the older and younger alluvial deposits show the normal distribution of sediment on an alluvial fan, grading westward through gradually decreasing grain sizes to clay-rich mud.

Table 8.8-1. Comparison of stratigraphic nomenclature for project area sediments.

Lawson (1914)	Trask and Rolston (1951)	Treasher (1963)	Atwater, et al. (1977)
Temescal Formation (secondary alluvium)	Bay mud	Younger Bay mud	Holocene Alluvial deposits
Merritt Sand	Merritt Sand	Sand deposits	Eolian deposits (late Pleistocene and Holocene)
San Antonio Formation	Posey Formation/San Antonio Formation	Older Bay mud	Alluvial deposits (late Pleistocene and Holocene)/Estuarine deposits (late Pleistocene)
Alameda Formation	Alameda Formation	Older Bay mud	Terrestrial and Estuarine deposits, undivided (Pliocene and Pleistocene)

Table 8.8-2 correlates these formations with modern mapping units. The Temescal Formation is the equivalent of the Holocene facies units. Similarly, the Alameda Formation is equivalent to the earlier Pleistocene facies units. The sediments that underlie the proposed RCEC plant site, including the AWT plant, electric transmission line, natural gas and water supply pipeline routes, and the Eastshore Substation are Temescal Formation units mapped by Helley and Miller (1992) Dibblee (1980), and Atwater (1977). The older Alameda Formation described by Lawson (1914) and Trask and Rolston (1951) is located below the San Antonio Formation. Atwater et al. (1977) mapped this facies as Qpht, beginning at a depth of approximately 12-15 feet below the proposed RCEC site. Since Lawson's (1914) marine Merritt Sand and underlying San Antonio Formation do not crop out in the vicinity of the RCEC, they are not listed in the table below.

Table 8.8-2. Correlation of Quaternary stratigraphic units in the project area.

Lawson (1914)	Atwater, et al. (1977)	Dibblee (1980)	Helley and Miller (1992)
Temescal Formation	Alluvial deposits (Qha) Estuarine deposits (Qhe)	Surficial deposits (Qa, Qls)	Alluvial fan and fluvial deposits (Holocene) (Qhaf)
Alameda Formation	Terrestrial deposits, undivided (Qpht)	Older alluvium unconformity (Qoa)	Alluvial fan deposits (Pleistocene) (Qpaf)

Temescal Formation

Lawson (1914) included within his Late Pleistocene and Holocene-age Temescal Formation alluvial deposits younger than and overlying the marine Merritt Sand. These younger alluvial deposits developed in part from the erosion and redeposition of older alluvium, composed of fragments of the Mesozoic and Tertiary rocks of the Berkeley Hills. Stratigraphic position, lithologic components, degree of consolidation, topographic expression, attitude (flat-lying or tilted), and fossil content can be used to distinguish the younger units from the older units. According to Savage (1951), Late Pleistocene and

Holocene Temescal sediments can often be distinguished from the older Pleistocene deposits by their relatively horizontal and uniform attitude. The older San Antonio Formation sediments are slightly tilted.

Alameda Formation

Lawson (1914) applied the name Alameda Formation to Pleistocene-age deposits of sandy clay, found immediately below the alluvial fans of the San Antonio Formation. Lawson determined this to be a Quaternary formation, generally of marine origin, that is several hundred feet thick. Parts of the Alameda formation may contain moderately firm sandy clay or silty clay up to 200 feet thick (Goldman 1969, Helley and Miller 1992). Pebbles in this formation are generally less than 1-inch in diameter and are of Franciscan origin. They also noted the presence of plant fragments at several horizons.

Fossil Content

The simple two-part subdivision of the alluvial fan deposits in the Ward Creek alluvial fan into the Temescal and San Antonio formations is supported by differences in fossil content, as well as stratigraphic superposition, topographic expression, and the presence or absence of deformation. From his survey of vertebrate faunas from the non-marine Quaternary deposits of the San Francisco Bay region, Savage (1951) concluded that only two divisions could be recognized. He named the earlier Pleistocene fauna the Irvingtonian and the later Pleistocene and Holocene fauna the Rancholabrean. As used in this report, the older San Antonio Formation is believed to be entirely Irvingtonian in age and the younger Temescal Formation is entirely Rancholabrean age.

At the project site, the Temescal Formation is underlain by undivided terrestrial deposits of Pleistocene and probably Pliocene age. The deposits unconformably overlie Mesozoic and Tertiary rocks. According to Atwater et al. (1977), these deposits correspond to the Alameda Formation as defined by Lawson (1914) and Trask and Rolston (1951).

8.8.1.3 Paleontological Resource Inventory Methods

A stratigraphic inventory and paleontological resource inventory were completed to develop a baseline paleontological resource inventory of the project site and surrounding area by rock unit, and to assess the potential paleontological productivity of each rock unit. Inventory methods included a review of published and unpublished literature and a cursory field survey. These tasks were in compliance with CEC (1999) and Society for Vertebrate Paleontology (SVP) (1995) guidelines.

Stratigraphic Inventory

Geological maps and reports covering the surficial geology of the project site and area were reviewed to determine the exposed rock units and to delineate their respective areal distributions in the project area.

Paleontological Resource Inventory

Published and unpublished geological and paleontological literature (including previous environmental impact review documents and paleontological resource impact mitigation program final reports) were reviewed to document the number and locations of previously recorded fossil sites from rock units exposed in and near the project site and surrounding area and the types of fossil remains each rock unit has produced. The literature review was supplemented by an archival search conducted at the University of California Museum of Paleontology in Berkeley, California on February 26, 2001.

Field Survey

The field reconnaissance was conducted on February 27, 2001, to document the presence of any previously unrecorded fossil sites and of strata that might contain fossil remains. The reconnaissance was limited to inspection of visible ground surface at the RCEC and AWT plant site. Ground surface visibility was nonexistent for the proposed gas pipeline, since the pipeline route runs underneath paved streets through mostly developed and urban areas. No exposures of potentially fossiliferous strata were observed in the project construction zone. A complete pedestrian survey of the entire project area of potential effect for paleontological resources was deemed unnecessary and no subsurface exploration was conducted. A more detailed survey was deemed unnecessary because the project site is located in a lowland, depositional environment consisting of Holocene alluvium located very near the early historic era bayland-bayshore saltmarsh boundary. Pleistocene deposit outcrops are unlikely in this area because of the lack of erosional features to expose older sediments beneath the Holocene sediments.

8.8.1.4 Paleontological Resource Assessment Criteria

The potential paleontological importance of the project area can be assessed by identifying the paleontological importance of exposed rock units within the project area. Since the areal distribution of a rock unit can be easily delineated on a topographic map, this method is conducive to delineating parts of the project that are of higher and lower sensitivity for paleontological resources and to delineating parts of the project that may therefore require monitoring during construction.

A paleontologically important rock unit is one that: (1) has a high potential paleontological productivity rating, and (2) is known to have produced unique, scientifically important fossils. The potential paleontological productivity rating of a rock unit exposed at the project site refers to the abundance/densities of fossil specimens and/or previously recorded fossil sites in exposures of the unit in and near the project site. Exposures of a specific rock unit at the project site are most likely to yield fossil remains representing particular species in quantities or densities similar to those previously recorded from the unit in and near the project site. However, well-developed and documented fossil-bearing formations are unlikely to yield a unique paleontological resource.

An individual vertebrate fossil specimen may be considered unique or significant if it meets the following criteria: it is 1) identifiable, 2) complete, 3) well preserved, 4) age diagnostic, 5) useful in paleoenvironmental reconstruction, 6) a type or topotypic specimen, 7) a member of a rare species, 8) a species that is part of a diverse assemblage, and/or 9) a skeletal element different from, or a specimen more complete than, those now available for its species. For example, identifiable vertebrate marine and terrestrial fossils are generally considered scientifically important because they are relatively rare. The value or importance of different fossil groups varies, depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions such as part of a research project. Marine invertebrates are generally common, well developed, and well documented. They would generally not be considered a unique paleontological resource.

The following tasks were completed to establish the paleontological importance of each rock unit exposed at or near the project site:

- The potential paleontological productivity of each rock unit exposed at the project site was assessed, based on the density of fossil remains previously documented within the rock unit.

- The potential for a rock unit exposed at the project site to contain a unique paleontological resource was considered.

8.8.1.5 Resource Inventory Results

Stratigraphic Inventory

This section begins with an overview of past efforts to map the surficial geology of the project region and attempts to correlate the various geologic units. This is followed by a description of the geologic units that outcrop in the immediate project vicinity.

Regional surficial geologic mapping of the project site and vicinity (1:125,000 or 1:500,000 scale) is provided by Goldman (1969), Finlayson et al. (1967), and Helley and Lajoie (1979). Atwater et al. (1977) created three separate 1:250,000 cross-sectional maps across the San Francisco Bay. Larger scale mapping of the project site (1:24,000 or 1:62,500 scale) is provided by Lawson (1914), Robinson (1956), Helley et al. (1979), Dibblee (1980), and Helley and Miller (1992).

Paleontological Resource Inventory and Assessment by Rock Unit

Mammalian fossils have been the most helpful in determining the relative age of the alluvial fan and Bay plain sedimentary deposits (Louderback 1951, Savage 1951). The mammalian inhabitants of the late Pleistocene and Holocene alluvial fan and floodplain included horses, mastodons, camels, ground sloths, and pronghorns.

Surveys of Late Cenozoic land mammal fossils have been provided by Hay (1927), Stirton (1939), Savage (1951), and Jefferson (1991b). On the basis of his survey of vertebrate fauna from the non-marine Late Cenozoic deposits of the San Francisco Bay region, Savage (1951) concluded that only two divisions of Pleistocene time could be recognized in the San Francisco Bay region. He named the earlier Pleistocene fauna the Irvingtonian and the later Pleistocene and Holocene fauna the Rancholabrean. The age of the later Pleistocene, Rancholabrean fauna was based on the presence of bison and on the presence of many mammalian species which are inhabitants of the same area today. In addition to bison, larger land mammals identified as part of the Rancholabrean fauna include mammoths, mastodons, camels, horses, and ground sloths.

No known vertebrate fossils or other paleontological resources are within the project Area of Potential Effect (APE). However, Pleistocene and Holocene vertebrate fossils have been reported from the general vicinity of the proposed RCEC plant site and related facilities, and the project area may therefore be considered an area of potential sensitivity for paleontological resources. A table providing the details of fossil remains, and a map showing the locations of these fossil sites, are provided in Appendix 8.8 (filed under a request for confidentiality).

Temescal Formation

Remains of land mammals have been found at a number of localities in younger alluvial deposits referable to the Temescal Formation (Hay 1927, Louderback 1951, Savage 1951; Jefferson 1991b). Jefferson (1991a,b) compiled a database of California Late Pleistocene (Rancholabrean North American Land Mammal Age) vertebrate fossils from published records, technical reports, unpublished manuscripts, information from colleagues, and inspection of museum paleontological collections at over 40 public and private institutions. He lists more than 50 individual sites in Alameda County that have yielded Rancholabrean vertebrate fossils, including several localities near the RCEC project area, studied by the University of California Museum of Paleontology (UCMP) in Berkeley, California. These fossils would presumably all be referable to the Temescal Formation, as used in this AFC section. In addition to UCMP localities, Jefferson (1991a, b) lists fossils localities from the Yale Peabody Museum, Chicago Field Museum of Natural History, and the U. S. National Museum.

The most common fossils reported from Rancholabrean-age alluvial sediments in the East Bay area are the remains of mammoths, bison, and horses. Helley and LaJoie (1979) and Atwater et al. (1977) noted that the Estuarine deposits (part of the Temescal Formation) locally also contain fresh water invertebrate fossils (gastropods and pelecypods). Helley and LaJoie (1979) note that alluvial deposits (also part of the Temescal Formation) locally contain aboriginal artifacts and skeletal remains. The age of these deposits apparently extends from latest Pleistocene to the Holocene. Lawson (1914) referred to the Temescal Formation as entirely Holocene in age, but Louderback (1951) believed that the bulk of this younger alluvium was Pleistocene in age. Based on the presence of fossil bison, Savage (1951) referred the younger alluvium to the Rancholabrean North American Land Mammal Age, which spans the boundary between Late Pleistocene and Early Holocene.

The closest vertebrate fossil to the RCEC is UCMP vertebrate fossil locality V-5258, located near Interstate 880 Freeway in the city of Hayward, approximately 2.75 miles north of the RCEC site. This site has yielded a bison fossil—a Rancholabrean land mammal. In addition, UCMP vertebrate fossil localities V-5928 and –6304, located approximately 3 miles northeast of the proposed RCEC site at near Mission Boulevard in Hayward, have produced horse fossils from Late Pleistocene gravels, which have been identified as Rancholabrean fauna referable to the Temescal Formation. Other Rancholabrean mammal remains found in Temescal Formations on the east side of San Francisco Bay include UCMP sites V-6420, -4045, -1051, -1052, -3613, -7073, -6533, -6644, -6227, -67194, and –2841. These sites have yielded fossil remains of mammoth, bison, camel, bear, horse, sea otter, tapir, merycoidodon, and ground sloth (precise locations found in Appendix Figure 8.8-1, filed separately under a request for confidentiality). In addition, Atwater et al. (1977) reported the presence of estuarine pelecypods, foraminifers, and seeds of the marsh plant *Salicornia* sp. from boreholes in San Francisco Bay, within three miles of the project site.

The occurrence of previously recorded fossil sites near the project site suggests that there is a potential for uncovering additional similar fossil remains during earth-moving activities related to construction of those areas of the project underlain by sediments of the Temescal Formation.

Alameda Formation

When naming the Alameda Formation, Lawson (1914) noted that this unit contained "marine shells". Trask and Rolston (1951) noted the presence of "plant fragments" in several horizons, particularly in the upper portions of the Alameda Formation. Atwater et al. (1977) reported sparse mollusks, foraminifers, ostracodes, and diatoms from boreholes in San Francisco Bay.

The Alameda Formation underlies the proposed RCEC site and is associated facilities at a depth of approximately 12-15 feet. Although no fossils have been reported from the site itself, marine fossils have been reported from boreholes in San Francisco Bay within 2 miles of the site. The presence of a number of previously recorded marine fossil sites near the project site suggests that there is a potential for uncovering additional similar fossil remains during earth-moving activities related to the RCEC construction if the excavation depth were to exceed approximately 10 feet. However, any identifiable fossil remains that may be recovered from the Alameda formation during project construction are not likely to be scientifically important because they have already been identified and dated by Atwater et al. (1977) and because coring anywhere in the vicinity would recover similar materials.

8.8.2 Environmental Consequences

The potential environmental effects from construction and operation of the RCEC and AWT plant on paleontological resources are presented in the following subsections.

8.8.2.1 Significance Criteria

In its standard guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) established three categories of sensitivity for paleontological resources: high, low, and undetermined. Areas where fossils have been previously found are deemed to have a high sensitivity and a high potential to produce fossils. In areas of high sensitivity, full-time monitoring is typically recommended during any project ground disturbance. Areas that are not sedimentary in origin and that have not been known to produce fossils in the past, typically are deemed to have low sensitivity and monitoring is usually not needed during project construction. Areas that have not had any previous paleontological resource surveys or fossil finds are deemed undetermined until surveys and mapping are done to determine their sensitivity. After reconnaissance surveys, observation of exposed cuts, and possibly sub-surface testing, a qualified paleontologist can determine whether the area should be categorized as having high, low, or undermined sensitivity. In keeping with the significance criteria of the SVP (1995), all vertebrate fossils are categorized as being of potential significant scientific value.

Appendix G of California Environmental Quality Act (CEQA) addresses significance criteria with respect to paleontological resources (Public Resources Code Sections 21000 et seq.). Appendix G(V)(c) asks if the project will "directly or indirectly destroy a unique paleontological resource or site or unique geologic feature."

Using both the criteria of the SVP (1995) and CEQA, outlined above, the significance of the potential adverse impacts of earth moving on the paleontological resources of each stratigraphic unit exposed in the project site construction zone was assessed. This assessment reflects the paleontological importance and impact sensitivity of the stratigraphic unit.

8.8.2.2 Construction

Potential impacts on paleontological resources resulting from the proposed RCEC and AWT plant can be divided into construction-related impacts and impacts related to plant operation. This section presents the potential adverse impacts on the paleontological resources resulting from construction of each portion of the project.

RCEC Plant Site

Construction-related impacts to paleontological resources primarily involve ground disturbance (excavations and drainage diversion measures).

The proposed RCEC site is situated on "Holocene Alluvial deposits" (Qha) equivalent to the Temescal Formation. The planned site filling and grading is not expected to result in significant adverse impacts to paleontological resources, as the ground surface in this area has already been greatly disturbed by construction of the existing metal painting company and radio towers. Neither are the supporting facilities, such as temporary construction offices, laydown areas, and parking areas, expected to have a significant adverse impact on resources, as they also are located on ground previously disturbed and will involve no significant ground disturbance.

The deepest excavation for power plant facilities will be approximately 18 feet below the existing ground surface (cooling tower pump bay). Other excavations will range in depth from 6 to 12 feet below the finished grade. The deep excavations at the power plant site will encounter sediments of the Temescal Formation, which are known to contain Rancholabrean-age vertebrate fossils in the general project vicinity. These excavations also have the potential to disturb sediments of the underlying Alameda Formation which may contain marine fossils. Thus, these deep excavations could cause impacts to paleontological resources in both stratigraphic units. However, only vertebrate fossils would be considered potentially significant because of their general rarity. Marine pelecypods, diatoms, and marine micro- and macrofauna would not be considered significant because Atwater et al. (1977) have already identified and dated these materials and because similar materials could be recovered by coring anywhere along the East Bay front. Implementation of the proposed mitigation measures will ensure that potentially significant paleontological resources are not affected.

Electric Transmission Line and Eastshore Substation Expansion—The electrical transmission lines will be located in a developed area; however, replacement of the existing lattice transmission towers with tubular steel towers will involve ground-disturbing activities in sediments of the Temescal Formation, which are known to contain Rancholabrean-age vertebrate fossils in the general project vicinity. Thus, these excavations could encounter to paleontological resources.

Natural Gas Pipeline—Installation of gas pipelines will occur in developed areas on previously disturbed ground; therefore, no significant adverse impacts to paleontological resources are expected.

Wastewater Return Pipeline—Installation of gas pipelines will occur in developed areas on previously disturbed ground; therefore, no significant adverse impacts to paleontological resources are expected.

AWT Plant

Impacts resulting from construction of the AWT plant will be similar to those from construction of the RCEC plant site. However, implementation of the proposed mitigation measures will ensure that potentially significant paleontological resources are not affected.

Construction Laydown and Worker Parking Areas

These areas occur on developed lands on previously disturbed ground; therefore, no significant adverse impacts to paleontological resources are expected.

8.8.2.3 Operation

No impacts on paleontological resources are expected to occur from the continuing operation of the RCEC AWT plant, or any of the related facilities because project operation will not involve significant ground disturbance.

8.8.3 Cumulative Impacts

If paleontological resources were encountered during the ground disturbance, the potential cumulative effect on paleontological resources would be low, as long as the mitigation measures proposed in Section 8.8.4 are implemented to recover the resources. When properly implemented, these mitigation measures would effectively recover the scientific value of significant fossils encountered during construction.

Thus, the proposed project will not cause or contribute to significant cumulative impacts to paleontological resources.

8.8.4 Proposed Mitigation Measures

This section describes measures proposed to reduce or mitigate potential project-related adverse impacts to significant paleontological resources.

- **Paleontological Mitigation Plan**—The paleontological resource mitigation program will include the preparation of a mitigation and monitoring plan for construction monitoring; emergency discovery procedures; sampling and data recovery, if needed; museum storage coordination for any specimen and data recovered; preconstruction coordination; and reporting.
- **Paleontological Monitoring**—Prior to construction, Calpine/Bechtel will retain a qualified paleontologist to design and implement a mitigation program during project-related earth-moving activities for deep excavation at the power plant site, for deep boring for electrical transmission towers, and for construction of the water and natural gas pipelines. The paleontologist will conduct a limited field survey of exposures of sensitive stratigraphic units in areas that will be disturbed by earth moving.
- **Construction Personnel Education**—Prior to start of construction, construction personnel involved with earth-moving activities will be informed of the possibility of encountering fossils, and trained in identification of fossils and proper notification procedures. This worker training will be prepared and presented by the project paleontologist. The previously-trained construction personnel will monitor earth-moving construction activities where this activity will disturb previously undisturbed sediment. Monitoring will not take place in areas where the ground has been previously disturbed, in areas underlain by artificial fill, or in areas where exposed sediment will be buried but not otherwise disturbed.

Implementation of these mitigation measures will reduce the potentially significant adverse environmental impact of project earth-moving activities on paleontological resources to an insignificant level. These measures will allow for the recovery of fossil remains and associated specimen data and corresponding geologic and geographic site data that otherwise might have been destroyed by construction and unauthorized fossil collecting.

8.8.5 Applicable Laws, Ordinances, Regulations, and Standards (LORS)

Paleontological resources are classified as non-renewable scientific resources and are protected by several federal and state statutes, most notably by the 1906 Federal Antiquities Act and other subsequent federal legislation and policies and by the state of California's environmental regulations (CEQA, Section 15064.5). Professional standards for assessment and mitigation of adverse impacts on paleontological resources have been established for vertebrate fossils by the SVP (1995, 1996). Design, construction, and operation of the RCEC and AWT plant, including transmission lines, pipelines, and ancillary facilities, will be conducted in accordance with all LORS applicable to paleontological resources. Federal and state LORS applicable to paleontological resources are summarized in Table 8.8-3 and discussed briefly below, along with SVP professional standards.

8.8.5.1 Federal

Federal protection for significant paleontological resources would apply to the RCEC if any construction or other related project impacts were to take place on federally owned or managed lands. Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (PL 59-209; 16 United States Code 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal land. The project currently does not cross such lands. Federal requirements would apply if a Federal agency were to obtain ownership of project lands during the term of the project license.

Table 8.8-3. Applicable LORS regarding paleontological resources.

LORS	Applicability	AFC Reference	Project Conformity
Antiquities Act of 1906	Protects paleontological resources from vandalism and unauthorized collecting on federal lands (currently no federal land)	Section 8.8.5	yes
CEQA, Appendix G	Fossil remains may be encountered by earth-moving activities	Section 8.8.4, Section 8.8.5	yes
Public Resources Code, Sections 5097.5/5097.9	Would apply only if some project land acquired by state (currently no state land)	Section 8.8.5	yes

8.8.5.2 State

The CEC environmental review process under the Warren-Alquist Act has been certified to be functionally equivalent to that of CEQA (Public Resources Code Sections 15000 et seq.) with respect to paleontological resources. CEQA's Appendix G (Public Resources Code Sections 21000 et seq.) lists among its significant effects when a project will "disrupt or adversely affect...a paleontological site except as part of a scientific study."

Other state requirements for paleontological resource management are in Public Resources Code Chapter 1.7, Section 5097.5, *Archaeological, Paleontological, and Historical Sites*. This statute specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources. It would apply to the RCEC only if the state or a state agency were to obtain ownership of project lands during the term of the project license.

8.8.5.3 County

Alameda County does not have LORS that specifically address potential adverse impacts to paleontological resources.

8.8.5.4 Professional Standards

The Society of Vertebrate Paleontology (SVP 1995, 1996), a national scientific organization of professional vertebrate paleontologists, has established standard guidelines that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, specimen preparation, analysis, and curation. Most practicing professional paleontologists in the nation adhere to the SVP's assessment, mitigation, and monitoring requirements, as specifically spelled out in its standard guidelines.

8.8.6 Involved Agencies and Agency Contacts

The CEC will be the lead agency for the protection of paleontological resources for this project.

8.8.7 Permits Required and Schedule

No state or county agency requires a paleontological collecting permit to recover fossil remains discovered by construction-related earth moving on either state or private land in the project site.

8.8.8 References

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8.9 PUBLIC HEALTH

This section presents the methodology and results of a human health risk assessment performed to assess potential impacts and public exposure associated with airborne emissions from the construction and routine operation of the proposed Russell City Energy Center (RCEC) and AWT plant.

Air will be the dominant pathway for public exposure to chemical substances released by the project. Emissions to the air will consist primarily of combustion by-products produced in the natural gas-fired turbines. Potential health risks from combustion emissions will occur almost entirely by direct inhalation. To be conservative, additional pathways were included in the health risk modeling; however, direct inhalation is considered the most likely exposure pathway. The risk assessment was conducted in accordance with guidance established by the California Air Pollution Control Officers' Association (CAPCOA, 1993).

Combustion byproducts with established CAAQS or NAAQS, including oxides of nitrogen (NO_x), carbon monoxide and fine particulate matter are addressed in the Ambient Air Quality section (see Section 8.1.3). However, some discussion of the potential health risks associated with these substances is presented in this section. Human health risks potentially associated with accidental releases of stored acutely hazardous materials at the proposed facility (aqueous ammonia) are also discussed in this section.

8.9.1 Affected Environment

The proposed RCEC will be located in the City of Hayward, Alameda County. Surrounding land uses are described in Section 8.6, Land Use. The nearest residences are located approximately 0.82 mile from the site. The amount of housing within a one-mile radius of the project is very small, and is confined to the Mt. Eden residential area east of Industrial Boulevard.

Terrain within a 10-mile radius of equal or greater elevation than the stack exhaust exit point (i.e., stack height plus grade elevation) is shown in Figure 8.9-1 (in pocket at back of section).

Sensitive receptors are defined as groups of individuals that may be more susceptible to health risks due to chemical exposure. Schools (public and private), day care facilities, convalescent homes, and hospitals are of particular concern. The nearest sensitive receptors within 6 miles of the RCEC site are listed in Table 8.9-1 below and shown in Figure 8.9-2 (in pocket).

Air quality and health risk data presented by CARB in the 2001 Almanac of Emissions and Air Quality for the San Francisco Bay Area Air Basin shows that over the period 1990 through 1999, the average concentrations and associated health risks for the top ten toxic air contaminants (TACs) has been substantially reduced, and the concentrations and associated health risks for the air basin are typically lower than the statewide averages. CARB estimated emissions inventory values for the top ten TACs for 2000 and ambient concentration and associated risk values for 1990-1999 are presented in Table 8.9-2 for Alameda County.

8.9.2 Environmental Consequences

8.9.2.1 Significance Criteria

Cancer Risk

Cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are not assumed to have a threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (i.e., a linear, no-threshold model). Under various state and local regulations, an incremental cancer risk of 10-in-one million due to a project is considered to be a significant impact on public health. For example, the 10-in-one-million risk level is used by the Air Toxics Hot Spots (AB 2588) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

Non-Cancer Risk

Non-cancer health effects can be either chronic or acute. In determining potential non-cancer health risks (chronic and acute) from air toxics, it is assumed there is a dose of the chemical of concern below which there would be no impact on human health. The air concentration corresponding to this dose is called the Reference Exposure Level (REL). Non-cancer health risks are measured in terms of a hazard quotient, which is the calculated exposure of each contaminant divided by its REL. Hazard quotients for pollutants affecting the same target organ are typically summed with the resulting totals expressed as hazard indices for each organ system. A hazard index of less than 1.0 is considered to be an insignificant health risk. For this health risk assessment, all hazard quotients were summed regardless of target organ. This method leads to a conservative (upper bound) assessment. RELs used in the hazard index calculations were those published in the CAPCOA AB 2588 Risk Assessment Guidelines (CAPCOA, 1993).

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure, caused by chemicals accumulating in the body. Because chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The lowest no-effect chronic exposure level for a non-carcinogenic air toxic is the chronic REL. Below this threshold, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation. The chronic hazard index was calculated using the hazard quotients calculated with annual concentrations.

Acute toxicity is defined as adverse health effects caused by a brief chemical exposure of no more than 24 hours. For most chemicals, the air concentration required to produce acute effects is higher than levels required to produce chronic effects because the duration of exposure is shorter. Because acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures, all hazard quotients are typically summed to calculate the acute hazard index. One-hour average concentrations are divided by acute RELs to obtain a hazard index for health effects caused by relatively high, short-term exposure to air toxics.

8.9.2.2 Construction Phase Impacts

The construction phase of the RCEC and AWT is expected to take approximately 18 to 21 months. No significant public health effects are expected during the construction phase. Strict construction practices that incorporate safety and compliance with applicable laws, ordinances, regulations, and standards (LORS) will be followed (see Section 8.9.5). In addition, mitigation measures to reduce air emissions from construction impacts will be implemented as described in Section 8.1.

Table 8.9-1. Sensitive receptors within six miles of the RCEC.

Name	Address	City	Name	Address	City
Elementary & Junior High Schools			**Day Care Centers**		
All Saints School	22870 2nd Street	Hayward	A Kids Kingdom	18550 Redwood Rd	Castro Valley
Alvarado Elementary School	31100 Fredi St	Union City	A Special Place	27305 Hintwood Ave	Hayward
American Heritage Christian	425 Gresel St	Hayward	ABC Academy	670 Sunset Blvd	Hayward
Ardenwood Elementary School	33955 Emilia Ln	Fremont	ABC pre-School & Day Care	20135 San Miguel Ave	Castro Valley
Barnard White Middle School	725 Wipple Rd	Union City	Adventure Montessori Academy	4101 Pleiades Pl	Union City
Bowman Elementary School	520 Jefferson St	Hayward	Adventure Time Lorenzo Manor	18250 Bengal Ave	Hayward
Brenkwitz School	22100 Princeton St	Hayward	Avenue Pre-School	1521 159th Ave	San Leandro
Burbank Elementary School	353 B St	Hayward	Beth Sholom Pre-Shool	642 Dolores Ave	San Leandro
Castro Valley Elementary	20185 San Miguel Ave	Castro Valley	Broadmoor Parent Nursery	951 Dowling Blvd	San Leandro
Cesar Chavez Middle School	2801 Hop Ranch Rd.	Union City	Burbank Pre School	15661 Washington Ave	San Lorenzo
Chabot Elementary School	19104 Lake Chabot Rd	Castro Valley	Calvary Lutheran School	17200 Via Magdalena	San Lorenzo
Cherryland Elementary School	585 Willow Ave	Hayward	Camelot School	2330 Pomar Vista Ave	Castro Valley
Colonial Acres Elementary School	17115 Meekland Ave	Hayward	Camelot Schools	21753 Vallejo St	Hayward
Corvallis School	14790 Corvallis St	San Leandro	Castro Valley Parent Nursery	3657 Christensen Ln	Castro Valley
Dayton Elementary School	1500 Dayton Ave	San Lorenzo	Cherubim's Children Center	30540 Mission Blvd	Hayward
East Ave Elementary School	2424 East Ave	Hayward	Child Family & Community	20900 Corsair Blvd	Hayward
Eden Gardens Elementary School	2184 Thayer Ave	Hayward	Children's Choice	185 W Harder Rd	Hayward
Eldridge Elementary School	26825 Eldridge Ave	Hayward	Circle Time Nursery	26555 Gading Rd	Hayward
Fairview Elementary School	23515 Maud Ave	Hayward	Cornerstone Pentesostal Church	24150 Hesperian Blvd	Hayward
Garfield Elementary School	13050 Aurora Dr	San Leandro	Creative Beginnings Preschool	20121 Sanata Maria Ave	Castro Valley
Glassbrook Elementary School	975 Schafer Rd	Hayward	Creative Beginnings Preschool	268 Bay Fair Mall	San Leandro
Harder Elementary School	495 Wyeth rd	Hayward	Darwin Head Start	2560 Darwin St	Hayward
Helen Turner Childrens Center	23640 Reed Way	Hayward	Debbie's Daycare	2664 Hawthorne Ave	Hayward
Highland Elementary School	2021 Highland Blvd	Hayward	Early Head Start Program	680 W Tennyson Rd	Hayward
Hillside School	15980 Marcella St	San Leandro	Eden Area Head Start	951 Palisade St	Hayward
Hillview Crest School	31410 Wheelon Ave	Hayward	Eldridge Elementary	96825 Eldridge Ave	Hayward
James Madison	14751 Juniper Street	San Leandro	Elmhurst Daycare & Preschool	380 Elmhurst St	Hayward
Jefferson Elementary School	14311 Lark St	San Leandro	Fairview Hills Pre-School	2841 Romagnolo St	Hayward
John Muir	24823 Soto Rd	Hayward	Free To Be School	188 Appian Way	Union City
Lea's Christian School	26236 Adrian Ave	Hayward	Growing Years Day Camp	20166 Wisteria St	Castro Valley
Lewelling School	562 Lewelling Blvd	San Leandro	Growing Years Preschool	20320 Anita Ave	Castro Valley
Longwood Elementary School	850 Longwood Ave	Hayward	Happiness Hill Pre-School	20600 John Dr	Castro Valley
Lorenzo Manor School	18250 Bengal Ave	Hayward	Hayward Parent Co-Op Nursery	2652 Vergil Ct	Castro Valley
Markham Elementary School	1570 Ward St	Hayward	Head Start Program	25926 Carlos Bee Blvd	Hayward

Table 8.9-1. (continued).

Name	Address	City
Elementary & Junior High Schools		
Marshall School	20111 Marshall St	Castro Valley
Monroe Elementary School	3750 Monterey Blvd	San Lorenzo
Montessori Children's House	166 W Harder Rd	Hayward
Montessori Children's School	1836 B St	Hayward
Moreau Catholic High School	27170 Mission Blvd	Hayward
Ochoa Intermediate School	2121 Depot Rd	Hayward
Palma Ceia School	27679 Melborne Ave	Hayward
Park Elementary School	411 Larchmont St	Hayward
Pioneer Elementary School	32737 Bel Aire St	Union City
Refugio M Cabello Elementary	4500 Cabello St.	Union City
Ruus School	28027 Dickens Ave	Hayward
Saint Bede's Ccd	26910 Patrick Ave	Hayward
Saint Clement's School	790 Calhoun St	Hayward
Saint Felicitas School	1650 Manor Blvd	San Leandro
Saint Joachim's Ccd	21250 Hesperian Blvd	Hayward
San Leandro Childrens	14311 Lark St	San Leandro
Schafer Park Elementary	26268 Flamingo Ave	Hayward
Shepard Elementary	27211 Tyrell Ave	Hayward
Southgate Elementary School	26601 Calaroga Ave	Hayward
Strobridge Elementary School	21400 Bedford Dr	Castro Valley
Treeview Elementary	30565 Treeview St	Hayward
Tyrell Elementary	27000 Tyrell Ave	Hayward
Washington Manor School	1170 Fargo Ave	San Leandro
Convalescent & Nursing Homes		
Bay Point Healthcare Center	442 Sunset Blvd	Hayward
Bethesda Christian Retirement	22427 Montgomery St	Hayward
Courtyard Care Center	1625 Denton Ave	Hayward
Diana's Care Home	27402 Manon Ave	Hayward
Driftwood Healthcare Center	19700 Hesperian Blvd	Hayward
Eden Villa	19960 Santa Maria Ave	Castro Valley
Eden-West Rehab & Convalescent	1805 West St	Hayward
Emerald Care Home	2729 Dowe Ave	Union City
Evergreen Residential Care	239 Blossom Way	Hayward
Fern Lodge Inc	18457 Madison Ave	Castro Valley

Name	Address	City
Day Care Centers		
Head Start Program	975 Schafer Rd	Hayward
His Growing From Infant Care	2490 Grove Way	Castro Valley
Kids Klub Children's Center	2500 Oliver Dr	Hayward
Learning Game	31600 Alvarado Blvd	Union City
Lea's Christian School	26236 Adrian Ave	Hayward
Lighthouse Kiddie Kingdom	16053 Ashland Ave	San Lorenzo
Lil Angels Day Care Center	28924 Ruus Rd	Hayward
Little Lambs Preschool	14871 Bancroft Ave	San Leandro
Lollipop Lane Preschool	341 Paseo Grande	San Lorenzo
Montessori Children's House	26236 Adrian Ave	Hayward
Montessori Children's House	166 W Harder Rd	Hayward
Montessori Children's School	1836 B St	Hayward
Montessori School	1101 Walpert St	Hayward
Montessori School	19234 Lake Chabot rd	Castro Valley
Montessori School	147945 Washington Ave	San Leandro
Montessori School	16492 Foothill Blvd	San Leandro
Our Future Tots Learning Center	963 Manor Blvd	San Leandro
Redwood Forest Pre-School	19200 Redwood Rd	Castro Valley
Right World Nursery School	20613 Stanton Ave	Castro Valley
Rise'n Shine Preschool	20104 Center St	Castro Valley
Saint Therese Day Care	1507 Rieger Ave	Hayward
San Lorenzo Community Church	945 Paseo Grande	San Lorenzo
San Lorenzo Parent Nursery	820 Bockman Rd	San Lorenzo
Semore School	4312 Dyer St	Union City
Sir Love	27653 Pompano Ave	Hayward
Stivers Academy	461 Bartlett Ave	Hayward
Sunset Parent Nursery School	22100 Princeton St	Hayward
Supporting Future	22584 S Garden Ave	Hayward
Tennyson Parent Nursery School	27552 E 11th St	Hayward
Tri Cities Children's Centers	625 Berry Ave	Hayward
Tri Cities Children's Centers	541 Blanche St	Hayward
Tri Cities Children's Centers	23640 Reed Way	Hayward
Woodroe Woods School	22502 Woodroe Ave	Hayward
YMCA	951 Palisade St	Hayward
Yours & Mine	2894 D St	Hayward

Table 8.9-1. Sensitive receptors within six miles of the RCEC.

Name	Address	City
Convalescent & Nursing Homes		
Galicia's Tulip Care Home	1771 Tulip Ave	Hayward
Gerrylaide Manor	261 Medford Ave	Hayward
Hayward Convalescent Hospital	1832 B St	Hayward
Hayward Hills Health Care Center	1768 B St	Hayward
Jones Rest Home	524 Callan Ave	San Leandro
Majestic Pines Care Center	1628 B St	Hayward
Morton Bakar Center	494 Blossom Way	Hayward
Oakcreek Alzheimers and Dementia	6127 E Castro Valley Blvd	Castro Valley
Quail Ridge Health Care Center	1440 168th Ave	San Leandro
Redwood Convalescent Hospital	22103 Redwood Rd	Castro Valley
Rose Gate	1345 Clarke St	San Leandro
Saint Anthony Care Center	553 Smalley Ave	Hayward
Saint Christopher Convalescent	22822 Myrtle St	Hayward
Saint Francis Extended Care	718 Bartlett Ave	Hayward
Saint Therese Convalescent Hospital	21863 Valleio St	Hayward
San Leandro Healthcare Center	368 Juana Ave	San Leandro
Santo Domingo Residential Care	3327 San Marco Ct	Union City
Seaton Rehabilation Hospital	1652 Mono Ave	San Leandro
St Anthony Care Center	553 Smalley Ave	Hayward
St Anthony Residential Care	4491 Ariel Ave	Fremont
St Christopher Convalescent	22822 Myrtle St	Hayward
St Francis Extended Care	718 Bartlett Ave	Hayward
St Gregory Care Center Center	22424 Charlene Way	Castro Valley
St John Kronstadt Convalescent	4432 James Ave	Castro Valley
St Therese Convalescent Hospital	21863 Vallejo St	Hayward
Sunbridge Care & Rehab Center	26660 Patrick Ave	Hayward
Sunbridge Care & Rehab Center	14766 Washington Ave	San Leandro
Valley Pointe Rehab & Nursing	20090 Stanton Ave	Castro Valley
Villa Fairmont Mental Health	15200 Foothill Blvd	San Leandro
Vintage Estates of Hayward	25919 Gading Rd	Hayward
Whispering Pines Rest Haven	565 Schafer Rd	Hayward
Wisteria Care Center	20524 Wisteria St	Castro Valley

Name	Address	City
Hospitals		
Alameda County Medical Center	15400 Foothill Blvd.	San Leandro
Alzheimer's Services	561 A St	Hayward
Courtyard Care Center	1625 Denton Ave	Hayward
Evergreen Senior Center	985 Sueirro St	Hayward
Laurel Grove hospital	19933 Lake Chabot	Castro Valley
San Leandro Healthcare Center	368 Juana Ave.	San Leandro
San Leandro Hospital	13855 E. 14th St.	San Leandro
San Leandro Surgery Center	15035 E 14th St	San Leandro
Seaton Rehabilitation Hospital	15705 Liberty St.	San Leandro
Senior Friends	13847 E 14th St.	San Leandro
St. Luke's Sub Acute Cure	1652 Mono Ave.	San Leandro

Table 8.9-2. Top ten Bay Area TACs.

TAC	Year 2000 tons/yr	1990-1999 Data Averages	
		Concentration	Risk per Million
Acetaldehyde	363	1.00 ppb	4.9
Benzene	890	1.18 ppb	109.2
1,3 Butadiene	141	0.24 ppb	91.3
Carbon tetrachloride	<.01	0.11 ppb	28.8
Chromium 6	0.019	0.17 ng/m3	25.2
Para-Dichlorobenzene	66	0.11 ppb	7.2
Formaldehyde	798	1.80 ppb	13.4
Methylene Chloride	366	0.62 ppb	2.29
Perchloroethylene	371	0.13 ppb	5.29
Diesel PM	947	ND	ND

Temporary emissions from construction-related activities are discussed in Section 8.1. Ambient air modeling for PM_{10}, CO, SO_2 and NO_X was performed as described in Section 8.1. Construction-related emissions are temporary and localized, resulting in no long-term impacts to the public.

Small quantities of hazardous waste may be generated during the construction phase of the project. Hazardous waste management plans will be in place so the potential for public exposure is minimal. Refer to Section 8.14 (Waste Management) for more information. No acutely hazardous materials will be used or stored on-site during construction (see section 8.5, Hazardous Materials Handling). To ensure worker safety during construction, safe work practices will be followed (see Section 8.16, Worker Safety).

8.9.2.3 Operational Phase Impacts

Environmental consequences potentially associated with the project are potential human exposure to chemical substances emitted into the air. The human health risks potentially associated with these chemical substances were evaluated in a health risk assessment. The chemical substances potentially emitted to the air from the proposed facility include ammonia, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) from the combustion turbines, and metals from the cooling tower. These chemical substances are listed in Table 8.9-3.

Emissions of criteria pollutants will adhere to NAAQS or CAAQS as discussed in the Ambient Air Quality section (see Section 8.1.4). The proposed facility also will include emission control technologies necessary to meet the required emission standards specified for criteria pollutants under Bay Area Air Quality Management District (BAAQMD) rules. Offsets will be required for emissions of criteria pollutants that exceed specified thresholds, to assure that the project will not result in an increase in total emissions in the vicinity. Finally, air dispersion modeling results (presented in the Ambient Air Quality section, Section 8.1.5.1.2) show that emissions will not result in concentrations of criteria pollutants in air that exceed ambient air quality standards (either NAAQS or CAAQS). These standards are intended to protect the general public with a wide margin of safety. Therefore, the project is not anticipated to have a significant impact on public health from emissions of criteria pollutants.

Potential impacts associated with emissions of toxic pollutants to the air from the proposed facility were addressed in a health risk assessment, presented in Appendix 8.1D. The risk assessment was prepared using guidelines developed under the AB 2588 Air Toxics "Hot Spots" Information and Assessment Act (CAPCOA, 1993).

Table 8.9-3. Chemical substances potentially emitted to the air from RCEC.

Criteria Pollutants
Carbon monoxide
Oxides of nitrogen
Particulate matter
Oxides of sulfur
Volatile organic compounds
Noncriteria Pollutants (Toxic Pollutants)
Ammonia
Acetaldehyde
Acrolein
1,3-Butadiene
Benzene
Ethylbenzene
Formaldehyde
Hexane
Propylene
Propylene oxide
Toluene
Xylene
Polycyclic aromatic hydrocarbons (PAHs)
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Chrysene
Dibenz(a,h)anthracene
Indeno(1,2,3-cd)pyrene
Naphthalene
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Silver
Zinc

8.9.2.4 Public Health Impact Study Methods

Emissions of toxic pollutants potentially associated with the facility were estimated using emission factors approved by BAAQMD, CARB, and the U.S. Environmental Protection Agency (USEPA). Concentrations of these pollutants in air potentially associated with the emissions were estimated using dispersion modeling. Modeling allows the estimation of both short-term and long-term average concentrations in air for use in a risk assessment, accounting for site-specific terrain and meteorological conditions. Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of excess lifetime cancer risks (for carcinogenic substances), or comparison with reference exposure levels for noncancer health effects (for noncarcinogenic substances).

Health risks were evaluated for a hypothetical maximum exposed individual (MEI) located at the MIR (maximum impact receptor). The hypothetical MEI is an individual assumed to be located at the point (MIR) where the highest concentrations of air pollutants associated with facility emissions are predicted to occur, based on air dispersion modeling. Human health risks associated with emissions from the proposed facility are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely that there would be significant impacts in any location in the vicinity of the facility.

Health risks potentially associated with concentrations of carcinogenic pollutants in air were calculated as estimated excess lifetime cancer risks. The excess lifetime cancer risk for a pollutant is estimated as the product of the concentration in air and a unit risk value. The unit risk value is defined as the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 $\mu g/m^3$ over a 70-year lifetime. In other words, it represents the increased cancer risk associated with continuous exposure to a concentration in air over a 70-year lifetime. Evaluation of potential noncancer health effects from exposure to short-term and long-term concentrations in air was performed by comparing modeled concentrations in air with the RELs. An REL is a concentration in air at or below which no adverse health effects are anticipated. RELs are based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential noncancer effects were evaluated by calculating a ratio of the modeled concentration in air and the REL. This ratio is referred to as a hazard quotient. The unit risk values and RELs used to characterize health risks associated with modeled concentrations in air were obtained from the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (CARB, 9/2000), and are presented in Table 8.9-4.

8.9.2.5 Characterization of Risks from Toxic Air Pollutants

The excess lifetime cancer risk associated with concentrations in air estimated for the MIR location is estimated to be 0.174×10^{-6}. Excess lifetime cancer risks less than 1×10^{-6} are unlikely to represent significant public health impacts that require additional controls of facility emissions. Risks higher than 1×10^{-6} may or may not be of concern, depending upon several factors. These include the conservatism of assumptions used in risk estimation, size of the potentially exposed population and toxicity of the risk-driving chemicals. Risks associated with pollutants potentially emitted from the facility are presented by exposure pathway in Table 8.9-5. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 8.1D. As described previously, human health risks associated with emissions from the proposed facility are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely that there would be significant impacts in any other location in the vicinity of the facility.

Cancer risks potentially associated with facility emissions also were assessed in terms of cancer burden. Cancer burden is a hypothetical upper-bound estimate of the additional number of cancer cases that could be associated with emissions from the facility. Cancer burden is calculated as the product of excess lifetime cancer risk and the number of individuals at that risk level. A worst-case estimate of cancer burden was calculated based upon the following assumptions.

The MIR concentration was applied to all affected portions of identified census tracts within the 6 mile radius area of the site. A detailed listing and map of affected census tracts and adjusted 1999 population estimates are provided in Appendix 8.1D. Figure 8.10-1 also shows the census tract locations. This procedure results in a conservatively high estimate of cancer burden.

As described previously, human health risks associated with emissions from the proposed facility are unlikely to be higher at any other location than at the location of the MIR. Therefore, the risks for all of these individuals would be lower (and in most cases, substantially lower) than 0.174 x 10^{-6}. The estimated cancer burden was 0.043, indicating that emissions from the facility would not be associated with any increase in cancer cases in the previously defined population. As stated previously, the methods used in this calculation considerably overstate the potential cancer burden, further suggesting that facility emissions are unlikely to represent a significant public health impact in terms of cancer risk.

Table 8.9-4. Toxicity values used to characterize health risks.

Compound	Unit Risk Factor $(\mu g/m^3)^{-1}$	Chronic Reference Exposure Level $(\mu g/m^3)$	Acute Reference Exposure Level $(\mu g/m^3)$
Acetaldehyde	2.7E-06	9.00E+00	--
Acrolein	--	2.00E-02	1.90E-01
Ammonia	--	2.00E+02	3.2E+03
Arsenic	3.3E-03	5.10E-01	1.9E-01
Benzene	2.9E-05	6.0E+01	1.3E+03
1,3-Butadiene	1.7E-04	--	--
Cadmium	4.2E-03	3.50E+00	--
Chromium	1.5E-01	2.00E-03	--
Copper	--	2.40E+00	1.0E+02
Ethylbenzene	--	2.0E+03	--
Formaldehyde	6.0E-06	3.0E+00	9.4E+01
Hexane	--	--	--
Lead	1.2E-05	--	--
Mercury(inorganic)	--	9.0E-02	1.8E+00
Naphthalene	--	9.0E+00	--
Nickel	2.6E-04	5.0E-02	6.0E+00
Polycyclic aromatic hydrocarbons	5.6E-03	--	--
Propylene	--	3.0E+03	--
Propylene oxide	3.7E-06	3.00E+01	3.1E+03
Silver	--	--	--
Toluene	--	3.00E+02	3.7E+04
Xylene	--	7.00E+02	2.2E+04
Zinc	--	3.50E+01	--

Source: CARB/OEHHA, 9-26-2000

Table 8.9-5 Summary of excess lifetime cancer risks for the Maximum Impact Receptor.

	Increased Lifetime Cancer Risk by Exposure Pathway				
Emission Source	**Inhalation of Ambient Air**	**Soil Ingestion**	**Dermal Contact with Soil**	**Ingestion of Garden Fruits and Vegetables**	**Infant Ingestion of Mother's Milk**
Total Pathway Risk (Combustion Sources[a] and Cooling Tower)	5.74E-08	2.88E-08	1.83E-08	6.99E-08	0.0E-08
Total Risk	0.174 in one million (70 year exposure)				

Note: [a]Combustion sources include turbines and duct burners.

The chronic noncancer hazard quotients associated with concentrations in air estimated for the MIR location were well below one for all target organs. A noncancer hazard quotient less than one is unlikely to represent a significant impact to public health. Chronic noncancer hazard quotients associated with inhalation of pollutants potentially emitted from the facility are presented in Table 8.9-6. The chemicals providing the largest contribution to noncancer risks associated with facility emissions are acrolein and ammonia, from combustion sources. The chronic noncancer hazard indices associated with non-inhalation exposure pathways are well below one for all target organs. Chronic noncancer hazard indices for non-inhalation exposure pathways are presented in Table 8.9-7. A noncancer reference exposure level (REL) is not available for lead. However, lead exposures are well below typical estimates of average daily exposures estimated for lead (ATSDR, 1996).

Table 8.9-6 Summary of chronic noncancer hazard quotients (inhalation exposure pathway) for the Maximum Impact Receptor.

	Target Organ[a]							
Emission Source	**Resp**	**CV/BL**	**CNS**	**Skin**	**Repro**	**Kidn**	**GI/LV**	**Immun**
Combustion Sources[b] and Cooling Tower	0.0107	<0.0001	<0.0001	0.0095	<0.0001	<0.0001	<0.0001	--
Total, All Pathways	<0.0216							

Notes:
[a]Resp = respiratory
[b]Combustion sources include turbines and duct burners
CV/BL = cardiovascular/blood, CNS = central nervous system, Repro = reproductive system, Kidn = renal system, GI/LV = gastrointestinal/liver, Immun = immunological system

Table 8.9-7. Summary of chronic noncancer hazard quotients (non-inhalation exposure pathway) for the Maximum Impact Receptor.

Chemical	Total Dose from Non-Inhalation Exposure Pathways (mg/kg-d) Combustion Sources and Cooling Tower	REL[a] (mg/kg-d)	Hazard Quotient (Total Dose/REL)
Naphthalene	3.35E-08	--	--
PAH	9.75E-09	--	--

Notes:
[a]REL - noncancer Reference Exposure Level

The acute noncancer hazard quotients associated with concentrations in air are shown in Table 8.9-8. The noncancer hazard quotients for all target organs fall below one. The chemicals providing the largest contribution to acute noncancer health risks are ammonia and acrolein. As described previously, a hazard quotient less than one is unlikely to represent significant impact to public health. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 8.1C. As described previously, human health risks associated with emissions from the proposed facility are unlikely to be higher at any other location than at the location of the MIR. If there is no significant impact associated with concentrations in air at the MIR location, it is unlikely that there would be significant impacts in any other location in the vicinity of the facility.

Table 8.9-8. Summary of acute noncancer hazard quotients for the Maximum Impact Receptor.

Emission Source	Target Organ[a]							
	Resp	CV/BL	CNS	Eye	Repro	Kidn	GI/LV	Immun
Combustion Sources[b] and Cooling Tower	0.1207	<0.0001	<0.0001	0.1207	<0.0001	--	--	0.0038
Total Acute Hazard Quotient	<0.246							

Notes:
[a]Resp = respiratory
[b]Combustion sources include turbines HRSG ducts burner, Diesel fire pump, and emergency generator
CV/BL = cardiovascular/blood, CNS = central nervous system, Repro = reproductive system, Kidn = renal system
GI/LV = gastrointestinal/liver, Immun = immunological system

The estimates of excess lifetime cancer risks and noncancer risks associated with chronic or acute exposures fall below thresholds used for regulating emissions of toxic pollutants to the air. Historically, exposure to any level of a carcinogen has been considered to have a finite risk of inducing cancer. In other words, there is no threshold for carcinogenicity. Since risks at low levels of exposure cannot be quantified directly by either animal or epidemiological studies, mathematical models have used to extrapolate from high to low doses. This modeling procedure is designed to provide a highly conservative estimate of cancer risks based on the most sensitive species of laboratory animal for extrapolation to humans (i.e., the assumption being that man is as sensitive as the most sensitive animal species). Therefore, the true risk is not likely to be higher than risks estimated using unit risk factors and is most likely lower, and could even be zero (USEPA, 1986; USEPA, 1996).

An excess lifetime cancer risk of 1 x 10^{-6} is typically used as a threshold of significance for potential exposure to carcinogenic substances in air. The excess cancer risk level of 1 x 10^{-6}, which has historically been judged to be an acceptable risk, originates from efforts by the Food and Drug Administration (FDA) to use quantitative risk assessment for regulating carcinogens in food additives in light of the zero tolerance provision of the Delany Amendment (Hutt, 1985). The associated dose, known as a "virtually safe dose" (VSD) has become a standard used by many policy makers and the lay public for evaluating cancer risks. However, a recent study of regulatory actions pertaining to carcinogens found that an acceptable risk level can often be determined on a case-by-case basis. This analysis of 132 regulatory decisions, found that regulatory action was not taken to control estimated risks below 1 x 10^{-6} (one-in-one million), which are called *de minimis* risks. *De minimis* risks are historically considered risks of no regulatory concern. Chemical exposures with risks above 4 x 10^{-3} (four-in-ten thousand), called *de manifestis* risks, were consistently regulated. *De manifestis* risks are typically risks of regulatory concern. The risks falling between these two extremes were regulated in some cases, but not in others (Travis et al, 1987).

The estimated lifetime cancer risks to the maximally exposed individual located at the MIR are less than 1 x 10^{-6}, and the aggregated cancer burden associated this risk level is less than one excess cancer case. These risk estimates were calculated using assumptions that are highly health conservative. Evaluation of the risks associated with the facility emissions should consider that the conservatism in the assumptions and methods used in risk estimation considerably overstate the risks from facility emissions. Based on the results of this risk assessment, there are no significant public health impacts anticipated from emissions of toxic pollutant to the air from the proposed facility.

8.9.2.6 Hazardous Materials

Hazardous materials will be used and stored at the facility. The hazardous materials stored in significant quantities on-site and descriptions of their uses are presented in Section 8.5. Use of chemicals at the proposed facility will be in accordance with standard practices for storage and management of hazardous materials. Normal use of hazardous materials, therefore, will not pose significant impacts to public health. While mitigation measures will be in place to prevent releases, accidental releases that migrate offsite could result in potential impacts to the public.

The California Health and Safety Code Sections 25531 to 25541 and Code of Federal Regulations (CFR) Title 40 Part 68 under the Clean Air Act establish emergency response planning requirements for acutely hazardous materials. These regulations require preparation of a Risk Management Plan (RMP), which is a comprehensive program to identify hazards and predict the areas that may be affected by a release of an acutely hazardous material (AHM). AHMs to be used at the facility include aqueous ammonia and cyclohexylamine, as discussed in Section 8.5.

An offsite consequence analysis was performed to assess potential risks to humans offsite if a spill or rupture of the aqueous ammonia storage tank were to occur; results of this analysis are presented in Section 8.5.

8.9.2.7 Operation Odors

Small amounts of ammonia used to control oxides of nitrogen (NO_x) emissions may escape up the exhaust stack but would not produce objectionable odors. The expected exhaust gas ammonia concentration, known as ammonia "slip," will be less than 5 parts per million (ppm). After mixing with the atmosphere, the concentration at ground level will be far below the detectable odor threshold of 5 ppm that the Compressed Gas Association has determined to be acceptable. Therefore, potential ammonia emissions are not expected to create objectionable odors. Other combustion contaminants are not present at concentrations that could produce objectionable odors.

8.9.2.8 Electromagnetic Field Exposure

Because the electric transmission line does not travel through residential areas, and based on recent findings of the National Institute of Environmental Health Sciences (NIEHS 1999), electromagnetic field exposures are not expected to result in a significant impact on public health. The NIEH report to the U.S. Congress found that "the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm (NIEH 1999)."

8.9.2.9 Summary of Impacts

Results from an air toxics risk assessment based on emissions modeling indicate that there will be no significant incremental public health risks from construction or operation of the proposed project. Results from criteria pollutant modeling for routine operations indicate that potential ambient concentrations of NO_2, CO, SO_2, and PM_{10} will not significantly impact air quality (Section 8.1). Potential concentrations are below the federal and California standards established to protect public health, including the more sensitive members of the population.

8.9.3 Cumulative Impacts

The health risk assessment for the proposed project indicates that the maximum cancer risk will be approximately 0.174 in one million (verses a significance threshold of 1.0 in one million) at the point of maximum exposure to air toxics from power plant emissions. This risk level is considered to be insignificant. Non-cancer chronic and acute effects will also be less than significant.

8.9.4 Mitigation Measures

8.9.4.1 Criteria Pollutants

Emissions of criteria pollutants will be minimized by applying Best Available Control Technology (BACT) to the facility. BACT for the combustion turbine includes the combustion of natural gas.

The proposed project location is in an area that is designated by the state as nonattainment for ozone and particulate matter (PM). Therefore, all increases in emissions of NO_x, volatile organic compound (VOC), particulate matter with an aerodynamic diameter less than a nominal 10 micrometers (PM_{10}), and sulfur oxides (SO_x) must be fully offset if emissions exceed specified trigger limits. The combination of using BACT and providing emission offsets as needed will result in no net increase in criteria pollutants. Therefore, further mitigation of emissions are not required to protect public health.

8.9.4.2 Toxic Pollutants

Emissions of toxic pollutants to the air will be minimized through the use of natural gas as the only fuel at the proposed facility. Emissions from tanks storing liquid organic chemicals will be minimized through the use of one or a combination of the following:

- Use of small capacity fixed roof tanks
- Use of low vapor pressure organic substances

- Use of exempt compounds
- Use of vapor balance and/or vapor recovery systems on a case-by-case basis as deemed appropriate

8.9.4.3 Hazardous Materials

Mitigation measures for hazardous materials are presented below and discussed in more detail in Section 8.5. Potential public health impacts from the use of hazardous materials are only expected to occur as a result of an accidental release. The plant has many safety features designed to prevent and minimize impacts from the use and accidental release of hazardous materials. The RCEC plant site will include the following design features:

- Curbs, berms, and/or concrete pits will be provided where accidental release of chemicals may occur.
- A fire protection system will be included to detect, alarm, and suppress a fire, in accordance with the applicable laws, ordinances, regulations, and standards (LORS).
- Construction of the aqueous ammonia storage system will be in accordance with applicable LORS.

A Risk Management Plan (RMP) for the RCEC facility will be prepared prior to commencement of facility operations. The RMP will estimate the risk presented by handling ammonia at the facility. The RMP will include a hazard analysis, off-site consequence analysis, seismic assessment, emergency response plan, and training procedures. The RMP process will accurately identify and propose adequate mitigation measures to reduce the risk to the lowest possible level.

A safety program will be implemented and will include safety training programs for contractors and operations personnel, including instructions on: 1) the proper use of personal protective equipment, 2) safety operating procedures, 3) fire safety, and 4) emergency response actions. The safety program will also include programs on safely operating and maintaining systems that use hazardous materials. Emergency procedures for RCEC personnel include power plant evacuation, hazardous material spill cleanup, fire prevention, and emergency response.

Areas subject to potential leaks of hazardous materials will be paved and bermed. Incompatible materials will be stored in separate containment areas. Containment areas will be drained to either an oily waste collection sump or to the wastewater neutralization tank. Also, piping and tanks exposed to potential traffic hazards will be additionally protected by traffic barriers.

8.9.5 Laws, Ordinances, Regulations, and Standards

An overview of the regulatory process for public health issues is presented in this section. The relevant LORS that affect public health and are applicable to this project are identified in Table 8.9-9. Table 8.9-10 also summarizes the primary agencies responsible for public health, as well as the general category of the public health concern regulated by each of these agencies. The conformity of the project to each of the LORS applicable to public health is also presented in this table, as well as references to the selection locations within this report where each of these issues is addressed. Points of contact with the primary agencies responsible for public health are identified in Table 8.9-10.

Table 8.9-9. Summary of primary regulatory jurisdiction for public health.

LORS	Public Health Concern	Primary Regulatory Agency	Project Conformance
Clean Air Act	Public exposure to air pollutants	USEPA Region IX CARB BAAQMD	Based on results of risk assessment as per CAPCOA guidelines, toxic contaminants do not exceed acceptable levels. (see Section 8.6.2.2) Emissions of criteria pollutants will be minimized by applying BACT to the facility. Increases in emissions of criteria pollutants will be fully offset. (Section 8.6.3.1)
Health and Safety Code 25249.5 *et seq.* (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Public exposure to chemicals known to cause cancer or reproductive toxicity	Office of Environmental Health and Hazard Assessment (OEHHA)	Based on results of risk assessment as per CAPCOA guidelines, toxic contaminants do not exceed thresholds that require exposure warnings. (see Section 8.6.2.2)
40 CFR Part 68 (Risk Management Plan)	Public exposure to acutely hazardous materials	USEPA Region IX Alameda County Office of Emergency Services (OES) City of Hayward Fire Department	A vulnerability analysis will be performed to assess potential risks from a spill or rupture of the aqueous ammonia storage tank. (See Section 8.6.2.3) An RMP will be prepared prior to commencement of facility operations. (See Section 8.6.3.3)
Health and Safety Code Sections 25531 to 25541	Public exposure to acutely hazardous materials	Alameda County Office of Emergency Services (OES) CARB BAAQMD	A vulnerability analysis will be performed to assess potential risks from a spill or rupture of the aqueous ammonia storage tank. (See Section 8.6.2.3)
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Public exposure to toxic air contaminants	CARB BAAQMD	Based on results of risk assessment as per CAPCOA guidelines, toxic contaminants do not exceed acceptable levels. (see Section 8.6.2.2)

Table 8.9-10. Summary of agency contacts for public health.

LORS	Public Health Concern	Primary Regulatory Agency	Regulatory Contact
Clean Air Act	Public exposure to air pollutants	USEPA Region IX CARB BAAQMD	David Howekamp, (916) 744-1219 Ray Menebroker, (916) 322-6026 William deBoisblanc, (415) 744-1254
Health and Safety Code 25249.5 *et seq.* (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Public exposure to chemicals known to cause cancer or reproductive toxicity	Office of Environmental Health and Hazard Assessment (OEHHA)	Cynthia Oshita or Susan Long, (916) 445-6900
40 CFR Part 68 (Risk Management Plan)	Public exposure to acutely hazardous materials	USEPA Region IX" Alameda County Office of Emergency Services (OES) City of Hayward Fire Department	David Howekamp, (916) 744-1219 Mark Blanchard, (510) 618-3490 Hugh Murphy, (510) 583-4924

Table 8.9-10. (continued)

LORS	Public Health Concern	Primary Regulatory Agency	Regulatory Contact
Health and Safety Code Sections 25531 to 25541	Public exposure to acutely hazardous materials	Alameda County Office of Emergency Services (OES)	Mark Blanchard, (510) 618-3490
		BAAQMD	William deBoisblanc, (415) 744-1254
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Public exposure to toxic air contaminants	CARB	Ray Menebroker, (916) 322-6026
		BAAQMD	William deBoisblanc, (415) 744-1254

8.9.6 Permits Required and Schedule

Agency-required permits related to public health include a Risk Management Plan and Bay Area Air Quality Management District Authority to Construct/Permit to Operate. These requirements are discussed in detail in Sections 8.5 (Hazardous Materials Handling) and 8.1 (Air Quality), respectively

8.9.7 References

ATSDR. 1996. *Toxicological Profile for Lead. Update.* Agency for Toxic Substances and Disease Registry.

CAPCOA. 1993. *Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines.* California Air Pollution Control Officers Association. October 1993.

California Air Resources Board (CARB). 2000. Consolidated table of OEHHA/ARB approved risk assessment health values. (http://arbis.arb.ca.gov/toxics/healthval/contable.pdf)

Hutt. P.B. 1985. Use of quantitative risk assessment in regulatory decision making under federal health and safety statutes, in *Risk Quantitation and Regulatory Policy.* Eds. D.G. Hoel, R.A. Merrill and F.P. Perera. Banbury Report 19, Cold Springs Harbor Laboratory.

National Institute of Environmental Health Sciences. 1999. Environmental Health Institute report concludes evidence is 'weak' that EMFs cause cancer. Press release. National Institute of Environmental Health Sciences, National Institutes of Health.

Travis, C.C., E.A.C. Crouch, R. Wilson and E.D. Klema. 1987. Cancer risk management: a review of 132 federal regulatory cases. Environ. Sci. Technol. 21:415-420.

U.S. Environmental Protection Agency (USEPA). 1986. Guidelines for carcinogen risk assessment. Federal Register. 51:33992. September 24, 1986.

USEPA. 1996. *Proposed Guidelines for Carcinogen Risk Assessment.* Office of Health and Environmental Assessment. EPA/600/P-92/003C. April 1996.

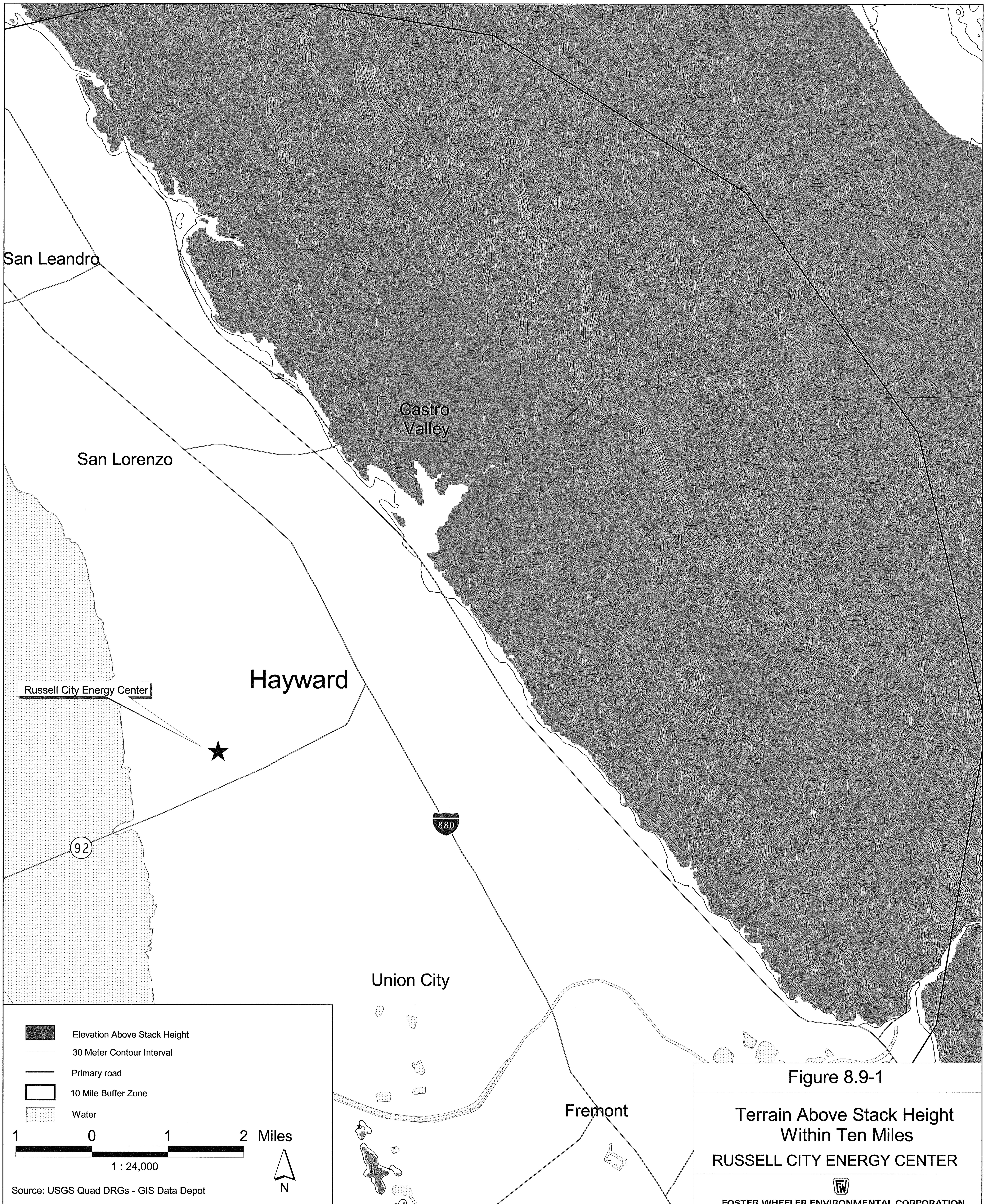

Figure 8.9-1

Terrain Above Stack Height Within Ten Miles

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

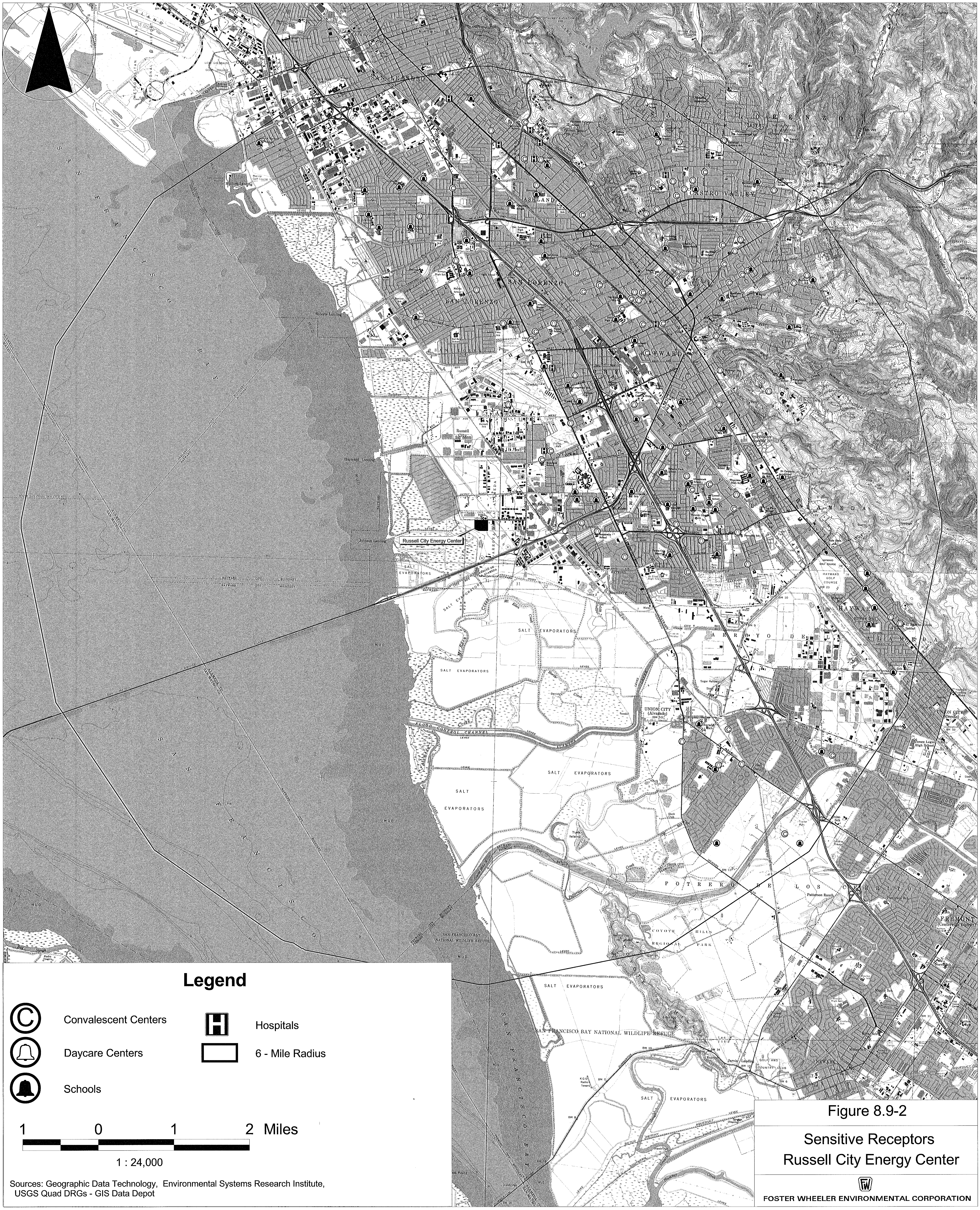

Figure 8.9-2

Sensitive Receptors
Russell City Energy Center

FOSTER WHEELER ENVIRONMENTAL CORPORATION

8.10 SOCIOECONOMICS

This section presents a discussion of the environmental setting, environmental consequences and impacts, and mitigation measures associated with the socioeconomic conditions of the Russell City Energy Center (RCEC) and the Advanced Wastewater Treatment (AWT) plant. Section 8.10.1 discusses the affected environment with respect to socioeconomic conditions. For purposes of this socioeconomic evaluation, the area that will be most affected, and thus analyzed, is the City of Hayward. In addition, some analyses include adjacent cities and Alameda County as a whole. The socioeconomic issues relevant to the existing environment include population, housing, employment and economic base, education, public services and utilities, and fiscal resources. Section 8.10.2 discusses regional and local impacts that arise from both power plant construction and operation. Section 8.10.3 evaluates any cumulative impacts to socioeconomics, including potential environmental justice issues in the project vicinity. Section 8.10.4 includes proposed mitigation measures. Section 8.10.5 presents applicable laws, ordinances, regulations, and standards (LORS). Section 8.10.6 references agency contacts; Section 8.10.7 presents permit requirements and schedules; and Section 8.10.8 contains references.

8.10.1 Affected Environment

The RCEC and AWT plant site, electrical transmission line, natural gas pipeline, and water supply and wastewater return pipelines are located in the City of Hayward, Alameda County. Specifically, the RCEC project site is located on approximately 14.7 acres on Enterprise Avenue across from the City of Hayward Water Pollution Control Facility (WPCF). The site is located within the West Industrial Planning Area of Hayward's Industrial Corridor (see Land Use, Section 8.6). Industrial and urban facilities are the primary land uses in the immediate surrounding area, including paint polymer production, metal fabrication, large vehicle (bus) assembly, milk and soft drink processing and bottling, distribution, warehousing and shipping, automobile salvage, and a variety of light industrial uses. The closest residential neighborhoods are located 0.82 miles from the project site and are well buffered from the RCEC project area by the intervening industrial/urban land uses.

8.10.1.1 Population

The City of Hayward is located on the east shore of the San Francisco Bay, 25 miles southeast of San Francisco, in the western portion of Alameda County. Incorporated cities in Alameda County, ranked in order of 2000 population data, include Oakland, Hayward, Berkeley, San Leandro, Livermore, Alameda, Pleasanton, Dublin, Albany, Piedmont, and Emeryville (California Department of Finance [CDOF] 2000a).

Historical and projected population trends for the City of Hayward, Alameda County, and California are summarized in Table 8.10-1, based on Association of Bay Area Governments (ABAG) projects done in 1998. Over the past 10 years, the City of Hayward and surrounding areas have experienced steady increases in population growth. According to the ABAG projections, the 2000 Hayward population would be 129,610 as compared with a 1990 population of 111,300 (U.S. Census Bureau, CDOF 2000a). Actual U.S. Census Bureau data from the Year 2000, recently released, show a City of Hayward population of 140,030, eight percent more than expected. This is, in fact, more than projected for the year 2010 (Table 8.10-1). In Alameda County, population growth has been steady since 1980. County population in 2000 was 1,443,741 (U.S. Census Bureau, 2000 Census).

Table 8.10-1. Estimated population growth in Hayward, Alameda County, and California.

Location	1990[1]	2000[2]	2005	2010
Hayward	111,300	129,610	133,700[3]	136,200[3]
Alameda Co.	1,284,825	1,443,741	1,571,796[4]	1,654,485[4]
California	29,942,397	33,773,000	37,372,444[4]	39,957,616[4]

[1]CDOF 2000b City/County population estimates 1991-98 w/1990 census data.
[2]2000 population figures from City/County Population Estimates with Annual Percent Change, January 1, 2000 (CDOF 2000a).
[3]Population projections are from Projections 98 (ABAG 1997); County Population Projections with Race/Ethnic Detail (CDOF 1998a).
[4]CDOF 2000c County population projections with race/ethnic detail, estimated July 1, 1990-96 and projected 1990-2040.

The City's population is becoming more diverse in its racial and ethnic composition. The non-Hispanic white population decreased from 1990 to 2000, while the size of the City's other primary population groups, Hispanic, Black, and Asian, increased (Table 8.10-9).

8.10.1.2 Housing

Housing data for the project area indicate there is limited available housing. The January 1, 2000, housing stock figures for Hayward and Alameda County showed 44,991 and 536,495 dwelling units, respectively (CDOF 2000a). Vacancy rates for Hayward are also low, at 4.97 percent, which is slightly less than the county vacancy rate of 5.01 percent and regional (9 Bay Area counties) rate of 5.22 percent. Housing resources are summarized in Table 8.10-2.

Table 8.10-2. Housing resources in the project vicinity.

Location	Single Housing Units	Multiple Housing Units	Mobile Homes	Total Housing Units	Vacancy Rates
Hayward	25,316	17,309	2,286	44,991	4.97%
Alameda Co.	319,478	210,057	6,960	536,495	5.01%
Bay Region	1,578,701	917,436	61,228	2,557,365	5.22%

Source: CDOF 2000a

8.10.1.3 Employment and the Economy

In regional terms, the employment outlook in Alameda County is strong. Alameda ranks second among Bay Area counties in the projected number of jobs to be generated between 2000 to 2020 (220,000), contributing 23 percent of the region's job growth over that time period. Overall, Hayward should account for 10 percent of the total job growth within Alameda County with almost 22,000 new jobs to be created by the year 2020 (City of Hayward 2001). These projections are in direct contrast to the significant job losses resulting from federal military base closures that have taken place in the Bay Area since the early 1990s. The southern portion of the county, part of Silicon Valley, is recognized for its concentration of high technology industries, especially computer hardware manufacturing.

The manufacturing and services sectors are expected to experience the largest percentage growth of any sector in Alameda County between 2000 and 2020 (ABAG 1997). The City of Hayward is among the high growth cities of Alameda County, with estimated current total employment of 90,080. This figure is projected to grow to over 110,000 by the year 2020 (estimates based on place of employment) based on recent Association of Bay Area Government (ABAG) estimates.

Table 8.10-3 shows the labor force levels (2000) for the state of California, Alameda County, and the City of Hayward. The California Employment Development Department (CEDD) estimates the average labor force (the total number of employable persons) for Alameda County in 2000 to be 740,000 persons, with an average unemployment rate of 3.0 percent (CEDD 2000a). Currently, the City of Hayward has the same unemployment rate as the County as a whole (3.0 percent). In comparison, California has a substantially higher unemployment rate of 5.4 percent (CEDD 2000b). Labor force, employment, and unemployment figures use workforce information by place of residence.

Construction of the RCEC and AWT plant project will create a short-term demand (18- to 21-month construction period starting summer of 2002) for various construction trade and operations workers. In the construction industry, due to the variable nature and duration of projects, workers often commute considerable distances to reach potential job locations. Since workers may frequently move from one project site to another, permanent relocation for any given project is usually not a practical option. Some workers may temporarily relocate on a workweek basis. Since the region's construction labor force is fairly large, it is expected that the majority of the construction workers will commute daily for one hour or less each way to the job site.

Table 8.10-3. Employment statistics in the project area.

Area	Labor Force	Employment	Unemployment	Unemployment Rate (%)
Hayward[1]	64,790	62,640	1,940	3.0
Alameda County[1]	740,000	718,000	21,900	3.0
California[2]	16,703,100	15,802,200	900,900	5.4

[1]Labor force data for sub-county areas, source: CEDD 2000a
[2]Civilian labor force data, source: CEDD 2000b

The project labor supply would be drawn from approximately a 50-mile radius surrounding the project site, including the counties of Alameda, Santa Clara, Contra Costa, San Mateo, San Francisco, Santa Cruz, and San Joaquin. The construction and operations-related labor force in these counties is presented in Table 8.10-4. In general, construction-related labor for the year 2002/2003, when the RCEC construction will take place, is expected to be approximately 200,000 people.

It is difficult to determine how many people within each trade are unemployed, again due to the nature of these occupations. Construction workers with short-duration jobs are often continuously in transition between jobs.

8.10.1.4 Education

A single public school district, the Hayward Unified School District (HUSD), serves the project area. HUSD operates 33 schools, including 24 elementary schools, 5 middle schools, and 4 high schools. Total enrollment during the 1999-2000 school year was 23,773 students (California Department of Education [CDOE] 2000), up from 21,693 in 1996 (CDOE 1996). Given the fact that regional population and employment are both expected to increase, future enrollment is likely to continue to increase over the next several years. The current pupil-teacher ratio is 20:1 and there are 1,178 Full-Time-Equivalent (FTE) teachers working within the District. The Economic Development Element of the Hayward General Plan indicates that many of the schools in the HUSD have relatively high transience rates and many are close to physical capacity, particularly with a 21:1 student to teacher ratio. This is a slightly better student to teacher ratio of 20.4:1 for the state during the same school year.

Table 8.10-4. Potential labor force in the principal labor pool area.[1]

Occupational Title	Annual Averages[2] 1995	2002	Percentage Change
Construction:			
Boilermakers	120	100	-16.7
Bricklayers/Cement Masons	3,640	4,340	19.2
Carpenters	13,360	15,260	14.2
Electricians	9,020	10,440	15.7
Insulators	830	1,120	34.9
Ironworkers (structural metal workers)	310	350	12.9
Laborers	102,240	123,490	20.8
Millwrights	480	430	-10.4
Operating Engineers	2,600	3,130	20.4
Painters	5,920	7,080	19.6
Pipefitters/Sprinklerfitters	5,680	6,850	20.6
Sheetmetal Workers	3,590	3,870	7.8
Supervisors (construction)	5,690	6,650	16.9
Surveyors (including technicians)	1,610	1,590	-1.2
Truck Drivers	20,310	21,840	7.5
Welders	4,330	4,990	15.2
Total Construction:	**179,730**	**211,530**	**17.7**
Operations:			
Mechanical Engineers (incl. technicians)	7,240	9,190	26.9
Electrical Engineers (incl. technicians)	41,200	53,720	30.4
Plant and System Operators	5,600	5,710	2.0
Total Operations:	**54,040**	**68,620**	**27.0**

Source: California Employment Development Department, 1999

[1]The labor pool area here includes the counties of Alameda, Santa Clara, Contra Costa, San Mateo, San Francisco, Santa Cruz, and San Joaquin.

[2]Figures represent aggregated county-wide data from 1999

Other educational facilities affiliated with the District include the Adult Education Laurel Site in Castro Valley, the Sunset Community Center's Adult School in Hayward, the Helen Turner Children's Center in Hayward, and the English Language Center in Hayward. Colleges and Universities in the Hayward area include the California State University at Hayward, Chabot Community College in Hayward, the Hayward Adult School, Heald College's Hayward School of Business and Technology, and the Life Chiropractic West College, which is located in the Hayward Industrial Corridor.

8.10.1.5 Public Services

Law Enforcement

The principal agency responsible for providing law enforcement in the City of Hayward is the Hayward Police Department. The Hayward Police Department is located at 300 West Winton Avenue, east of I-880, approximately 2.4 miles from the project site. Police services are provided by 268 full-time officers in patrol, investigation, and administration (City of Hayward 2000).

The Alameda County Sheriff's Office provides additional law enforcement support throughout the county and is responsible for various tasks that include providing patrol and investigative services to the unincorporated areas of Alameda County. Since Hayward is an incorporated city, the Sheriff's Office does not have direct jurisdiction in most of the project vicinity. There are segments of land along Depot and Clawiter Roads (the Mount Eden Neighborhood) that are unincorporated County land. However, the Sheriff's Office does serve the county, including Hayward, as Coroner, Public Administrator, and Director of Emergency Services. In addition, it operates a full service criminalistics laboratory and two county jails (Santa Rita and North County Jail). The Sheriff's Office has a budget of approximately $135 million and employs over 1,400 persons, including over 800 sworn personnel (Alameda County Sheriff's Office 1999).

Fire Protection

Fire protection service for the City of Hayward is provided by the Hayward Fire Department, which has an ISO Fire Rating of 3. The Hayward Fire Department is served by 125 firefighters and officers, 11 civilian positions, 6 fire stations, 8 engine companies and 2 truck companies (City of Hayward 2000). The 6 fire stations are strategically located around the city so response times from these stations would be rapid. The closest fire station to the project site is the City of Hayward Fire Station No. 6, located approximately 2 miles from the site on West Winton Avenue.

Medical Facilities

The closest emergency medical facility to the project site is Kaiser Foundation Hospital, located in Hayward approximately 2 miles from the project site. In addition, St. Rose Hospital is located nearby, about 2.25 miles from the RCEC. These two hospitals provide a combined 399 beds along with specialized care and services (City of Hayward 2000). Other medical facilities in the project region include the Newark Health Center (Alameda County Health Care Services Agency) as well as numerous local private health care providers.

8.10.1.6 Utilities

Electricity and Gas

PG&E provides electrical and natural gas service to Hayward. There is a 115-kV utility corridor that runs north-south between PG&E's Eastshore and Grant substations. A PG&E 230-kV transmission line crosses the San Francisco Bay, paralleling the Hayward-San Mateo Bridge to also connect with the Eastshore Substation. This line continues eastward over the East Bay hills. All electrical transmission lines are above ground, while the distribution lines, which connect existing and new development, may be both above and underground.

A major PG&E natural gas distribution line, Line 153, runs northwest-southeast within the Hayward Industrial Corridor along the Union Pacific Railroad tracks, less than a mile east of the project site. All natural gas lines are underground. Local utility systems are currently functioning within capacity and are capable of expanding to meet demand.

Sewer

Regional sewer services are provided by the City of Hayward and the East Bay Municipal Utility District (EBMUD) (EBMUD 2000). The City of Hayward processes wastewater from within the city limits at the City's WPCF, located at 3700 Enterprise Avenue directly across the street from the RCEC site. This plant has a rated capacity of 16.5 mgd. Wastewater collection and treatment for the cities of Union City, Newark, and Fremont is provided by the Union Sanitary District (USD) through their 30-mgd capacity Alvarado Treatment Plan in Union City, approximately 3 miles south of Hayward. To the north of Hayward, the City of San Leandro provides wastewater treatment for its residences. The cities of Hayward and San Leandro and the USD are members of the East Bay Dischargers Authority (EBDA), which operates a permitted outfall for treated wastewater in the San Francisco Bay near the Oakland Airport.

EBMUD provides wastewater treatment (and water service) for parts of Alameda and Contra Costa counties, including unincorporated areas near Hayward, such as Castro Valley and San Lorenzo. The District serves approximately 600,000 people in an 83-square-mile service area. Service charges are based on the volume and quality of discharge.

Water

Regional water services are provided by the City of Hayward and EBMUD. The City of Hayward Public Works Department provides water to City residents. Hayward residents have access to a very high quality water supply, the source of which is the Hetch Hetchy reservoir in the Sierra Nevada Mountains within Yosemite National Park. Hayward has access to this water through the Hetch Hetchy aqueduct in perpetuity, by agreement with the City of San Francisco, which owns and operates the Hetch Hetchy system. Water system capacity is approximately 32 million gallons per day (mgd), while daily average consumption is 19 mgd.

The Alameda County Water District (ACWD) is responsible for the acquisition, distribution, and management of water supplies for cities of Fremont, Newark, and Union City. This service area is approximately 103 square miles in size, with an estimated 73,000 customers. ACWD currently delivers approximately 45 million gallons per day (mgd) of water to its customers (50,000 acre-feet per year). Water supplies obtained by ACWD are mostly from local groundwater pumping. This is supplemented, however, by imported water delivered via the South Bay Aqueduct and the Hetch Hetchy Aqueduct (ACWD 1998).

EBMUD provides water (and sewer services) for parts of eastern Alameda County near the project not served by ACWD or the City of Hayward, such as unincorporated communities and the City of San Leandro (EBMUD 2000). Approximately 1.2 million people are served by the system in a 325-square-mile service area. EBMUD draws approximately 90 percent of its water from the 577-square-mile protected watershed of the Mokelumne River, which collects Sierra Nevada snowmelt and flows into Pardee Reservoir in the Sierra foothills. The remaining 10 percent of the supply is obtained from local runoff to three East Bay reservoirs (EBMUD 2000). EBMUD has a maximum water supply capacity of 502 mgd and an average daily consumption of 304 mgd.

Telephone

Pacific Bell provides standard telephone service to the City of Hayward. In addition there are a number of telephone service providers specializing in high-speed fiber optic data and communications connections and wireless communications, providing service to the area (City of Hayward 2000).

8.10.1.7 Fiscal Resources

Property tax is a significant source of revenue for the City. The City's assessed valuation is $6,018,581,405. Property taxes are applied to the value of most secured and unsecured property in the county. Property tax collection is the responsibility of Alameda County. Once the county collects property tax, it redistributes a percentage back to the Cities. Under state law, Hayward receives somewhat less than 20 percent of the locally-generated property tax (City of Hayward 1998).

Another significant source of revenue is taxable retail sales, which generally represents about 41 percent of the City's total General Fund revenue (City of Hayward 1998). In 1995, this represented $2,001,862 (City of Hayward 2000).

8.10.2 Environmental Consequences

8.10.2.1 Potential Environmental Impacts

Many projects, such as power plants, have the potential to impact local socioeconomic resources like population, housing, employment, education (schools), public services and utilities, and fiscal resources. This section analyzes the impacts of the RCEC and AWT plant on each of these areas. Impacts have the potential to occur locally and/or regionally, although most impacts would be relatively localized. Local impacts were determined by comparing project demands with the socioeconomic resources of the Hayward area. Regional consequences compared demands with the resources of the county or larger region. Overall, it is anticipated that the proposed project will not have any significant adverse impacts on the socioeconomic environment of the local or regional area.

8.10.2.2 Significance Criteria

The criteria used in determining whether project-related socioeconomic impacts are significant are consistent with standard industry practice and California Code of Regulations Title 14, §15065. Project-related impacts are determined to be significant if they:

- Induce substantial growth or concentration of population, either directly or indirectly
- Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere
- Displace substantial numbers of people, necessitating the construction of housing elsewhere
- Disrupt or divide the physical arrangement of an established community
- Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the following: fire protection, police protection, schools, parks, or other public facilities.

Other impacts may be significant if they cause substantial change in community interaction patterns, social organizations, social structures, or social institutions; if they cause substantial conflict with community attitudes, values, or perceptions; or if they cause substantial inequities in the distribution of project cost and benefit.

8.10.2.3 Construction Phase Impacts

Construction Workforce

Actual construction will take place over approximately 18 to 21 months during the 2-year construction period, beginning in the summer of 2002. Primary trades in demand will include boilermakers, carpenters, electricians, ironworkers, laborers, millwrights, operators, pipefitters, and others, as presented in the Table 8.10-5, which shows total construction workforce for the RCEC and AWT plant. Total construction personnel requirements during the 18 to 21 months of construction will be approximately 6,396 person-months, or 535 person-years. Construction personnel requirements will peak at approximately 485 workers during month 15 of the construction period.

Construction Impacts on Population

Due to the small scale of the project, it is not likely that project construction would generate a significant increase in area population. Almost all of the construction workforce (277 workers on average, peaking to 485 in month 15) will be drawn from the principal labor pool (Alameda, Contra Costa, San Francisco, San Joaquin, San Mateo, Santa Clara, and Santa Cruz counties). The proximity of the project to the labor pool and the fact that individual work assignments typically last from several days to weeks suggests that there will be no permanent relocation of construction workers. Overall, there will be no significant construction-related impacts to local population conditions.

Construction Impacts on Housing

There will be no impact to local housing. As discussed above, there will be no permanent relocation of construction workers. However, there may be some temporary relocation that would impact local hotel/motel conditions. If necessary, there is adequate hotel/motel space available in Hayward and in close-by communities of San Leandro, Union City, San Lorenzo and Castro Valley (total number of rooms of 1,821) or in all of Alameda County (total number of rooms of 12,126) to accommodate workers who might choose to commute to the project site on a workweek basis. The average hotel/motel occupancy rate for the Oakland Metropolitan Statistical Area (MSA) which covers Alameda and Contra Costa Counties was 71.0 percent in the year 2000. Therefore, based on this figure, there would be 528 and 3,517 rooms available for rent in near-by communities and in the county, respectively. Thus, available hotel/motel space is more than sufficient to meet the construction workers needs (personal communication, Kathi Drewes, Director, Hotel Motel Association of California, 3/28/01).

Construction Impacts on Employment and the Economy

The project will provide short-term job opportunities for up to 277 construction workers on average. Construction personnel requirements would peak at 485 workers during the single most active month of construction. The average construction workforce of 277 workers represents a negligible percent (0.13 percent) of the 2002 projected construction labor pool of 211,530 (Table 8.10-4).

In 2000, the unemployment rates in both Hayward Alameda County were 3.0 percent. Both are significantly lower than California's civilian unemployment rate of 5.4 percent for the same time period.

Table 8.10-5. Construction personnel by month (months after Notice to Proceed) for the power plant and AWT plant, combined.

	Months After Notice To Proceed																								
Craft Mix	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**Total**
Boilermaker	-	-	-	8	16	24	36	45	48	48	48	48	48	48	45	40	30	16	8	4	2	-	-	-	562
Carpenter	2	12	24	40	40	40	40	33	22	22	22	22	22	22	22	22	22	22	18	9	3	-	-	-	481
Cement mason	-	1	4	5	5	7	7	9	9	6	5	5	4	4	-	-	-	-	-	-	-	-	-	-	71
Electricians	1	4	8	11	11	12	22	33	49	66	83	88	88	88	88	82	66	55	44	33	11	-	-	-	943
Iron worker	-	4	16	33	33	33	39	44	49	50	40	33	26	18	14	9	9	9	9	5	-	-	-	-	473
Labor	5	10	18	27	30	30	30	30	24	24	24	23	23	22	22	22	22	18	13	9	9	-	-	-	435
Millwright	-	-	-	-	-	3	13	26	33	33	33	27	26	26	22	18	13	9	7	4	4	-	-	-	297
Operator	3	5	9	11	14	16	16	16	16	16	14	14	14	14	14	11	11	9	7	4	2	-	-	-	236
Pipe fitter	2	12	18	18	16	20	24	33	49	77	112	121	121	121	121	121	110	88	66	33	13	-	-	-	1296
Teamster	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	-	-	-	35
Insulation worker	-	-	-	-	-	-	-	-	-	-	-	7	13	27	33	39	39	39	39	26	13	-	-	-	275
Painter	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	6	6	6	6	5	5	-	-	-	38
Sheet metal	-	-	-	-	-	-	-	-	-	-	-	5	13	27	39	39	39	39	37	37	25	-	-	-	300
Total craft manpower	15	50	99	155	167	187	229	271	301	344	383	396	401	420	422	410	368	311	255	170	88	-	-	-	5442
Field start-up staff	-	-	-	-	-	-	-	-	1	1	2	7	11	14	14	15	15	16	15	14	14	12	6	4	161
Field non-manual staff	7	14	20	27	33	40	43	46	49	50	50	50	50	50	49	49	46	40	33	22	13	6	4	2	793
On-site total	22	64	119	182	200	227	272	317	351	395	435	453	462	484	485	474	429	367	303	206	115	18	10	6	6396

Assuming that all of the construction workforce is derived from Alameda County alone, the addition of 485 temporary jobs would reduce the county's unemployment rate by only about 0.1 percent.

Overall, the proposed project will not have significant impacts in this area. It will not create excessive demand on construction trades and will help maintain the region's low unemployment rate.

Construction Impacts on Education

Construction of the proposed project will not cause significant impacts to population or housing in the City of Hayward, the Tri-Cities area to the south, or San Leandro-Oakland to the north. In fact, virtually the entire construction workforce is expected to commute to the project site, as opposed to relocating to the area. As a result, the construction of the RCEC and AWT plant will not create any significant adverse impacts to the local school system since there will likely be no new students entering the local school districts.

Construction Impacts on Public Services and Facilities

The construction of the proposed project will not cause significant demands on public services or facilities. During construction, the demand for public services such as police, fire, and medical facilities, are only needed in cases of emergency (i.e., construction accidents). Due to standard safety plans in effect at the project site (see Section 8.16, Worker Health and Safety), it is expected that these occurrences will be rare. Emergency services are all available within the City of Hayward, in close proximity to the project site.

Construction Impacts on Utilities

Construction of the proposed project will not cause significant demands to electricity and gas, sewer, water, or telephone service. All utilities are readily available from local utility providers.

Construction Impacts on Fiscal Resources

The total construction cost of the project is estimated to be between $300 and $400 million, of which $58.2 million will be paid out as wages and salaries, including benefits (estimated using $60.00/hr). Based on the multiplier effect, and applying the income multiplier of 1.59 (State of California, 1982), project construction would result in over $92 million in total income to the local community. According to the economic theory of the multiplier effect, every dollar spent on the project regionally, generates an additional 59 cents of income as a consequence of additional spending. The multiplier effect suggests that money circulating within an economy will lead to secondary employment and expenditures in local industries (e.g., retail, transportation, and entertainment).

Local products subject to County taxes will be purchased during the construction process. Property tax revenue, which reflects the value of the completed facility, will not be realized by local governments until after completion of construction. Unlike the property tax, sales tax revenue begins to flow when construction starts due to immediate purchases of goods and services. Five to ten million dollars of total local product purchases would be taxed during project construction.

The sales tax rate in Alameda County is 8.25 percent, distributed as follows: 6 percent state, 1.25 percent local government, 0.5 percent Alameda County Transportation Authority (ACTA), and 0.5 percent Bay Area Rapid Transit District (BART) (California Board of Equalization 1999). Therefore, the total tax revenue from the sale of local products as stated above would be in the range of $412,500 to $825,000 distributed as shown in Table 8.10-6.

Table 8.10-6. Alameda County sales tax rate and distribution.

Sales Tax Rate	Distribution – Percent	Distribution – Dollars
8.25% (county-wide)	State of California - 6.0%	$300,000 - $600,000
	Local (City/County) - 1.25%	$62,500 - $125,000
	ACTA - 0.5%	$25,000 - $50,000
	BART - 0.5%	$25,000 - $50,000
Totals	**8.25%**	**$412,599 - $825,000**

Source: California Board of Equalization, 1999

8.10.2.4 Operation Phase Impacts

Plant Operation Workforce

The RCEC and AWT plant are expected to begin commercial operation by the summer of 2004. Most of the on-site facility operators would commute from various locations in Alameda County itself and/or from one of the surrounding Bay area counties (Contra Costa, San Francisco, San Joaquin, San Mateo, Santa Clara, and Santa Cruz). The RCEC is expected to employ approximately 25 full-time employees with job classifications as shown in Table 8.10-7. The AWT will employ an additional 6 persons full time (3 persons in 2 shifts).

Table 8.10-7. Plant operation workforce.

Department	Personnel	Shift	Work days
Operations, plans	10 Operating Technicians		7 days a week
Maintenance, plans	5 Maintenance Technicians (2 mechanical, 1 electrical, and 2 instrumentation)	Standard 8-hour days	5 days a week (Maintenance Technicians will also work unscheduled days and hours as required)
Administration plans	5 Administrators (1 Operations Supervisor, 1 Maintenance Supervisor, 1 Plant Manager, 1 Plant Administrator and 1 Plant Engineer)	Standard 8-hour days	5 days a week with additional coverage as required
AWT	6 operating technicians	Rotating 12-hour shift, 2 operators per shift, plus 2 relief operators	7 days a week

Operation Impacts on Population

The proposed power plant is expected to employ approximately 25 people in full-time, on-site positions (Table 8.10-7). These employees would be drawn from the local and regional (Bay Area) labor force. Employees would not be expected to relocate, and as a result, there would be no significant impact on population due to plant operations. The AWT plant will employ approximately 6 people in full-time positions and would also have no significant impact on population due to plant operations.

Operation Impacts on Housing

Since there would be no expected increase in the local population resulting from facility operations, there would also be no anticipated significant impacts to local housing resources.

Operation Impacts on Employment and the Economy

As stated above, the project is expected to employ approximately 25 full-time positions. Although there will be a minor increase in employment due to the project, it will not have a significant impact on local employment rates. For the most part, non-technical positions will be filled from the local workforce, while the regional labor force will supply the more technical positions. There are a sufficient number of skilled employees in the region to meet the project's operations labor needs (Table 8.10-4). Although there will be a minor local increase in employment, the project will not make a significant impact on local employment rates. The average salary per operations employee is expected to be $50,000 per year, which corresponds to an average operations payroll of $1.3 million annually. The operations payroll will have a direct beneficial impact to the local economy through local spending patterns by the RCEC and AWT plant employees.

Operation Impacts on Education

There will be no significant impact to the local educational system from the operation of the RCEC and AWT plant since there will be no significant increase in local school district enrollment. However, Calpine/Bechtel will be required to pay a school impact fee based on the amount of inhabitable space constructed at the site. The current fee rate is $0.33 per square foot. Total inhabitable space at the RCEC will be approximately 28,500 square feet; therefore, the estimated school impact fee is $9,405. The AWT plant will be exempt from the school impact fee requirement because this facility will be deeded to the City of Hayward following construction. Calpine/Bechtel will be required to provide Hayward Unified School District with a letter documenting that the property will be deeded to the City following construction; Board of Education approval will be required (Lepore 2001).

Operation Impacts on Public Services

Operation of the proposed project will not cause significant demands on public services or facilities, although there is a potential for infrequent calls to the Hayward Fire Department in the event of an emergency. However, the Hayward Fire Department's ISO rating of 3 suggests that it will be able to sufficiently handle any increased activity resulting from the RCEC. In the event that emergency medical services are needed, Kaiser Foundation Hospital and St. Rose Hospital are both located close-by.

Operation Impacts on Utilities

Operation of the proposed project will not cause significant demands to electricity, water, sewer, or telephone service. These utilities are readily available from local utility providers. Natural gas will be used to fuel the electrical generation process. As a result, there will be demand for natural gas to operate the facility. PG&E has agreed to supply natural gas to the facility. The primary source of industrial makeup water will be tertiary-treated water from the AWT plant. The RCEC will also require potable water for domestic use and for fire fighting. The source for this water will be the City of Hayward.

Operation Impacts on Fiscal Resources

The RCEC will enhance fiscal resources through payment of property taxes, which are levied and collected annually by Alameda County at a rate of 1.1572 percent of property value. The RCEC's total value for property tax purposes has not been established. The derivation of this value is highly complex, incorporating a number of factors related to the anticipated revenue generating capability of the property over time including production capacity, amount and term of the income stream, allowance for relevant expenses, development and application of an appropriate discount rate in a discounted cash flow model, and an estimation of the present worth of the reversionary value at the end of the term.

A simple assessment using values of $300 to $400 million, based on Calpine/Bechtel's estimate of project value, suggests the total property tax obligation could range from $3.47 million to $4.63 million annually. The County would return a portion of this amount to the City of Hayward.

Environmental Justice

The purpose of Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations* (1994), is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and/or low-income communities. The Order requires that impacts on minority or low-income populations be taken into account when preparing environmental and socioeconomic analysis of projects or programs that are proposed, funded, or licensed by federal agencies.

Two documents provide some measure of guidance to agencies required to implement the Executive Order. The first document is the *Environmental Justice Guidance Under the National Policy Act*, published by the Council on Environmental Quality (CEQ). The second document, the EPA's *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis*, serves as a guidance for incorporating environmental justice goals into EPA's preparation of environmental impact statements under NEPA. These documents provide specific guidelines for determining whether there are any environmental justice issues associated with a proposed federal project. The RCEC will be in compliance with these Guidances and the Executive Order, because local minority and low-income populations will not be exposed to disproportionately high and adverse impacts from the project.

General Issues

The CEC has incorporated an environmental justice analysis as part of its power plant licensing process under the California Environmental Quality Act (CEQA). To prove a violation of civil rights, the government must demonstrate that a project would cause impacts that are "disproportionately high and adverse," either directly, indirectly, or cumulatively. To make a finding that disproportionately high and adverse effects would likely fall on the minority or low-income population, three conditions must be met simultaneously: 1) there must be a minority or low-income population in the impact zone; 2) a high and adverse impact must exist; and 3) the impact on the minority or low-income population must be disproportionately high and adverse.

Methodology

According to CEQ and EPA guidelines established to assist federal and state agencies for developing strategies to examine this circumstance, the first step in conducting an environmental justice analysis is to define minority and low-income populations. Based on these guidelines, a minority population is present in a project area if: a) the minority population of the affected area exceeds 50 percent, or b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. By the same rule, a low-income population exists if the project area is comprised of 50 percent or more people living below the poverty threshold, as defined by the U.S. Census Bureau, or is significantly greater than the poverty percentage of the general population or other appropriate unit of geographic analysis. The second step of an environmental justice analysis requires a finding of a high and adverse impact. The CEQ guidance indicates that when determining whether the effects are high and adverse, agencies are to consider whether the risks or rates of impact "are significant (as employed by NEPA) or above generally accepted norms." The final step requires a finding that the impact on the minority or low-income population be *disproportionately* high and adverse. While none of the Guidances define the term "disproportionately high and adverse," the CEQ Guidance includes a non-quantitative definition that states that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population.

The area of potential effect (APE) for the purposes of an environmental justice screening is the area approximately 6 miles from the project site. The CEC has used this distance in past projects to take into account potential air emissions effects. In order to use a comparable distance in this analysis, data from the U.S. Census Bureau, 2000 Census, for race and ethnic origin were obtained. As of the time of this printing, 2000 Census data for poverty status was not yet available from the U.S. Census Bureau. In addition, the 2000 Census data is not available by census tract for race and ethnic origin or poverty status. This information is expected to be available sometime in July 2001. For this reason, both 1990 and 2000 Census data are presented here. The 2000 data is presented for race and ethnic origin, for cities and unincorporated census places, and 1990 data is presented for census tracts, within a 6-mile radius (see Figure 8.10-1 in pocket). Figure 8.10-1 also shows Toxic Release Inventory System toxic release sites and AIRS Facility System air pollution point sources sites, as tracked by the EPA.

For the RCEC project, the 6-mile radius includes all or part of the cities of Hayward, Union City and San Leandro, as are the unincorporated areas of Ashland, Cherryland, Fairview, San Lorenzo and Castro Valley. For example, all of the densely developed portions of Hayward are within six miles of the project as well as all of the unincorporated community of San Lorenzo. Portions of Castro Valley, San Leandro, and Union City extend a mile or more beyond the six-mile radius. The city limits of Fremont extend into the radius, but it is mostly unpopulated areas along the bay margins that do so. These city and unincorporated community boundaries are an appropriate aggregation of demographic units with which to screen for potential environmental justice effects. All census tracts touching on the 6-mile radius were included in the analysis.

Results

As discussed above, to make a finding that disproportionately high and adverse effects would likely fall on the minority or low-income population, three conditions must be met simultaneously: 1) there must be a minority or low-income population in the impact zone; 2) a high and adverse impact must exist; and 3) the impact on the minority or low-income population must be disproportionately high and adverse.

Poverty Population—The six-mile radius near the project area does not contain a large low-income population. The percentage of individuals living below the poverty threshold ranges, based on 1990 census data by city or unincorporated place, is about 6.39 percent (2000 data is expected to become available in July 2001). This is well below the 50 percent criterion.

By 1990 census tract (Table 8.10-10), there are no tracts with a poverty population greater than 50 percent within 6 miles of the project. Of the 73 census tracts, only 15 have poverty populations greater than 10 percent. Two have poverty populations between 20 and 30 percent of the tract population. The tract with the highest poverty rate is Tract 4377, with 28.6 percent in poverty in 1990. Overall, the tract is at 47.9 percent of the median statewide income. Tract 4377 is located about 3 miles east of the RCEC. Therefore, the project would not cause a disproportionate high and adverse impact on low-income populations.

Minority Population—Minority (non-white) populations make up 68.7 percent of the combined populations of the cities of Hayward, Union City, San Leandro, and unincorporated communities (Census places) of San Lorenzo, Castro Valley, Ashland, Cherryland, and Fairview, based on 2000 Census data. Table 8.10-8 shows demographic data for these cites and unincorporated areas. This compares with a minority population for Alameda County of 59.1 percent and statewide of 53.3 percent (Table 8.10-9). The APE thus has a minority

Table 8.10-8. Race, Hispanic origin, and poverty statistics within six miles of the RCEC.

	Hayward		Union City		San Leandro		Unincorporated[1]		Combined	
	No.	Pct	No.	Pct	No.	Pct	No.	Pct	No.	Pct
a. Race and Hispanic origin (2000 census)										
White	40,896	29.2%	13,610	20.4%	33,646	42.3%	15,137	34.3%	103,289	31.3%
Hispanic origin	47,850	34.2%	16,020	24.0%	15,939	20.1%	13,960	31.7%	93,769	28.4%
Asian	26,189	18.7%	28,780	43.0%	18,064	22.7%	5,100	11.6%	78,133	23.6%
Black	14,846	10.6%	4,321	6.5%	7,622	9.6%	7,277	16.5%	34,066	10.3%
Hawaiian or Pac. Isl.	2,511	1.8%	577	0.9%	627	0.8%	453	1.0%	4,168	1.3%
Amerindian	570	0.4%	132	0.2%	360	0.5%	249	0.6%	1,311	0.4%
Other race	692	0.5%	203	0.3%	175	0.2%	116	0.3%	1,186	0.4%
Two or more races	6,476	4.6%	3,226	4.8%	3,019	3.8%	1,808	4.1%	14,529	4.4%
Total	140,030	100.0%	66,869	100.0%	79,452	100.0%	44,100	100.0%	330,451	100.0%
b. Poverty (1990 census)										
Above poverty level	100,858	90.5%	51,301	95.4%	64,343	95.0%	32,031	89.1%	248,533	92.4%
Below poverty*	10,640	9.5%	2,461	4.6%	3,375	5.0%	3,934	10.9%	20,410	7.6%
Total	111,498	100.0%	53,762	100.0%	67,718	100.0%	35,965	100.0%	268,943	100.0%

[1]Unincorporated Census places within 6 miles of the project include Castro Valley, San Lorenzo, Ashland, Cherryland, and Fairview.
*For persons whose poverty level has been determined.
Source: U.S. Census Bureau, 2000 census (race) and 1990 census (poverty). Note: 2000 poverty data not available at the time of this writing.

Table 8.10-9. Race and Hispanic origin, Alameda County and California.

	Alameda County		California	
	No.	Pct	No.	Pct
Race and Hispanic origin (2000 census)				
White	591,095	40.9%	15,816,790	46.7%
Hispanic origin	273,910	19.0%	10,966,556	32.4%
Asian	292,673	20.3%	3,648,860	10.8%
Black	211,124	14.6%	2,181,926	6.4%
Hawaiian or Pac. Isl.	8,458	0.6%	103,736	0.3%
Amerindian	5,306	0.4%	178,984	0.5%
Other race	4,676	0.3%	71,681	0.2%
Two or more races	56,499	3.9%	903,115	2.7%
Total	1,443,741	100.0%	33,871,648	100.0%

Table 8.10-10. Poverty and racial/ethnic group data by census tract, 6-mile radius, 1990 Census.

Census Tract #	Tract Population	Percent of Median Income*	Income Level	% Below Poverty Line	Racial or ethnic group: American Indian	Asian	Black	Hispanic	White	Other	Minority Population	Minority Percent
4304	2,008	119.0%	Middle	0.5%	20	151	0	213	1,624	0	384	19.1%
4305	4,807	100.5%	Middle	5.0%	5	461	339	658	3,339	5	1,468	30.5%
4306	5,070	117.0%	Middle	1.9%	23	418	107	393	4,129	0	941	18.6%
4307	3,721	110.2%	Middle	1.3%	4	280	61	269	3,095	12	626	16.8%
4308	4,865	83.6%	Middle	7.0%	0	295	83	371	4,116	0	749	15.4%
4309	3,884	79.0%	Moderate	6.9%	37	195	119	395	3,138	0	746	19.2%
4310	2,126	79.9%	Moderate	6.2%	26	150	76	254	1,612	8	514	24.2%
4311	2,999	73.6%	Moderate	4.5%	19	115	160	441	2,256	8	743	24.8%
4312	4,894	94.2%	Middle	5.3%	0	423	254	613	3,604	0	1,290	26.4%
4324	4,768	85.1%	Middle	3.9%	44	672	204	1,016	2,827	5	1,941	40.7%
4325	7,152	85.5%	Middle	5.7%	79	1,246	473	1,494	3,860	0	3,292	46.0%
4326	5,010	84.3%	Middle	4.9%	17	434	397	675	3,487	0	1,523	30.4%
4327	2,465	108.1%	Middle	3.8%	45	157	39	199	1,996	29	469	19.0%
4328	3,584	140.2%	Upper	7.9%	5	555	120	391	2,513	0	1,071	29.9%
4329	779	.	.	.	8	61	418	149	143	0	636	81.6%
4330	3,234	88.5%	Middle	5.8%	15	368	37	332	2,472	10	762	23.6%
4331	9,145	88.2%	Middle	4.5%	22	1,294	883	1,324	5,597	25	3,548	38.8%
4332	5,882	83.9%	Middle	8.4%	15	1,038	592	673	3,544	20	2,338	39.8%
4333	6,179	93.4%	Middle	2.8%	9	978	128	1,101	3,932	31	2,247	36.4%
4334	3,485	97.6%	Middle	2.8%	6	691	217	384	2,182	5	1,303	37.4%
4335	3,937	97.7%	Middle	3.1%	8	521	51	636	2,721	0	1,216	30.9%
4336	5,100	84.9%	Middle	5.8%	25	726	168	669	3,512	0	1,588	31.1%
4337	2,511	69.0%	Moderate	11.5%	39	187	153	449	1,683	0	828	33.0%
4338	5,348	79.5%	Moderate	4.4%	36	713	459	1,042	3,098	0	2,250	42.1%
4339	4,999	48.1%	Low	20.6%	83	568	1,199	991	2,151	7	2,848	57.0%
4340	3,857	58.9%	Moderate	11.0%	45	330	366	823	2,293	0	1,564	40.6%
4351.01	4,583	88.3%	Middle	9.5%	55	543	775	667	2,506	37	2,077	45.3%
4351.02	4,901	143.6%	Upper	4.1%	5	989	499	374	3,034	0	1,867	38.1%
4352	3,827	111.5%	Middle	6.5%	45	387	1,179	523	1,677	16	2,150	56.2%
4353	3,947	71.1%	Moderate	12.0%	80	204	573	452	2,629	9	1,318	33.4%
4354	3,264	67.0%	Moderate	14.4%	96	209	356	703	1,900	0	1,364	41.8%
4355	3,067	77.9%	Moderate	8.4%	38	105	240	610	2,074	0	993	32.4%
4356	7,699	62.1%	Moderate	13.7%	57	397	398	2,151	4,696	0	3,003	39.0%
4357	3,797	87.2%	Middle	8.8%	35	299	119	632	2,712	0	1,085	28.6%
4358	4,387	83.7%	Middle	5.2%	46	474	42	819	3,006	0	1,381	31.5%
4359	4,602	101.6%	Middle	2.5%	31	574	42	576	3,363	16	1,239	26.9%
4360	4,010	100.1%	Middle	3.8%	5	252	75	613	3,065	0	945	23.6%
4361	4,337	91.0%	Middle	4.4%	41	532	90	650	3,012	12	1,325	30.6%

Table 8.10-10. (Continued)

Census Tract #	Tract Population	Percent of Median Income*	Income Level	% Below Poverty Line	Racial or ethnic group						Minority Population	Minority Percent
					American Indian	Asian	Black	Hispanic	White	Other		
4362	2,636	66.9%	Moderate	11.7%	50	125	155	658	1,620	28	1,016	38.5%
4363	4,753	66.7%	Moderate	13.8%	49	358	216	1,973	2,124	33	2,629	55.3%
4364.01	6,555	93.9%	Middle	7.7%	43	443	560	901	4,608	0	1,947	29.7%
4364.02	2,911	142.9%	Upper	2.1%	0	272	198	216	2,225	0	686	23.6%
4365	3,716	80.8%	Middle	8.1%	20	263	365	857	2,211	0	1,505	40.5%
4366	8,755	62.7%	Moderate	16.8%	93	959	1,182	2,746	3,724	51	5,031	57.5%
4367	2,372	80.6%	Middle	8.7%	59	259	118	983	953	0	1,419	59.8%
4368	2,871	94.3%	Middle	9.0%	28	375	279	621	1,568	0	1,303	45.4%
4369	5,739	71.6%	Moderate	12.2%	0	613	411	2,258	2,452	5	3,287	57.3%
4370	2,968	101.7%	Middle	1.9%	30	439	153	475	1,871	0	1,097	37.0%
4371	7,833	92.2%	Middle	7.0%	25	2,173	877	1,505	3,241	12	4,592	58.6%
4372	5,066	103.0%	Middle	6.8%	16	1,238	346	705	2,748	13	2,318	45.8%
4373	2,948	81.3%	Middle	6.1%	22	582	300	583	1,455	6	1,493	50.6%
4374	2,968	90.8%	Middle	5.9%	78	352	90	771	1,677	0	1,291	43.5%
4375	4,065	70.1%	Moderate	13.4%	0	473	348	1,556	1,688	0	2,377	58.5%
4376	2,551	75.8%	Moderate	11.9%	6	427	196	498	1,424	0	1,127	44.2%
4377	7,464	46.9%	Low	28.6%	86	951	1,286	2,445	2,663	33	4,801	64.3%
4378	3,464	97.0%	Middle	5.3%	0	671	255	821	1,713	4	1,751	50.6%
4379	2,434	79.7%	Moderate	14.3%	0	271	197	652	1,307	7	1,127	46.3%
4380	2,842	93.3%	Middle	4.2%	0	202	117	429	2,094	0	748	26.3%
4381	5,198	92.4%	Middle	3.3%	49	411	245	.	3,155	.	2,043	39.3%
4382.01	3,848	76.5%	Moderate	8.3%	22	779	283	1,253	1,497	14	2,351	61.1%
4382.02	6,335	84.8%	Middle	6.2%	48	1,452	423	1,064	3,348	0	2,987	47.2%
4383	3,321	96.2%	Middle	4.0%	13	968	274	1,099	967	0	2,354	70.9%
4384	2,055	104.4%	Middle	3.7%	10	484	127	364	1,070	0	985	47.9%
4403.01	4,753	102.3%	Middle	3.5%	9	717	444	1,096	2,484	3	2,269	47.7%
4403.02	5,928	117.1%	Middle	1.7%	39	2,783	603	844	1,659	0	4,269	72.0%
4403.04	4,704	103.8%	Middle	9.7%	16	2,175	476	828	1,203	6	3,501	74.4%
4403.05	4,153	128.8%	Upper	2.3%	36	1,664	434	615	1,360	44	2,793	67.3%
4403.06	4,029	100.9%	Middle	11.7%	36	1,723	433	705	1,132	0	2,897	71.9%
4403.07	4,279	93.9%	Middle	5.0%	0	1,127	312	839	2,001	0	2,278	53.2%
4403.31	2,351	80.8%	Middle	7.1%	6	773	195	693	675	9	1,676	71.3%
4415.01	5,019	139.0%	Upper	1.6%	18	2,641	253	494	1,602	11	3,417	68.1%
4415.02	10,651	128.7%	Upper	3.7%	29	4,672	513	966	4,471	0	6,180	58.0%
4415.98	7,853	132.4%	Upper	1.6%	60	3,339	392	679	3,364	19	4,489	57.2%
Totals	323,618				2,165	55,146	24,547	57,394	181,95	537	141,666	43.8%

*Median tract income percent of statewide median income.

Source: U.S. Census Bureau, 1990 census.

population that is 9.6 percentage points higher than that of Alameda County and 15.4 percentage points higher than that of the State of California.

As discussed above, the first step in the three-part analysis of Environmental Justice is whether a minority population exists in the impact area. That question is answered in the affirmative. The analysis then considers the second and third questions in the three-pronged test. Is there a high and adverse impact? Is the impact on the minority population disproportionately high and adverse?

In this case, there are no high and adverse impacts associated with the RCEC project. Specifically, as discussed in Section 8 of the AFC, there are no significant, unmitigated environmental impacts associated with the RCEC project. For example, local and regional air quality impacts will be mitigated to a level of less than significant. With respect to local air quality effects, the RCEC project addressed those issues with three different types of analyses: 1) pollution control technologies, including the use of BACT, dry low-NOx combustors, SCR, and natural gas as the sole fuel source, 2) the air quality impacts analysis performed by the Applicant, and 3) preparation of a health risk assessment for the RCEC project. With respect to regional air quality impacts, the RCEC project's demonstration that there will be no significant impact is confirmed by the Applicant's regional air quality studies, including a cumulative impacts analysis regarding regional air quality and the provision of emission offset or emission reduction credits. As another example, the project would cause no significant impacts to endangered or threatened species. The project site contains 1.68 acres of seasonal wetlands. Calpine/Bechtel will obtain a permit under the Clean Water Act from the U.S. Army Corps of Engineers to fill these wetlands at the plant site. The permit application will include a plan to mitigate this potential impact to below significance level. Similarly, noise modeling was performed to confirm that the RCEC's contribution to cumulative noise will not cause the background level to be increased by more than 5 dBA (barely noticeable increase) at the nearest receptor and that the project will comply with the City of Hayward's property line noise limit of 75 dBA, L_{DN}.

As set forth in this AFC for each subject area, there are no unmitigated significant impacts associated with the RCEC project. Accordingly, since there are no high and adverse impacts associated with the project, there are no high and adverse impacts to fall disproportionately on minority populations.8.10.3 Cumulative Impacts

No significant adverse impacts to socioeconomic resources were identified; therefore, no cumulative impacts would result. Overall, the RCEC project will have a positive socioeconomic effect.

8.10.4 Proposed Mitigation Measures

No significant adverse impacts to socioeconomic resources were identified; therefore, no mitigation measures are proposed.

8.10.5 Applicable Laws, Ordinances, Regulations, and Standards (LORS)

All applicable LORS and their conformance measures are detailed in the text below. Table 8.10-10 summarizes this information.

8.10.5.1 Federal

None are applicable. The environmental justice issue, an issue of federal as well as state concern for any project, is addressed above in Section 8.10.2.

Table 8.10-10. Laws, Ordinances, Regulations and Standards.

LORS	Document and Section	Applicability	AFC Section Where Conformance is Discussed	Agency/Contact
Federal:				
	Environmental Justice	Nondiscrimination in siting or operating facilities	8.10.3	EPA Region 9 Romel Pasevak (415) 744-1212
State:				
General Plan	California Government Code, Section 65302	Requires each city/county to implement a General Plan	8.10.3.3 8.10.5.4	City of Hayward Comm. & Econ. Development Admin. Ms. Ann Bauman (510)583-4228
Local:				
School impact fees	Hayward Unified School District (HUSD)	School impact fees on new development in the City	8.10.5.3	Hayward Unified School District Interim Superintendent Cynthia LeBlanc (510) 784-2600
Other Agency Contacts:				
Hayward Police Department		Construction, safety & emergency response	8.10.1.5 8.10.2.3 8.10.2.4	Hayward Police Department Chief Craig Calhoun (510) 293-7272
Hayward Fire Department		Construction, safety & emergency response	8.10.1.5 8.10.2.3 8.10.2.4	Hayward Fire Department Chief Larry Arlsten (510) 583-4945
Alameda County Sheriffs Department		Construction, safety & emergency response	8.10.1.5	Alameda County Sheriffs Department Timothy P. Ostlund (510) 271-5198
Kaiser Foundation Hospital		Emergency response	8.10.1.5 8.10.2.3 8.10.2.4	Kaiser Foundation Hospital Operations Duayna Pucci (510) 784-4313
St. Rose Hospital		Emergency response	8.10.1.5 8.10.2.3 8.10.2.4	St. Rose Hospital V.P. Hospital Operations Bryan Daylor (510) 264-4005

Table 8.10-10. (Continued).

LORS	Document and Section	Applicability	AFC Section Where Conformance is Discussed	Agency/Contact
Alameda County Assessors Office		Tax revenues	8.10.2.3 8.10.2.4	Alameda County Assessors Office Dean Lewis (510) 272-3777
Alameda County Auditors Office		Tax revenues	8.10.2.3 8.10.2.4	Alameda County Auditors Office Patrick O'Connell (510) 272-6565

8.10.5.2 State

California State Planning Law, Government Code Sections 65302 et seq., requires that each city and county adopt a General Plan consisting of seven mandatory elements, to guide its physical development. Section 65302(c) requires a housing element and Section 65302(e) requires an open space element be included in the General Plan. Section 65303(a) provides that optional elements also may be included in the General Plan. The City of Hayward manages local development through the Hayward General Plan, which was created in 1986 and amended in 1998.

8.10.5.3 Local

The Economic Development Element of the Hayward General Plan identifies the current economic condition, constraints, and opportunities within the City of Hayward and establishes policies and strategies that:

- Support economic growth
- Maintain a healthy balance between economic growth and environmental quality
- Provide the necessary supports to businesses
- Eliminate cumbersome and unnecessary regulations
- Prevent the wasteful under-utilization of physical resources
- Encourage businesses that create permanent, higher wage jobs to locate and/or expand in Hayward
- Assist City residents to acquire skills so they may fill future jobs

The project will comply with these policies by slightly increasing employment; providing additional tax revenue; and maintaining the energy supplies in California required to support and maintain such objectives.

In addition, communities assess impact fees (e.g., school or transportation impact fees) as part of the building permit process. According to the Hayward General Plan, while Hayward does not have a Transportation Improvement Fee on new development projects, the Supplemental Building Construction and Improvement Tax (SBCIT) serves a similar purpose by generating General Fund revenue (City of Hayward 1998). The project will comply with this regulation by paying all applicable impact fees, including the SBCIT fees, as determined by the appropriate governing entity.

8.10.6 Involved Agencies and Agency Contacts

Table 8.10-10 includes a list of agencies and contact persons.

8.10.7 Permits Required and Schedule

No permits related to the socioeconomic aspects of the project are required.

8.10.8 References

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East Bay Municipal Utility District (EBMUD). 2000. EBMUD web site. Internet Site: www.ebmud.com/about/aboutmain.html

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U.S. Environmental Protection Agency (EPA). 1998. *Final guidance for incorporating environmental justice concerns in EPA's NEPA compliance analysis*. April, 1998.

U.S. Census Bureau. 2001. 1990 Census lookup. Selected tables. Internet Site: www.ffiec.gov

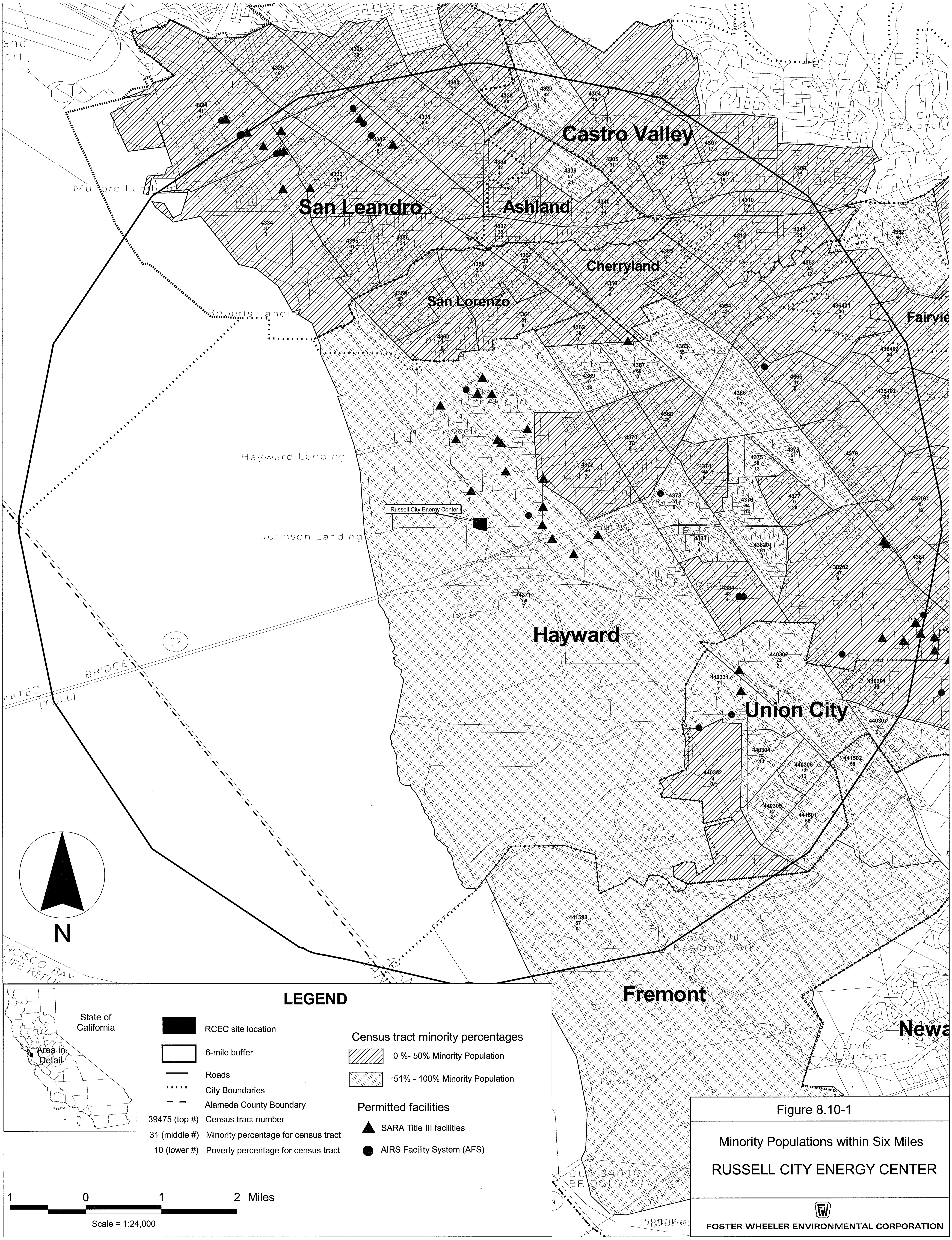

Figure 8.10-1

Minority Populations within Six Miles

RUSSELL CITY ENERGY CENTER

8.11 SOILS AND AGRICULTURE

This section presents an evaluation of the potential environmental effects from construction and operation of the proposed Russell City Energy Center (RCEC), Advanced Wastewater Treatment (AWT) Plant, and linear facilities on soils and agriculture. The RCEC will be located near San Francisco Bay in Hayward, California. Hayward is located in the western part of Alameda County. The impact assessment includes the approximate 14.7-acre site for the RCEC and AWT plant as well as the corridor for the 16-inch natural gas pipeline, the 230-kV electric transmission line, and the water supply and wastewater return pipelines.

Section 8.11.1 describes the existing environment that the project may affect. Section 8.11.2 identifies potential environmental impacts resulting from construction and operation of the RCEC and AWT plant. Section 8.11.3 discusses potential cumulative impacts, and Section 8.11.4 describes proposed mitigation measures. Section 8.11.5 addresses laws, ordinances, regulations, and standards (LORS) applicable to geological resources and hazards. Section 8.4.6 describes the agencies involved and provides agency contacts, and Section 8.4.7 describes the permits required and a schedule for obtaining such permits. Section 8.11.8 contains a list of references cited.

8.11.1 Affected Environment

The RCEC and AWT plant will be located on a 14.7-acre site at 3590 and 3636 Enterprise Avenue in the City of Hayward. The site consists of artificially drained soils formed from alluvium. This land is naturally high in salts, and is not designated by the California Department of Conservation as Prime Farmland or Farmland of Statewide Importance. Land along the electric transmission line, natural gas pipeline, and water supply and discharge pipeline routes is very similar to the RCEC and AWT plant site in soil type. The project site does not include publicly owned lands for which there is an adopted policy preventing non-agricultural use (California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program 1994).

8.11.1.1 Soil Resources

Identification of soil types and their distribution was accomplished primarily through a review of maps provided by the U.S. Soil Conservation Service (now called the Natural Resources Conservation Service [NRCS]). Figure 8.11-1 is a detailed map of the surficial soils in the project area. The soil map units associated with the RCEC facility, AWT plant, electric transmission line, water supply and wastewater discharge pipelines, and natural gas pipeline route are listed in Table 8-11-1. Table 8.11-2 provides a detailed summary of the physical and chemical characteristics of each soil type identified from the project site. This information was obtained from the Soil Survey of Alameda County, California, Western Part (SCS 1981).

RCEC Plant Site

The power plant site is entirely situated within the Reyes clay, drained soil type series (Figure 8.11-1). These soils tend to be very deep, exhibit level to nearly level topography, and are poorly to very poorly drained clays formed in tidal flats. Reyes clay soils have a high potential for shrinking and swelling.

Electrical Transmission Line and Eastshore Substation—The new overhead transmission lines will run east on Enterprise Avenue from the RCEC plant switchyard to the existing 115-kV transmission corridor, then 1.1 miles south to PG&E's existing Eastshore Substation. The line is situated within the

Table 8.11-1. Soil mapping unit identified by project component.

Project Component	Soil Mapping Unit
RCEC and AWT plant	139 - Reyes clay, drained
Electric Transmission Line	111 - Danville silty clay loam, 0 to 2 percent slopes 139 - Reyes clay, drained 143 - Sycamore silt loam, drained 154 - Willows clay, drained
Natural Gas Pipeline Route	107 - Clear Lake clay, 0 to 2 percent slopes 111 - Danville silty clay loam, 0 to 2 percent slopes 139 – Reyes clay, drained 154 – Willows clay, drained
Water Supply Pipeline	139 - Reyes clay, drained
Construction Laydown and Worker Parking	107 - Clear Lake clay, 0 to 2 percent slopes 111 - Danville silty clay loam, 0 to 2 percent slopes 139 - Reyes clay, drained 154 – Willows clay, drained

Danville, Reyes, Sycamore, and Willows series (Figure 8.11-1). These soils are usually very deep, well to very poorly drained clays, silty clays, silt loams, and silty clay loams formed on nearly level to sloping (less than 9 percent) ground in low alluvial terraces, tidal flats, flood plains, and basin rims. These soils exhibit a moderate-to-high potential for shrink-swell behavior.

Natural Gas Pipeline—The proposed natural gas pipeline route crosses several soil series, including the Clear Lake, Danville, Reyes, and Willows (Figure 8.11-1). These soils are usually very deep, well to very poorly drained clays, silty clays, clay loams, silt loams, and silty clay loams formed on nearly level to sloping (less than 9 percent) ground in low alluvial terraces, tidal flats, flood plains and basin rims. These soils exhibit a moderate-to-high potential for shrink-swell behavior. Construction of the gas pipeline would only temporarily affect these soils.

Wastewater Return Pipeline—The wastewater return route runs through the Reyes soil series (Figure 8.11-1). These soils tend to be very deep and very poorly drained, and exhibit nearly level topography in tidal flats. Their shrink-swell potential is high. These soils tend to be finely textured (i.e., clayey) formed from alluvium derived from mixed sources.

Construction Laydown and Worker Parking Areas—The construction laydown and worker parking areas cross soils of the Danville, Clear Lake, Reyes, and Willow soil series. These soils are the same as those located along the natural gas pipeline. There would be little disturbance of these soils for laydown and construction parking.

AWT Plant

The AWT plant is entirely situated within the Reyes clay, drained-soil type series (Figure 8.11-1). These soils tend to be very deep, exhibit level to nearly level topography, and are poorly to very poorly drained clays formed in tidal flats. Reyes clay soils have a high potential for shrinking and swelling.

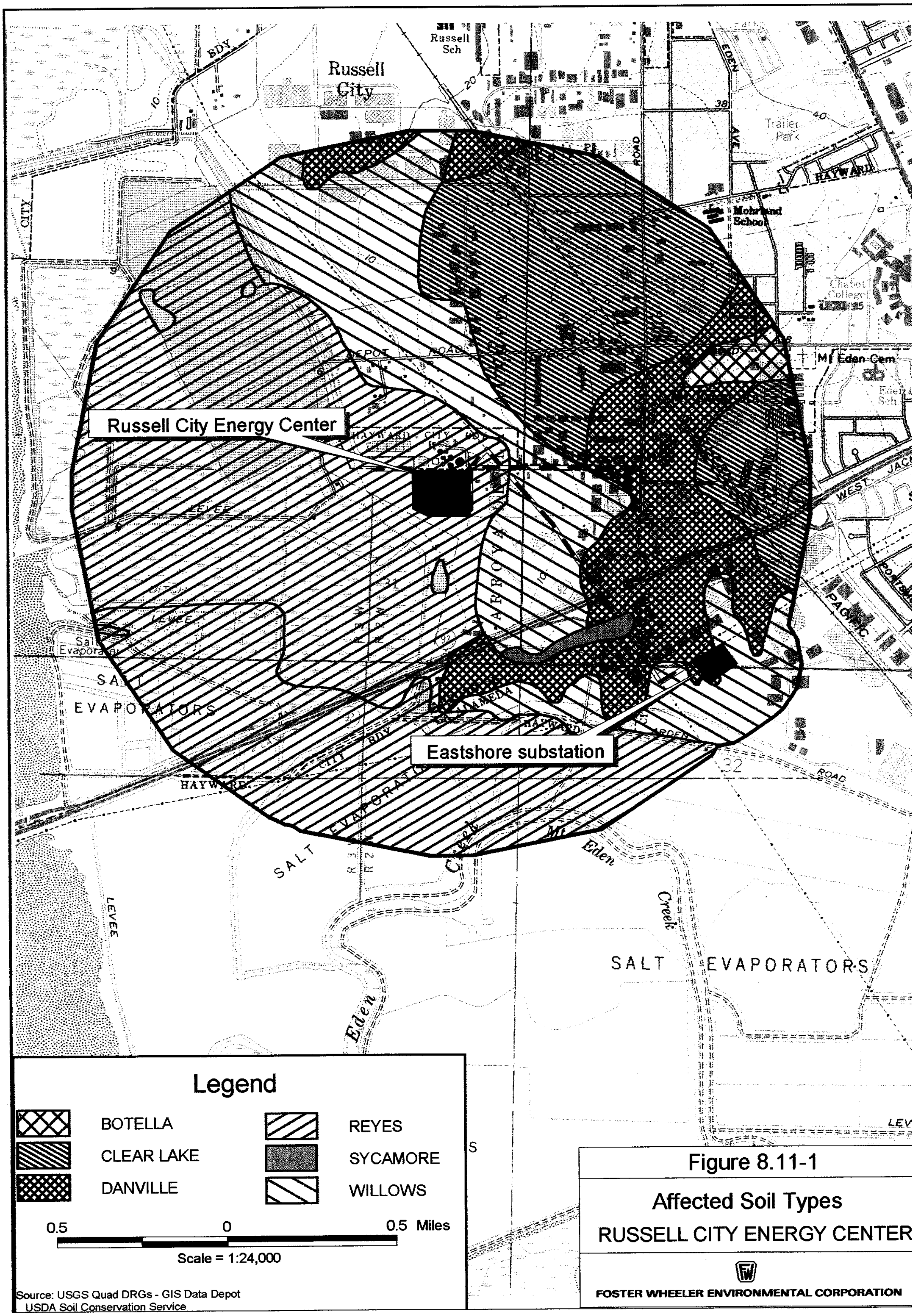

Figure 8.11-1

Affected Soil Types

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Table 8.11-2. Soil mapping unit descriptions.

Map[1/]	Soil Series Name	Depth (inches)	USDA texture	USCS[2/] Classification	Permeability (in/hr)	Drainage	Erosion Hazard	Erosion Factors[3/] K	T	Land Capability[4]	pH	Salinity (mmhos/cm)
107	Clear Lake	0-26	Clay	CH, CL	0.06-0.2	Poorly drained	None	0.24	5	IIIs-5 Nonirrigated	6.1-8.4	<2
		26-60	Clay, silty clay	CH, CL	0.06-0.2			0.24		IIs-5 Irrigated	7.4-8.4	<4
111	Danville	0-21	Silty clay loam	CL	0.2-0.6	Well drained	None	0.32	5	IIIs-3 Nonirrigated	6.1-7.3	<2
		21-53	Clay, silty clay, silty clay loam	CL, CH	0.06-0.2			0.24		IIs-3 Irrigated	6.1-7.3	<2
		53-80	Clay loam, silty clay loam	CL	0.2-0.6			0.28			6.6-8.4	<2
139	Reyes	0-6	Clay	MH	<0.06	Very poorly drained	None	0.15	5	Ivw-9 Nonirrigated	6.1-8.4	4-8
		6-72	Clay, silty clay, silty clay loam	ML, MH	<0.06			0.28			3.6-6.0	>16
143	Sycamore	0-18	Silt loam	ML	0.6-2.0	Poorly drained	Slight	0.49	5	IIIc-1 Nonirrigated	6.6-8.4	<2
		18-60	Silt loam, loam	ML	0.6-2.0			0.49			6.6-8.4	<2
154	Willows	0-19	Clay	CH	<0.06	Poorly drained	None	0.28	2	IIIs-5 Nonirrigated	7.4-9.0	2-8
		19-72	Clay, silty clay	CH	<0.06			0.28		Iis-5 Irrigated	8.5-9.0	>4

1/ Soil numbers refer to numbers shown on Figure 5.6-2 (Soil Map of Project Area).

2/ Unified Soil Classification System.

3/ K is a measurement of relative susceptibility to sheet and rill erosion by water. It ranges from 0.10 to 0.64, with lower values representing a lower susceptibility to erosion. T represents soil-loss tolerance, which is defined as the maximum rate of soil erosion (wind and water) without reducing crop production or environmental quality. Values range from 1 to 5 tons of soil loss per acre per year with 5 representing soils less sensitive to erosion.

4/ An indication of the suitability of soils for most kinds of field crops. Land capability classes are I through VIII. Subclasses are designated by letters e, w, s, or c. The land capability units are 0 through 9. See Soil Survey of Alameda County, California, Western Part, p. 31-32.

NA: Not Applicable

Source: U.S. Soil Conservation Service 1981.

8.11.1.2 Agricultural Resources

The City of Hayward does not have agriculture land uses. Local agricultural uses in the Tri-City area (Union City, Newark, Fremont) to the south include livestock grazing, and cultivation of pumpkins, squash, and cold weather crops (broccoli, lettuce, and cauliflower). None of these agricultural areas are located near the project or its appurtenant facilities. Livestock grazing occurs mainly in the hilly areas to the east of Fremont and Union City. Crop cultivation takes place in a few areas within the city limits of Fremont and Newark. Some project area soils (types 107, 111, 154) are considered prime farmland soils when found in open field or agricultural areas, but none of the project facilities cross these soils in any other context than land that is zoned and used as urban, industrial land.

RCEC Plant Site

There are no agricultural crops on or near the RCEC power plant site.

Electrical Transmission Line and Eastshore Substation—There are no agricultural land uses along the proposed route for the transmission line, which runs from the RCEC east to the existing 115-kV transmission line, then south to the existing PG&E Eastshore Substation. Construction of the transmission line will occur in an existing transmission line right-of-way. There are no agricultural uses along this route.

Natural Gas Pipeline—Construction of the natural gas pipeline would not displace or disrupt agricultural operations, as it will be placed entirely in city streets and on industrial facility property.

Wastewater Return Pipeline—The wastewater discharge pipeline will cross Enterprise Avenue to the Hayward Water Pollution Control Facility, directly across the street from the RCEC site. It will not displace or disrupt any agricultural operations.

AWT plant

There are no agricultural crops on or near the AWT plant site.

Construction Laydown and Worker Parking Areas

There are no agricultural uses near the construction laydown and worker parking areas.

8.11.2 Environmental Consequences

The following subsections describe the probable environmental effects on agricultural production and soils during the construction and operational phases of the project.

The 14.7-acre proposed RCEC and AWT plant site is presently an open field occupied by the KFAX radio broadcasting towers and transmitter shed and the Rummels Industries metal sand blasting and painting operations. After the power plant site has been graded, compacted, covered with concrete or gravel, and the constructor has installed drainage systems, there will be little remaining potential for natural erosion.

8.11.2.1 Soil Resources

The Universal Soil Loss Equation is typically used to quantify water-induced soil loss in agricultural areas. Since there will be no conversion of agricultural land during construction, estimates of soil loss have not been determined. Erosion characteristics of individual soil series have been included in Table 8.11-2. The soil series affected by this project have erosion hazards of none to slight (SCS 1981). Also, the erosion factors for these soils indicate low to moderate susceptibilities of erosion and high tolerances of soil loss without compromising either crop production or environmental quality. Anticipated soil erosion during and after construction will, however, be minimized through implementation of the erosion control measures. Routine vehicle traffic during operation of the project will be limited to existing roads, most of which are paved, and standard operational activities will not disrupt soils.

The proposed transmission line and pipeline routes generally follow existing utility corridors or roadways, which will facilitate access and reduce project-related disturbances. Disturbed areas along linear facility routes will be allowed to revegetate following construction activities.

Significance Criteria

The project could cause a significant environmental impact in relation to soil resources by causing:

- Accelerated wind or water-induced soil erosion resulting from project construction or operation
- Increased sedimentation in stream channels and stream crossings

Impacts to soil resources would be significant if construction activities were to occur in areas of high erosion susceptibility and the disturbed areas were left exposed and not properly stabilized.

Construction Impacts

Potential construction effects on soil resources include increased soil erosion, soil compaction, loss of soil productivity, and disturbance of saturated soils. Soil erosion results in the loss of topsoil and increased sedimentation of surface waters downstream of the construction site. The magnitude, extent, and duration of this construction-related impact would depend on several factors, including the proximity of the construction to water; the soils affected; and the method, duration, and time of year of construction.

RCEC Plant Site

Construction of the 12.55-acre power plant site will require minimal grading and earthwork. Graded areas will be smooth, compact, free from irregular surface changes, and sloped to drain toward the natural drainage system. Any cut-and-fill slopes for permanent embankments will be designed to withstand horizontal ground accelerations for Seismic Zone 4. Geogrid reinforcement for fill slopes and soil nailing for cut slopes will be provided, if necessary, for slopes requiring soil reinforcement to resist seismic loading. Slopes for embankments will be no steeper than 2:1 (horizontal:vertical).

Any areas to be backfilled (if needed) will be prepared by removing unsuitable material and rocks. The bottom of an excavation will be examined for loose or soft areas. Such areas will be fully excavated and backfilled with compacted fill in layers of uniform, specified thickness. Structural fill supporting foundations, roads, parking areas, etc., will be compacted in accordance with ASTM standards. Final grading will include aggregate surfacing of the entire site to control erosion except for paved roadways or landscaped areas.

The surficial soils at the RCEC site are predominantly clay (Reyes clay, drained). The cut-and-fill operations at the site will result in alteration of the existing soil profiles. Alteration of the existing soil profiles, including mixing of soils and rock, will alter the physical, chemical, and biological characteristics of the native soils. Clearing of the protective vegetative cover and the subsequent soil disturbance will likely result in short-term increases in water and wind erosion rates. The proposed project design will include measures to stabilize fill areas and cut slopes and to control drainage and erosion. These design measures are expected to minimize erosion and sedimentation to acceptable levels.

Following construction, wind and water erosion on the plant site will be reduced, because the site will be leveled, compacted, covered with concrete and/or aggregate, and drainage will be controlled through a storm drain system. Implementation of the mitigation measures discussed in Section 8.11.4 will limit impacts to the soil resources at the power plant site to acceptable levels. There would likewise be no significant impacts from air emissions to the surrounding soil-vegetation system.

Electrical Transmission Line and Eastshore Substation Expansion—A new 1.1-mile electrical transmission line will be constructed from the RCEC switchyard and extend a short distance across Enterprise Avenue to an existing Pacific Gas and Electric 115-kV transmission line. From that point, the existing transmission line, running about 1 mile south to the Eastshore Substation, will be upgraded for the RCEC project. This upgrading will consist of new conductors and replacement towers. Construction of the new transmission line will result in soil disturbance and compaction by construction vehicles and activities at transmission tower structure locations (including foundation excavations), at equipment staging areas, and at pull and tension sites. Construction of the proposed transmission line support bases will temporarily disturb land at the existing support bases. Soil disturbance, however, will be very slight, because the majority of these support bases are currently located in parking lots. One new tower will be constructed on a vacant parcel of City land immediately east of the City of Hayward Water Pollution Control Facility. One tower is located in the State Route 92 interchange to Clawiter Road/Industrial Boulevard. Clearing of vegetation at these two locations, and associated soil disturbance and compaction by construction vehicles and activities will result in short-term increased water and wind erosion rates until disturbed areas are stabilized. Increased soil compaction may decrease the ability of vegetation to reestablish following disturbance, which may result in increased erosion.

Implementation of the mitigation measures specified in Section 8.11.3 will limit impacts to the soil resources associated with construction of the transmission system to acceptable levels. Overall, the construction impacts to soils along the transmission line route will not be significant.

Natural Gas Pipeline—The construction right-of-way disturbances along the natural gas pipeline route are expected to be approximately 3 to 7 feet wide. Effects on soils and prospects for soil erosion are very slight because the pipeline will be constructed only along improved areas, including paved city streets and parking lots.

Wastewater Return Pipeline—The construction right-of-way disturbances along the wastewater discharge pipeline route are expected to be approximately 3 to 7 feet wide. Effects on soils and prospects for soil erosion are very slight because the pipeline will be constructed only over a very short distance, across Enterprise Avenue to the City of Hayward Water Pollution Control Facility.

AWT Plant

Potential impacts resulting from construction of the AWT plant will be substantially similar to those expected for construction of the RCEC plant site. Following construction, wind and water erosion on the plant site will be reduced because the site will be leveled, compacted, covered with concrete and/or aggregate, and drainage will be controlled through a storm drain system. Implementation of the mitigation measures discussed in Section 8.11.4 will limit impacts to the soil resources at the AWT plant to acceptable levels.

Construction Laydown and Worker Parking Areas

Large power plant and AWT plant components will be stored at the construction laydown and worker parking areas. Activities during the construction phase, including vehicular travel on graded access roads (at the Eastshore Substation), may temporarily disturb the existing ruderal vegetation, compact soil, and potentially increase wind and water erosion. Appropriate erosion and dust control techniques will be implemented during construction. No significant erosional impacts will result.

Operational Impacts

Operation of the RCEC, AWT plant, electric transmission lines, natural gas pipeline, and water supply and wastewater return pipelines, are not expected to result in significant impacts to soil from either erosion or compaction. Routine vehicular access to the individual project components during operation of the project will be limited to existing roads, most of which are paved. Standard operational activities will not involve disruption of soil.

RCEC Plant Site

Operation of the project will have little or no effect on soils.

Natural Gas Pipeline—Operation of the natural gas line will have little or no effect on soils; the natural gas line will be underground.

Electrical Transmission Line and Eastshore Substation Expansion—Operation of the electrical transmission system will have little or no effect on soils.

Wastewater Return Pipeline—Operation of the wastewater discharge pipeline will have little or no effect on soils.

AWT Plant

Operation of the AWT plant will have little or no effect on soils.

Construction Laydown and Worker Parking Areas

The construction laydown and worker parking areas will be returned to their pre-project uses after construction is completed.

8.11.2.2 Agricultural Resources

The following significance criteria were used in evaluating potential impacts to agricultural resources:

- Substantial displacement or curtailment of agricultural land uses
- Degradation of agricultural land productivity
- Impacts to Prime Farmland, agricultural areas of statewide importance, or unique farmland

Impacts could be significant if the project were to alter land with special designations (e.g., Prime Farmland) to the point that the disturbed area would no longer exhibit the inherent characteristics of the special designation.

Construction Impacts

Since the project will not cause a substantial displacement or curtailment of agricultural land use, or a degradation of agricultural productivity, the construction phase of the project will not cause a significant impact to agricultural resources.

Operational Impacts

Operation of the power plant and advanced wastewater treatment plant, electric transmission line, natural gas pipeline, and water supply and discharge pipelines, will not cause any impacts to agricultural resources because they will not affect agricultural land in any way.

8.11.3 Cumulative Impacts

Since the construction and operation of the project and its appurtenant facilities will not have other than minor and temporary effects on soil resources and will have no effects on agricultural lands, they will cause no cumulative impacts.

8.11.4 Proposed Mitigation Measures

This section discusses mitigation measures that will be implemented to reduce project-related effects on soil resources. The project will not affect any agricultural lands or resources.

Appropriate erosion control measures will help maintain soil resources and water quality, protect property from erosion damage, and prevent accelerated soil loss (which destroys soil productivity and its capacity to support and maintain vegetation). Temporary erosion control measures will be installed before construction begins and will be removed from the construction site after construction activities are completed.

The following mitigation measures can be implemented to reduce potentially significant soil impacts. An acceptable level of soil erosion, as used herein, is defined as that amount of soil loss that would not affect (i.e., limit) the potential long-term beneficial uses of the soil as a growth medium or adversely affect water resources due to accelerated erosion and subsequent sedimentation.

- Prepare an Erosion Control Plan prior to construction and implement the plan during and following construction. Erosion and sediment control measures may include, but are not limited to, use of sand bags, mulches, protective coverings (e.g., jute netting and rip-rap), installation of culverts under roadways at drainage crossings, installation of sediment detention basins, construction of water diversions along roads, and water bars along pipeline rights-of-way. The plan will conform to the Alameda County Hydrology Manual and local ordinances.
- Conduct grading operations in compliance with the Alameda County Grading Ordinance.
- Perform construction activities in accordance with the Stormwater Pollution Prevention Plan (SWPPP) and associated Monitoring Program. These items will be required for the project in accordance with California's General Industrial Stormwater Permit for Construction Sites under the United States Environmental Protection Agency (US EPA) National Pollutant Discharge Elimination System (NPDES) Program. The SWPPP will include erosion control measures, including Best Management Practices to reduce erosion and sedimentation.
- Stabilize disturbed areas that will not be covered with surface structures (e.g., buildings) or pavement following grading and/or cut-and-fill operations. In areas to be disturbed or excavated along pipeline routes and where vegetation is present prior to construction, topsoil will be selectively salvaged and replaced. No seeding or irrigation is proposed.
- Limit soil erosion/dust generation by wetting active construction areas with water (including roads) or by applying commercial dust palliatives (soil binders).

- Conduct visual post-construction monitoring of areas that were disturbed during the construction phase, particularly noting steep slope areas or other erosion prone areas.
- Implement corrective measures in areas that do not respond adequately to initial stabilization techniques or in areas where accelerated erosion is occurring.

8.11.5 Applicable Laws, Ordinances, Regulations, and Standards

Federal, and state laws, ordinances, regulations, and standards (LORS) applicable to Agriculture and Soils are discussed below. The LORS are summarized in Table 8.11-3.

Table 8.11-3. LORS Applicable to agriculture and soils

LORS	Applicability	Conformance (Section)
Federal:		
Clean Water Act	Controls erosion of soil and disruption or displacement of surface soil	Section 8.11.3
California:		
None directly applicable	N/A	N/A
Alameda County:		
None directly applicable	N/A	N/A
City of Hayward:		
None directly applicable	N/A	N/A

8.11.5.1 Federal

The Clean Water Act (CWA) authorizes the USEPA to regulate discharges of wastewater and stormwater into surface waters by using NPDES permits and pretreatment standards. These permits are implemented at the state level by the State Water Resources Control Board (SWRCB), but the USEPA may retain jurisdiction at its discretion. The primary interest of the CWA in the current project concerns soil erosion control during construction, and the need to prepare and execute site-specific erosion control measures for construction of each element of the project that will entail physical disruption or displacement of surface soil.

8.11.5.2 State

There are no State of California LORS that are directly applicable to agriculture and soils. The SWRCB, which controls surface water discharge, may become involved indirectly through a discharge National Pollution Discharge Elimination System permit if a surface discharge during construction were to cause soil erosion (see Section 8.15, Water Resources).

8.11.5.3 Local

Neither Alameda County nor the City of Hayward has any laws or ordinances that directly control soil resources or the removal of farmland from active production. The county does prohibit discharge of drainage onto county roadways, in order to prevent roadway erosion.

8.11.6 Involved Agencies and Agency Contacts

There are a number of agencies involved with agriculture, land use, and soil erosion. The NRCS, Alameda County Department of Agriculture/Weights and Measures, and the City of Hayward Planning

Department will be involved on the RCEC project. The agencies and persons to contact for each of these agencies are shown in Table 8.11-4.

Table 8.11-4. Agency contacts.

Topic	Agency	Contact	Title	Telephone
Soil erosion	NRCS 430 G Street #4164 Davis, CA 95616-4164	Eric N. Vinson	State Soil Scientist	(530) 792-5640
Agriculture	Alameda County Dept. of Agriculture/Weights and Measures 224 W. Winton Ave., Room 184 Hayward, CA 94544	Earl Whitaker	Agriculture Commissioner	(510) 670-5232
Land use	City of Hayward Community and Economic Development Department	Gary Calame	Sr. Planner	(510) 583-4226

8.11.7 Permits Required and Schedule

The City of Hayward will require a grading and erosion control permit prior to the start of construction. The State Water Resources Control Board will require a NPDES General Permit for Stormwater Discharges prior to the start of construction. The schedule for acquiring these permits is summarized in Table 8.11-5. Information required to obtain each permit is also included.

Table 8.11-5. Permits required and schedule.

Permit/Approval Required	Schedule
Grading/Drainage/Erosion Control Permit: • Engineered Grading Plan • Topographic Plan • Drainage controls • Surface Hydrology Report • Geotechnical/Geological Hazard Evaluation • Identify material source or disposal location and haul route • Erosion and Dust Control Plan • Traffic Control Plan	30 days prior to start of construction activities, or as agreed with the CEC CPM.
NPDES General Permit for Stormwater Discharges Associated with Construction Activities: • Submit Notice of Intent (NOI), including facility information, receiving water information, implementation requirements, site map, and certification • Prepare a Stormwater Pollution Prevention Plan (SWPPP) • Prepare a Stormwater Monitoring Plan (SMP)	Submit application 120 days prior to start of construction, or as agreed with the CEC CPM.

8.11.8 References

California Department of Conservation. 1994. *A guide to the farmland mapping and monitoring program*. Appendix B: Mapping categories and soil taxonomy terms. Division of Land Resource Protection.

U.S. Soil Conservation Service (SCS). 1981. *Soil survey of Alameda County, California, Western Part.*

8.12 TRAFFIC AND TRANSPORTATION

This section presents information on traffic and transportation as required by the siting regulations of the California Energy Commission. The potential effects on traffic and transportation resulting from construction and operation of the proposed Russell City Energy Center (RCEC) and Advanced Wastewater Treatment (AWT) Plant were analyzed and are documented within this section. It contains information on the existing transportation system along with a discussion of the potential effects of the project. Section 8.12.1 discusses the existing environmental setting; Section 8.12.2 discusses the environmental effects of construction and subsequent operation; Section 8.12.3 evaluates potential cumulative impacts to traffic and transportation due to other simultaneous projects; Section 8.12.4 includes proposed mitigation measures during construction and operation; Section 8.12.5 presents applicable laws, ordinances, regulations, and standards (LORS); Section 8.12.6 references agency contacts; and Section 8.12.7 contains references.

8.12.1 Affected Environment

8.12.1.1 Regional

The RCEC and AWT plant project site is located in the East Bay area of the San Francisco region in California. The East Bay area is served by an extensive transportation system, including major freeway, highway, airport and rail facilities. Figure 8.12-1 illustrates the regional transportation setting. The RCEC and AWT plant site is located within the City of Hayward, in Alameda County. The primary transportation corridors in or near Hayward consist of Interstate 880 (the Nimitz Freeway) and State Route 92. I-880 runs north south from Oakland to San Jose. Freeways, such as I-880, are described within the General Plan of Hayward, as "designed with limited access to serve regional through traffic." In general, freeways are under the jurisdiction of the State Department of Transportation (Caltrans); local roadways, collectors, and arterials generally fall under the jurisdiction of the City of Hayward. The Metropolitan Transportation Commission is responsible for regional transportation planning and coordination between all levels of government responsible for transportation development and maintenance. Near the City of Hayward, the I-880 has four lanes in each direction, which include a High Occupancy Vehicle (HOV) lane. State Route 92 runs east-west and has two lanes in each direction in the vicinity of the site. Improvements are currently underway, or planned for this freeway; for example, an additional lane expansion at the existing tollbooths situated west of the site area along State Route 92 is currently underway.

8.12.1.2 Local

The local transportation network near the site is illustrated in Figure 8.12-2. In general, the RCEC site can be accessed from Interstate 880 via State Route 92 westbound and then along a variety of local access routes. The most likely (shortest) access routes are as follows:

- From State Route 92 westbound exit Clawiter Road northbound. Turn left onto Enterprise Avenue (an east-west trending street) go 0.9 miles, past Whitesell Street, and left onto the site.
- Exit State Route 92 on Industrial Boulevard. Heading northbound, make a left onto Depot Road, left onto Clawiter Road (southbound), right onto Enterprise Avenue and left onto the site.
- From State Route 92 eastbound to Eden Landing Road (Clawiter Road) northbound over the freeway, left onto Enterprise Avenue (an east-west trending street) for 0.9 miles and left, after Whitesell Street, onto the site.

The option to use the Industrial Boulevard exit may be beneficial, since it is a four-lane road, whereas Clawiter Road is only a two-lane road. Likewise, when turning left onto Depot Road, it is also a four-lane road.

The amount of time traveled on Clawiter Road is extremely short using either option. The site's proximity to the freeways allows for minimal surface street travel time.

The only local roadways near the site that may experience direct project impact (due to construction of the natural gas pipeline) are Enterprise Avenue and Clawiter Road. Section 8.6, Land Use, describes the pipeline route, while construction practices to ensure safe, efficient and reliable access are described later in this section.

According to the Hayward General Plan (City of Hayward, 1998), State Route 92 is identified as a congested roadway with an E/F Level of Service (LOS) rating. The LOS refers to the amount of congestion at a given roadway segment or intersection (Table 8.12-1). The Hayward General Plan also includes recommended improvements for State Route 92, some of which are either complete or currently underway, such as lane widening between I-880 and the Hayward-San Mateo Bridge. Even with those improvements, however, the General Plan states that there may be congestion along State Route 92 in its 2010 forecast.

Table 8.12-2 lists the several intersections in the vicinity of the RCEC project that the City of Hayward may consider for improvements, since they are classified as LOS "E"or below. The key intersections are shown in Figure 8.12-3. Both the east and west Clawiter Road exits are planned to be upgraded by the City of Hayward. For each intersection, 1996 and projected 2010 LOS are presented; 2010 estimates are based on current (unimproved) intersections. The effects of the planned improvements are unknown. One major improvement that will take place is the signalization of the Clawiter intersection with State Route 92. This will improve access to the project site.

8.12.1.3 Other Transportation Issues and Plans

This section describes other traffic and transportation-related issues and plans important for the subsequent analysis of potential project impacts. One major improvement that will take place this year is the signalization of the Clawiter intersection with state Route 92. This will improve access to the project site dramatically.

Passenger Vehicle/Truck Percentages

Due to the close proximity of the site to interstate freeways and state highways, as well as the overall small number of construction vehicles expected, no significant impacts to existing traffic ratios between passenger vehicles and trucks is anticipated. The City of Hayward estimates that truck traffic on surface streets near the project site represents 12 percent of all daily vehicle traffic.

Weight/Load Restrictions

The Hayward General Plan, Transportation Element, does not specifically detail size and weight/load limits for any roadways in the city. Therefore, all applicable regulations are found in California Vehicle Code.

- The gross weight imposed upon the highway by the wheels on any axle of a vehicle shall not exceed 20,000 pounds and the gross weight upon any one wheel, or wheels, supporting one end of an axle, and resting upon the roadway, shall not exceed 10,500 pounds;

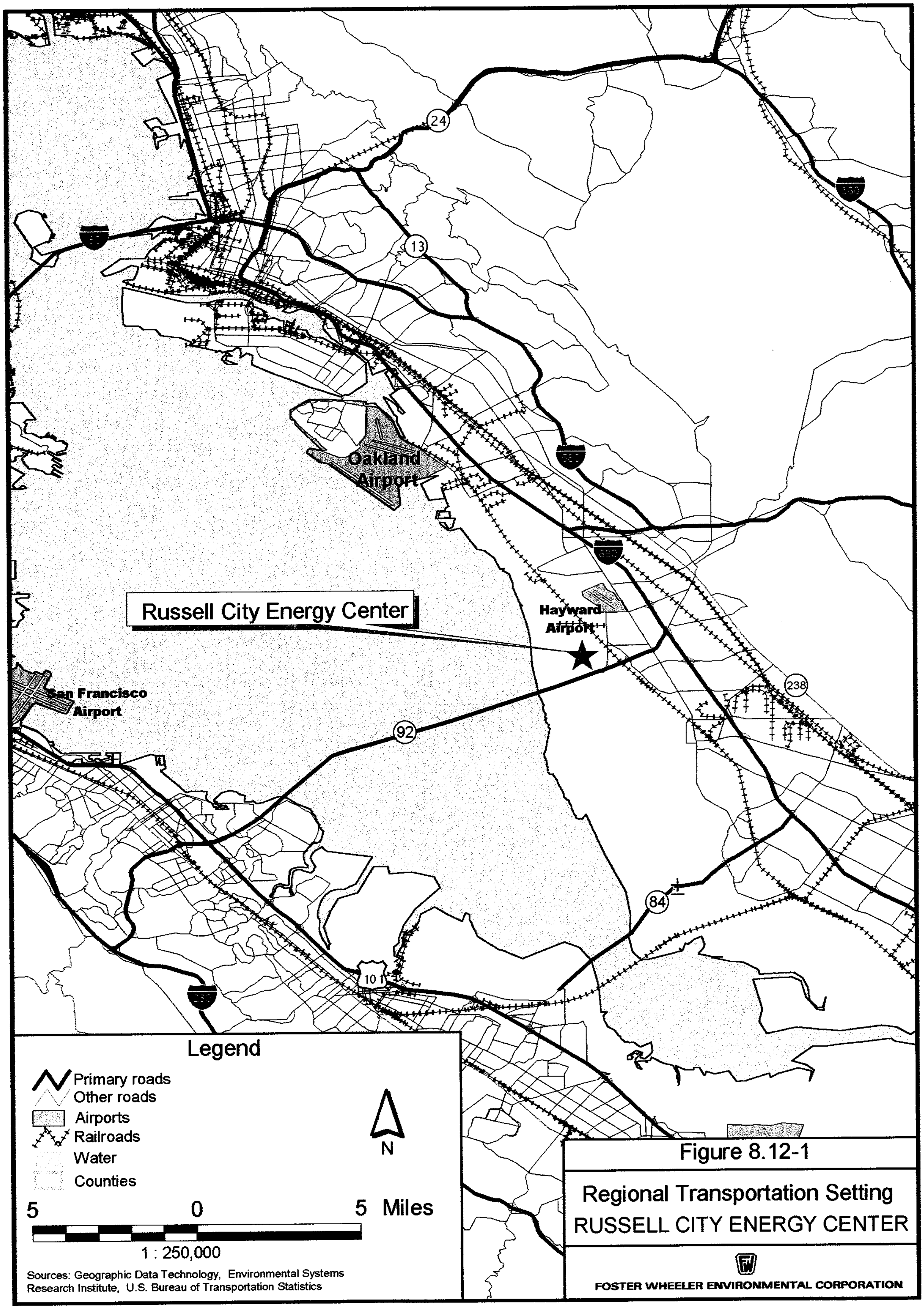

Figure 8.12-1

Regional Transportation Setting
RUSSELL CITY ENERGY CENTER

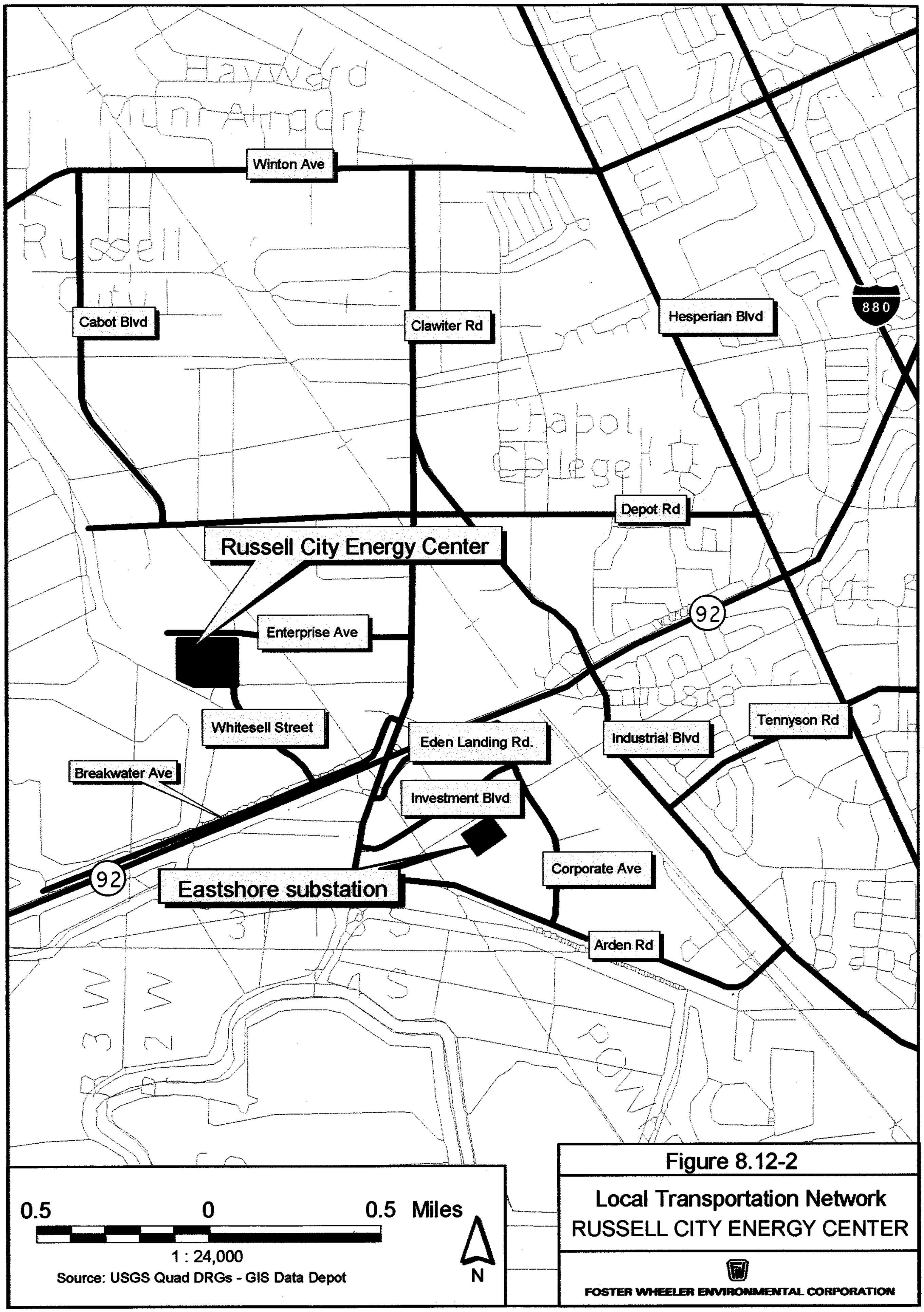

Figure 8.12-2

Local Transportation Network

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Russell City Energy Center AFC

May 2001

Table 8.12-1. Summary of levels of service for intersections.

Level of Service	Type of Flow	Delay	Maneuverability	Volume/Capacity V/C Ratio	Average Stop Delay/Vehicle (sec)
A	Stable Flow	Very slight or no delay. If signalized, conditions are such that no approach phase is fully utilized by traffic and no vehicle waits longer than one red indication.	Turning movements are easily made, and nearly all drivers find freedom of operation.	0.00–0.60	Less than 5.0
B	Stable Flow	Slight delay. If signalized, an occasional approach phase is fully utilized.	Vehicle platoons are formed. Many drivers begin to feel somewhat restricted within groups of vehicles.	0.61–0.70	5.1 to 15.0
C	Stable Flow	Acceptable delay. If signalized, a few drivers arriving at the end of a queue may occasionally have to wait through one signal cycle.	Back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted.	0.71–0.80	15.1 to 25.0
D	Approaching Unstable Flow	Tolerable delay. Delays may be substantial during short periods, but excessive back-ups do not occur.	Maneuverability is severely limited during short periods due to temporary back-ups.	0.81–0.90	25.1 to 40.0
E	Unstable Flow	Intolerable delay. Delay may be considerable (up to several signal cycles).	There are typically long queues of vehicles waiting upstream of the intersection.	0.91–1.00	40.1 to 60.0
F	Forced	Excessive delay.	Jammed conditions. Back-ups from other locations restrict or prevent movement. Volumes may vary widely, depending principally on the downstream back-up conditions.	Varies	Greater than 60.0

Table 8.12-2. Intersections with planned improvements[1].

Map Key No.	Intersection	1996 Delay (sec.)	1996 LOS	2010[2] Delay (sec.)	2010[2] LOS
5	Northbound-880 Ramp @ A Street	27	D	32	D
6	Southbound-880 Ramp @ A Street	31	D	35	D
7	Hesperian Boulevard @ A Street	136	F	98	E
17	Hesperian Boulevard @ Eastbound-SR92 Ramp	15	C	19	C
18	Hesperian Boulevard @ Westbound-SR92 Ramp	5	A	6	B
19	Industrial Boulevard @ Eastbound-SR92 Ramp	16	C	15	B
20	Industrial Boulevard @ Westbound-SR92 Ramp	14	B	13	B
21	Clawiter Road @ Eastbound-SR92 Ramp	1000	F	n/a	n/a
22	Clawiter Road @ Westbound-SR92 Ramp	321	F	n/a	n/a
24	Harder Rd. @ Santa Clara/Jackson	34	D	32	D
25	Santa Clara Street @ Winton Avenue	20	C	21	C
26	Hesperian Boulevard @ Winton Avenue	36	D	39	D

[1]Source: City of Hayward Circulation Element, 1998
[2]2010 estimates are based on current (unimproved) intersections
n/a – not available

- The maximum wheel load is the lesser of the following: (a) the load limit established by the tire manufacturer, or (b) a load of 620 pounds per lateral inch of tire width, as determined by the manufacturer's rated tire width.
- The gross weight imposed upon the highway by the wheels on any one axle of a vehicle shall not exceed 18,000 pounds and the gross weight upon any one wheel, or wheels, supporting one end of an axle and resting upon the roadway, shall not exceed 9,500 pounds, except that the gross weight imposed upon the highway by the wheels on any front steering axle of a motor vehicle shall not exceed 12,500 pounds; maximum allowable gross combination weight is 80,000 pounds (State of California Vehicle Code, Section 35550-35559).
- The maximum allowable vehicle height is 14 feet (State of California Vehicle Code, Section 35250-35252).
- The maximum allowable vehicle width is 102 inches (State of California Vehicle Code, Section 35100-35111).
- Maximum allowable length for single vehicle is 40 feet.
- Maximum allowable length for combination of vehicles is 65 feet.
- Maximum allowable length for combination of vehicles consisting of a truck tractor and two trailers is 75 feet, provided each individual trailer length does not exceed 28 feet 6 inches (State of California Vehicle Code, Section 35400-35414).

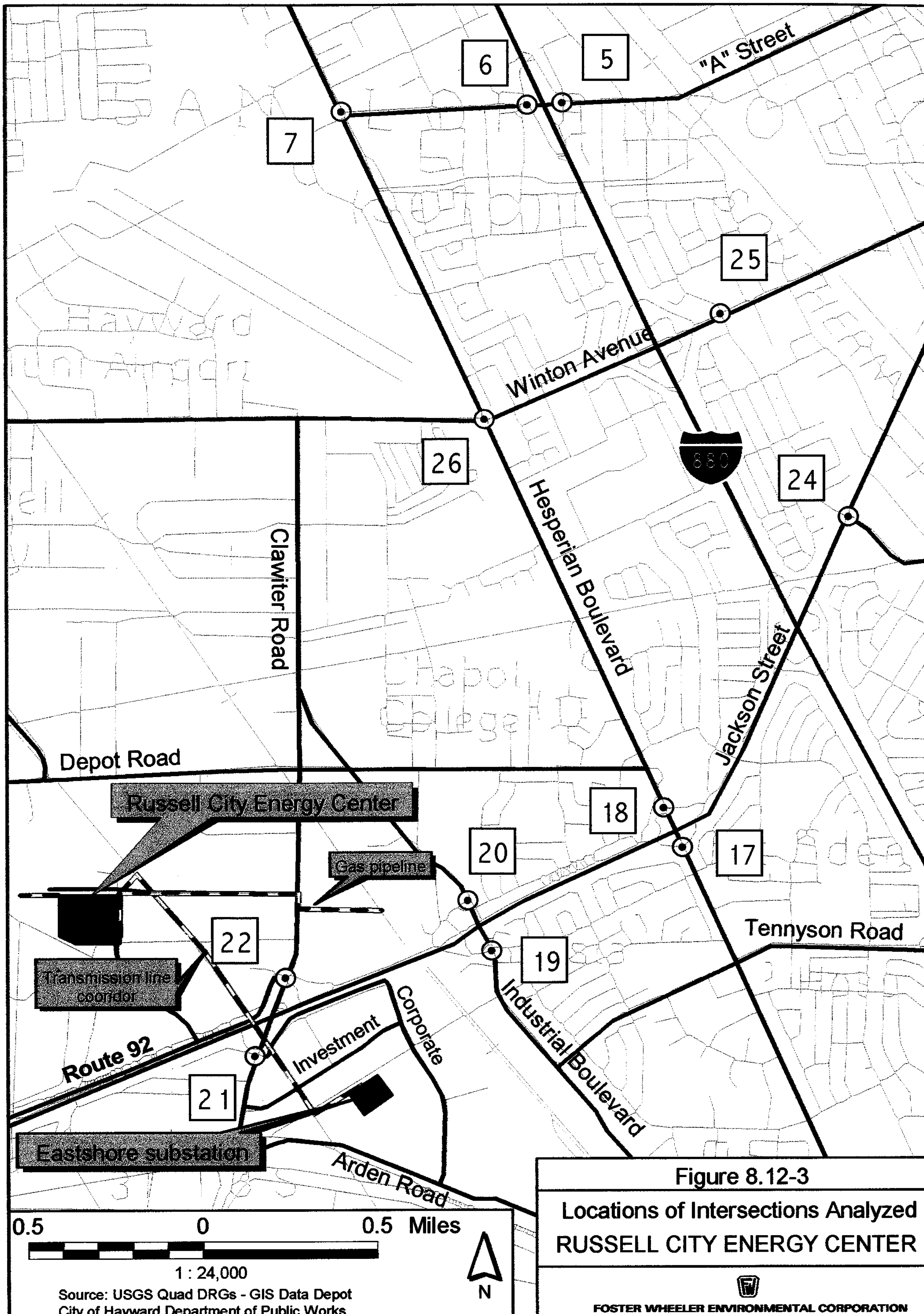

Figure 8.12-3

Locations of Intersections Analyzed

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May 2001

As noted in the Vehicle Code, these provisions would not apply if the city permitted the operation and transport of vehicles and loads on city roadways in excess of the maximum gross limits specified in the Vehicle Code (State of California Vehicle Code, Section 35780-35796).

Public Safety

There are no road features or characteristics in the project vicinity that would affect public safety nor are there any substandard bridges along the potential access routes. In addition, there are no city roadways that are subject to "normal" weather-related closures such as localized flooding or fog.

Truck Routes

The City of Hayward General Plan addresses truck routes within their General Plan by their policy to "evaluate and enforce a system of designated truck routes." The strategies to implement this system are to; (1) encourage trucks to use designated routes rather than local streets in the Downtown and other neighborhoods; and to prohibit overnight and other specified truck parking activities in residential areas (City of Hayward 1998).

All major routes leading to the RCEC and AWT plant site are suitable for truck travel. The average daily traffic volumes (ADT) on selected routes throughout Hayward are shown on Figure 8.12-4. As mentioned previously, the City of Hayward estimates that truck traffic on surface streets near the project site represents 12 percent of all daily vehicle traffic.

Hazardous Materials

The City of Hayward General Plan does not address hazardous materials transportation permits or routes. Calpine/Bechtel will obtain appropriate permits required by the State of California. Those permits are discussed in the environmental consequences section (8.12.2). The City of Hayward requests that when travelling with hazardous materials, the most direct route to the desired site should be used.

Public Transportation

The City of Hayward and the surrounding area has an extensive public transportation system in place, consisting of an integrated air, bus, rail, and bike network. Both the existing transit network and the proposed transit improvements are shown on Figure 8.12-5 (in pocket).

A nearby general aviation airport, in the City of Hayward, and three international airports in San Jose, Oakland, and San Francisco, provide air service in the region.

Public transit service is provided by the Bay Area Rapid Transit (BART) and the Alameda County (AC) Transit system. There are two BART lines (Richmond-Fremont and Bay City-Dublin/Pleasanton) with three stations (Downtown, South Hayward, and Castro Valley). AC Transit provides service throughout the East Bay as well as express service across the Bay Bridge to San Francisco. Hayward is also served by Amtrak's Capital Corridor route, which provides intercity rail passenger service between Sacramento and San Jose. For people who cannot use conventional fixed-route transit, specialized services or paratransit are available within the East Bay area. East Bay Paratransit is working to achieve service to such riders in a service territory that extends a minimum of ¾ mile outward from a transit station or bus route. Paratransit services require advance reservation (City of Hayward 1998). The City of Hayward provides a backup "safety net" service when East Bay Paratransit is unable to provide service.

The City of Hayward adopted an updated Bicycle Master Plan in early 1997. This plan proposed a network of bicycle facilities as shown in Figure 8.12-5, including bike paths, lanes and routes. The plan also sets priorities for implementation and funding of the various proposals (City of Hayward 1998). In addition, the Bay Trail exist as a bicycle trail across State Route 92 on the Clawiter overpass, then runs west on Breakwater to the Shoreline Interpretive Center. At this point, it becomes a combined bicycle-hiking trail. The Bay Trail, upon completion, will encircle the San Francisco and San Pablo Bays with a continuous network of bicycle and hiking trails (ABAG 1999/00). There is a planned new crossing for bicycles and Bay Trail users planned for construction in the next two years to the west of Clariwater.

Specific parking issues are generally addressed through the normal project review and approval process. The City of Hayward's policy provides for on-site, off-street parking sufficient to serve anticipated demands of proposed projects, although the City is evaluating that policy with respect to certain types of projects located in areas close to public transportation (City of Hayward 1998).

Traffic Projections/Plans

Hayward's General Plan provides Link LOS projections for the year 2010 (Table 8.12-2). Tables 8.12-3 and 8.12-4 list the average daily traffic numbers for selected key highway and roadway intersections near the project. The classification and roadway design capacities of selected roadways that will be used to access the RCEC and AWT plant site are shown in Table 8.12-5. When reviewing the *Federal Transportation Improvement Plan (FTIP),* the *State Transportation Improvement Plan (STIP)* and the *Regional Transportation Improvement Plan (RTIP),* there were no projects Alameda County area that affected the RCEC project (Caltrans 1999).

One project planned of the AWT immediate project area, however, is the City of Hayward's planned widening and extension of Whitesell Street through to connect with Cabot Boulevard to the north, and new interchange to State Route 92. This project will improve north-south through access to the Hayward Industrial corridor.

8.12.2 Environmental Consequences

8.12.2.1 Significance Criteria

Criteria used in determining whether project-related traffic impacts are significant are consistent with standard industry practice and California Code of Regulations Title 14, §15065. A project will have a significant effect on traffic and transportation if it will:

- Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system
- Exceed, either individually or cumulatively, a level of standard service established by the county Congestion Management Agency for designated roads or highways
- Result in a change in traffic patterns, including an increase in traffic levels or a change in location that results in substantial safety risks
- Substantially increase hazards due to a design feature or incompatible uses
- Result in inadequate emergency access
- Result in inadequate parking capacity
- Conflict with adopted policies, plans, or programs supporting alternative transportation.

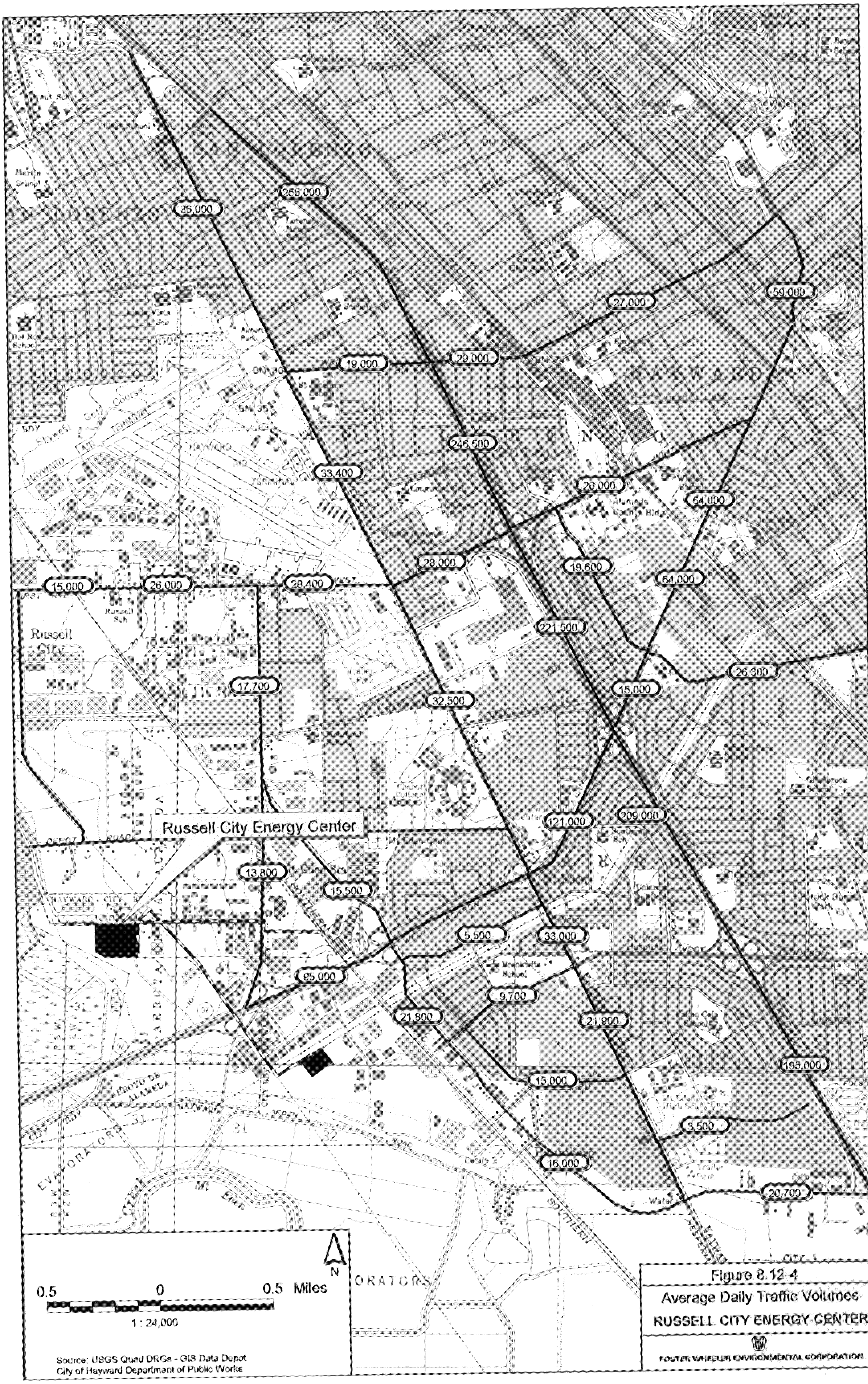

Figure 8.12-4

Average Daily Traffic Volumes

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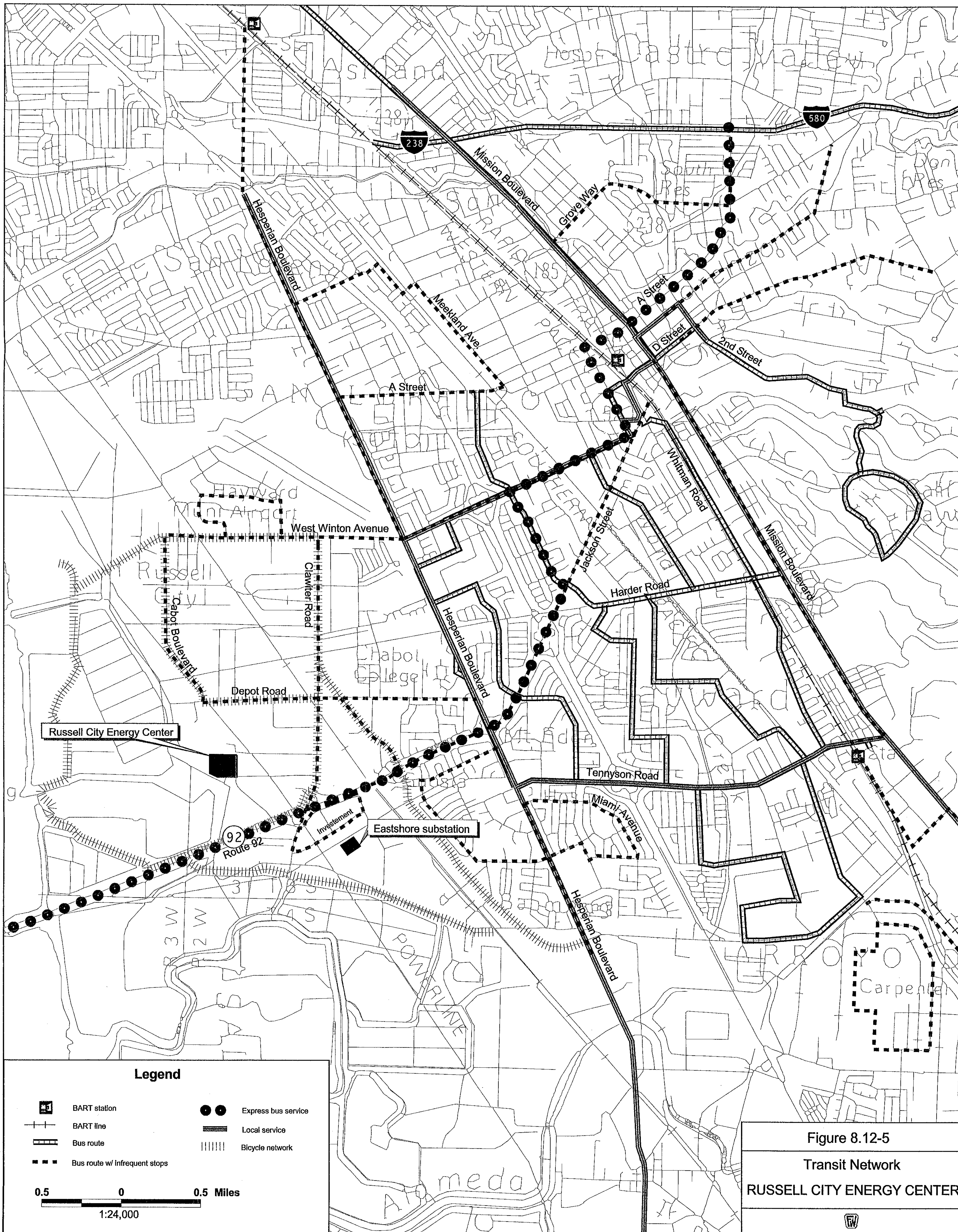

Figure 8.12-5

Transit Network

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Table 8.12-3. Existing traffic characteristics in the project area for selected highway intersections.

	(S/W)			Eastbound (N/E)		
Route	Westbound Peak Hr	Peak Month	AADT	Peak Hr	Peak Month	AADT
SR92 @ Clawiter	7,100	89,000	85,000	7,800	97,000	93,000
SR92 @ Industrial	7,800	97,000	93,000	7,600	94,000	90,000
SR92 @ Hesperian	7,600	94,000	90,000	9,000	111,000	107,000
SR92 @ I-880	9,000	111,000	107,000	5,600	68,000	66,000

Source: Caltrans 1999

Table 8.12-4. Existing traffic characteristics in the project area for selected local roadway segments.

Street Location (Direction)	AM Peak Hr	PM Peak Hour	ADT
Clawiter Road, south of Depot Road (Northbound)	228	821	6,411
Clawiter Road, south of Depot (Southbound)	1,191	460	7,404
Subtotal			**13,800**
Industrial Blvd., south of Depot Road (Northbound)	754	612	9,532
Industrial Blvd., south of Depot Road (Southbound)	432	568	5,927
Subtotal			**15,500**
Industrial Blvd., south of SR 92 westbound ramp (Northbound)	1,351	762	11,630
Industrial Blvd., south of SR 92 westbound ramp (Southbound)	693	956	10,189
Subtotal			**21,800**

Source: City of Hayward, Engineering-Transportation Division 2001.

Table 8.12-5. Road classification and design capacity.

Route	Classification	Design Capacity (ADT)	Design Speed (miles per hour)
I-880	Freeway	>40,000	65
Route 92	Freeway	>40,000	65
Industrial Blvd.	Major Arterial	25,000-40,000	50
Winton Avenue	Major Arterial	25,000-40,000	50
Depot Road	Minor Arterial	10,000-25,000	40
Clawiter Road	Minor Arterial	10,000-25,000	40
Enterprise Avenue	Cul-de-sac	<1,000	35

Source: Transportation Research Board, 1980.

8.12.2.2 Level of Service Analysis Methodology

To assess the potential of the project-related traffic to impact local traffic congestion, the number of project-related trips through each intersection and the intersection LOS were estimated for conditions before project construction, during construction, and during project operation. The trip estimating methodology is based on the "Critical Movement Analysis Planning Method" described in Transportation Research Circular No. 212, (Transportation Research Board, 1980). This document is a general discussion of intersection operations that is used to define the overall LOS at a signalized intersection, given existing traffic volumes and projected project-related traffic. The Planning Method calculates a "sum of critical volumes" for the critical traffic control phases of an intersection (phases for which there might be significant delay or obstruction), and a corresponding LOS. The critical volume is the volume of traffic that will cause a significant conflict with opposing traffic. This occurs where left-turning traffic obstructs through traffic at an intersection. The critical volume for an intersection as a whole is calculated as the number of vehicles turning left plus the number of through vehicles at a given intersection, for each flow direction possible at that intersection. For this analysis, the City of Hayward provided information about the various combinations of signal phases (such as left-turn permissive, left-turn protected, etc.) for each key signalized intersection in the project area, and the current traffic flows in each direction at these intersections by hourly peak (from February 2000 data collected by the City). The raw data is included as Appendix 8.12-A. Project-related impacts (e.g., LOS impacts) were not evaluated by roadway segment because ADT data was not available for several key roadways (such as Enterprise Avenue).

The impact analysis assumes "average or better" conditions of geometry and traffic (i.e., vehicle headways, lane widths, truck percentages, effects of parking and pedestrians, etc.). After observing the project site and based on discussions with the City of Hayward, the project area's geometry and traffic were deemed "average." The procedure does not explicitly deal with signal timing and does not necessarily relate to the amount of vehicle delay. The procedure assumes a random arrival of vehicles on all approaches (rather than the vehicle platoons that are usually created by coordinated signal systems).

In cases where signal-protected left-turn phases are not provided at the intersection (in other words, a permissive left turn intersection), the "filtering" left-turn capacity for permissive left-turn movements during the green signal phase is calculated as follows:

Capacity = (1200 - Vo) x G/C

Where:

Capacity	=	filtering left-turn capacity in vehicles per hour (vph) for permissive left-turn movements during the green light
Vo	=	volume (vph) of opposing traffic, including through and right turning vehicles
G/C	=	proportion of light cycle during which the left turns and the opposing traffic have a green light (G = green time, C = total cycle time).

On single-lane approaches, estimates of the critical volumes and protected/permissive phasing are sometimes problematic due to the variable permissive left-turn capacity, and the sometimes-varying lane use during a cycle.

On multi-lane approaches with permissive left-turn phasing, through and right-turn vehicles generally tend to shift to the right lane(s) to avoid being blocked by same-direction left-turn vehicles that are waiting for gaps in the opposing traffic stream. This shift is accounted for in the methodology by a factor that adjusts the proportion of vehicles blocked or stopped at the intersection.

At narrow, single-lane approaches, however, one or a few left-turn vehicles may block the entire approach. Thus, the critical volume for a single-lane approach would depend on the width of the approach, the presence and location of on-street parking, the length of the green, the opposing traffic volume, and the proportion of left-turn vehicles in the traffic stream. For this analysis, it was assumed that all intersections with a single-lane approach would be wide enough to allow right-hand turns at the same time as left-hand turns.

The lowest critical volume (best LOS) for a single-lane approach is calculated as the highest combination of the through and right-turn volumes summed with the opposing left-turn volume. The highest critical volume (worst LOS) for a single-lane approach is calculated as the total of the approach volumes for both approaches. Separate right-turn phases are not considered in the critical volume calculation since right-turn movements in exclusive right turn-lanes are seldom a critical movement (especially where right turns on red are allowed).

The guidelines used to identify LOS and volume/capacity (V/C) ratio based on the sums of intersection critical volumes are shown in Table 8.12-6. Table 8.12-6 shows critical volume thresholds for each LOS, A through F (the volume below which a given intersection remains at a given LOS). To define the level of service of an intersection with two-phase control, for example, given actual hourly traffic counts for the daily peak period of travel, one would add the left-turn volume to the opposing direction's through volume for all applicable travel directions at that intersection (for example, east-west, west-east, north-south, south-north). If the resulting sum of critical volumes were less than 900 cars, the LOS would be A. If a project were to add a volume of traffic to an intersection that would increase this sum of critical volumes to more than 900 cars, it would cause a change in LOS from A to B.

For this analysis, the traffic generated by the project in the study area during construction and operation was assigned to the surrounding street system for a hypothetical return commute. The resulting trip numbers were then added to the existing, critical volumes (based on City of Hayward's traffic data from February 2000) for each key intersection and compared with the LOS thresholds listed in Table 8.12-6.

Table 8.12-6. Critical intersection threshold volumes volume to capacity ratios by level of service.

Level of Service	Two-phase control	Three-phase control	Four or more phases	Typical V/C ratio
A	900	855	825	0.00-0.60
B	1050	1000	965	0.61-0.70
C	1200	1140	1100	0.71-0.80
D	1350	1275	1225	0.81-0.90
E	1500	1425	1375	0.91-1.00
F	N/A	N/A	N/A	Varies

Source Transportation Research Circular 212 (Transportation Research Board 1980).

The key analysis assumptions were as follows:

- Ten percent of trips to the project are carpool trips
- The normal construction workday begins at 7:00 a.m. and ends at 3:30 p.m.
- Sixteen percent of construction traffic arrives during the peak period

The daily peak traffic hour can vary by intersection, but at the most important intersection in this analysis, Enterprise Avenue and Clawiter Road, it is 7:00 to 8:30 a.m. To be conservative, however, this analysis assumes that 16 percent of construction traffic arrives during the peak period. This number was chosen as an estimate of the highest number of peak-hour trips that the project might generate. It represents the highest percentage of peak-hour traffic as a proportion of average daily traffic for any intersection in Hayward. Peak-hour traffic for most intersections in the project area is generally closer to 10 percent of average daily traffic.

Based on an analysis of the local grid system and historical traffic data, it was assumed that traffic coming out of the project site in the afternoon and heading east on Enterprise Avenue would flow to Clawiter Road, where 80 percent would turn south (right) in order to access State Route 92 and disperse in all directions via this multi-lane freeway. There are few residential areas that would be more accessible to Enterprise and Clawiter by turning left (north) on Clawiter than via State Route 92. It is also fair to assume that much of the construction workforce may arrive from outside the immediate area and will thus want to access State Route 92 to disperse through the freeway system. The remaining 20 percent of the traffic approaching Clawiter would disperse north onto Clawiter and, from there, to other roadways in the Industrial Corridor and the Mount Eden or adjacent neighborhoods. Traffic dispersion assumptions are given in Appendix 8.12-A.

Construction Phase Impacts

RCEC Plant Site

Access to the RCEC plant for construction activities will be from separate improved entrance roads extending south from Enterprise Avenue. Most of the RCEC site will be paved to provide internal access to all project facilities and on-site buildings. Locked/electric gates will control access into the facilities. Vehicular traffic into and out of the site will be limited as much as practical to daylight hours. There will be adequate internal circulation and parking. Due to the nature of the construction, along with the limited size of the site, additional areas will need to be leased for vehicle parking and/or laydown of materials during the construction period. Alternative sites for laydown and parking are located on Depot Road, just north of the RCEC, across Whitesell Street to the east of the RCEC, and on vacant land surrounding the PG&E Eastshore Substation.

Construction of the proposed facility will take place from the summer of 2002 to the spring of 2004, for a total duration of 18 to 21 months. It is anticipated that the on-site construction workforce required to build the RCEC will be drawn from the Bay area regional labor pool, with most workers coming from Alameda County. The average construction workforce will be approximately 277 persons, with a peak construction workforce of 485 persons (see Table 8.10-5 in the Socioeconomics section). According to the Metropolitan Transportation Commission, approximately 30 percent of cars have more than one occupant during commute time. For construction workers arriving from a wide variety of locations, a more reasonable assumption would be that 10 percent of the workforce may carpool. Using this figure, an average of 211 round-trip commutes per day for the 21-month construction period is expected. Peak construction traffic would result in 399 round trip commutes per day (443 peak workers minus 10 percent [44] = 399). The construction phase trip generation summary is found in Table 8.12-7. This analysis includes construction of the RCEC and AWT plants.

Table 8.12-7. Construction phase trip generation, daily traffic and peak hour.

	Vehicle daily round-trips		Vehicle total daily traffic (one-way)		PCE[1] daily peak-hour trips[4]	
Traffic Source	**Average**	**Peak[2]**	**Average**	**Peak[2]**	**Average**	**Peak[2]**
Worker trips[3]	277	485	554	970	89	155
Delivery trucks	10	25	20	50	1	3
Total	287	510	574	1020	90	158

[1] A passenger car equivalent (PCE) factor of 2.0 was applied to delivery trucks and heavy trucks.
[2] "Peak" refers to scheduled peak months of construction activity (months 11-16, especially month 15).
[3] Assumes 10% of workers carpool (1.1 persons per vehicle).
[4] Assumes 16% of workers and 10% of deliveries arrive or depart during peak traffic hour.

In the trip estimation, each truck counts the same as two cars because of their size and effect on traffic congestion. Therefore, in the peak month of construction, the project would generate a total of 848 one-way trips (including trips to and from the work site), compared with 448 on average during construction month. The peak-hour traffic for both the average and peak construction months is then calculated by assuming that 16 percent of cars and 10 percent of trucks for delivery arrive or depart during the peak traffic hour.

Table 8.12-8 lists the background peak traffic, construction-related traffic (existing plus project), and operation phase traffic (existing plus project) from the RCEC project at each key intersection analyzed. Traffic project construction and operation was added to existing traffic and distributed to the local and regional street and highway system by estimate (see assumptions below) and in Appendix 8.12-A. The resulting traffic volumes were added to the existing critical volumes for each intersection to determine whether or not the project could cause a change in the existing LOS and, hence, a significant adverse impact.

State Route 92, Clawiter Road, Enterprise Avenue, Industrial Avenue, and Depot Road are the primary roadways that will be used for travel to and from the project work site. Enterprise Avenue will experience the greatest volume of construction traffic, since it is the primary access route. The estimated additional traffic volumes (construction and operation) on each street from the RCEC construction traffic are shown in Figure 8.12-6. These estimates, and the estimates of traffic flowing through the various intersections, were derived based on the following general assumptions:

- Eight percent of construction traffic originates on the San Francisco Peninsula via State Route 92
- Thirty-five percent of the construction traffic originates from the north via I-880
- Thirty-one percent of the construction traffic originates from the south via I-880
- Twenty-two percent of the construction traffic originates east of I-880 and arrives via Route 92
- Four percent of the traffic is from the immediate local area (Hayward)
- Drivers generally choose the shortest distance to freeway access, though they may select alternate routes.

Projected LOS impacts during construction for selected roadway intersections are summarized in Table 8.12-9. No LOS classifications will change as a result of the RCEC construction or operation.

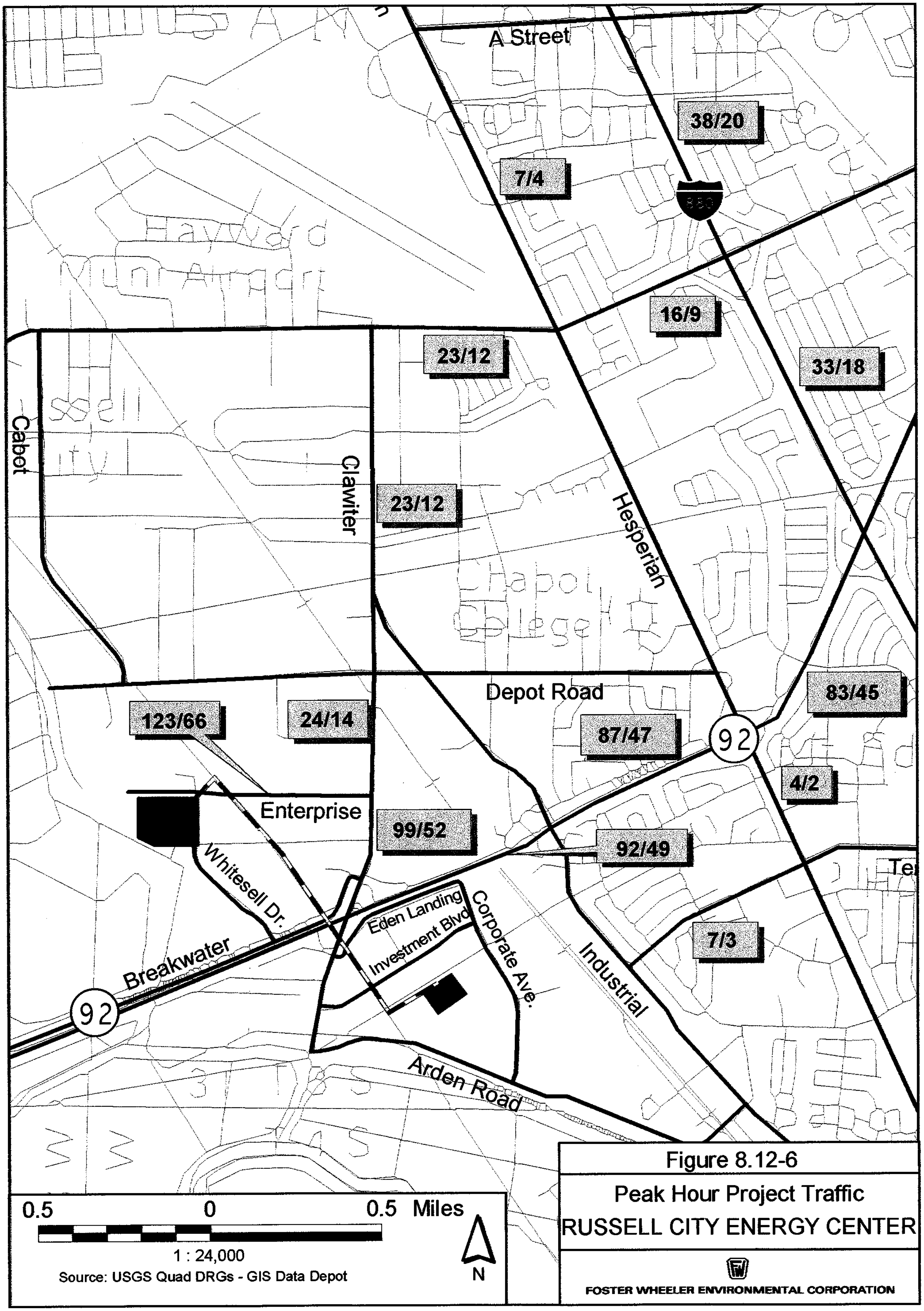

Figure 8.12-6

Peak Hour Project Traffic

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Table 8.12-8. Existing peak hourly traffic compared with peak RCEC construction and operation traffic at key intersections.

	Eastbound			Westbound			Northbound			Southbound		
	Left	Thro	Right	Left	Thro	Right	Left	Thro	Right	Left	Thro	Right
Enterprise Avenue (E-W) and Clawiter Road (N-S—Two phases—Evening peak*												
Existing conditions	165	-	126	12	6	15	33	620	8	4	470	25
Existing + peak construction	197	-	252	12	6	15	33	620	8	4	470	25
Existing + peak operation	183	-	198	12	6	15	33	620	8	4	470	25
Enterprise Avenue (E-W) and Clawiter Road (N-S)—Three phases—Morning peak												
Existing conditions	45	1	33	9	-	4	52	343	12	5	753	177
Existing + peak construction	45	1	33	9	-	4	178	343	12	5	753	209
Existing + peak operation	45	1	33	9	-	4	124	343	12	5	753	195
Depot Road (E-W) and Clawiter Road (N-S)—Four phases—Evening peak												
Existing conditions	246	531	43	38	148	7	40	426	220	18	113	79
Existing + peak construction	246	531	43	38	148	7	40	455	223	18	113	79
Existing + peak operation	246	531	43	38	148	7	40	442	222	18	113	79
Depot Road (E-W) and Industrial Boulevard (N-S)—Four phases—Evening peak												
Existing conditions	22	323	470	32	32	17	135	289	70	46	537	7
Existing + peak construction	22	323	473	32	32	17	135	289	70	46	537	7
Existing + peak operation	22	323	47 2	32	32	17	135	289	70	46	537	7
Industrial Boulevard (E-W) and Clawiter Road (N-S)—Four phases—Morning peak												
Existing conditions	141	-	3	-	-	-	32	438	-	-	317	-
Existing + peak construction	141	-	3	-	-	-	32	467	-	-	317	-
Existing + peak operation	141	-	3	-	-	-	32	454	-	-	317	-
Industrial Boulevard (N-S) and State Route 92—Four phases—Morning peak												
Existing conditions	132	5	68	77	28	9	501	873	128	2	407	92
Existing + peak construction	132	8	68	77	28	9	501	873	128	2	407	98
Existing + peak operation	132	7	68	77	28	9	501	873	128	2	407	95

*Worst-case peak traffic is used in this analysis. This is morning (am) traffic for some intersections, evening (pm) for others. Both morning and evening are included for Enterprise and Clawiter, because morning traffic to the project will turn left on to Enterprise, causing greater potential for delay than evening traffic, which will turn right from Enterprise to Clawiter.

Table 8.12-9. Construction and operation phase LOS for selected roadway intersections.

Intersection	Existing: Total Peak In/Out Vehicle Trips at Intersection	Existing: Current LOS	Construction Phase: Total Peak In/Out Vehicle Trips at Intersection	Construction Phase: LOS	Operation Phase: Total Peak In/Out Vehicle Trips at Intersection	Operation Phase: LOS
Industrial @ Clawiter (am)	1862	B	1920	B	1894	B
Enterprise @ Clawiter (am)	2886	A	3174	A	3043	A
Enterprise @ Clawiter (pm)	2968	A	3284	A	3034	A
SR-92 @ Clawiter (am)	--	F	--	F	--	B
Depot @ Clawiter (pm)	3818	C	3887	C	3854	C
Depot @ Industrial (pm)	3960	C	3966	C	3964	C
Industrial @ SR 92 (am)	4644	C	4662	C	4654	C

*Note: Current LOS is based on intersection delay rather than critical v/c ratio.

Though actual traffic counts were not available for one of the key intersections, State Route 92 at Clawiter, this intersection is at LOS "F," and the project would not make it significantly worse. Signalization and other improvements are planned for this intersection for this year. For the other intersections, the project's effect on the volume to capacity ratio is very small and not enough to cause a decrease in LOS. Further from the key intersection of Enterprise and Clawiter, the project's effect is barely perceptible in the volume/capacity ratio.

Increased transportation due to the RCEC construction will include deliveries of plant equipment and construction materials by truck, such as concrete, steel, and lumber. Truck deliveries will occur between 7:00 a.m. and 4:30 p.m. on weekdays. In total, approximately 4,000 truck deliveries of materials and supplies are expected between summer 2002 and spring 2004, an average of about 10 deliveries per weekday. At various times during peak construction, the number of daily deliveries will increase to as many as 50 per day. This will not significantly affect the traffic/truck mix along state highways, but it may increase the ratio of trucks to passenger vehicles on city streets. The percentage breakdown of truck deliveries by load type is presented below:

- Major equipment (components of the heat recovery steam generator, combustion turbine generator and steam turbine generator) (18%)
- Mechanical equipment (4%)
- Electrical equipment and material (7%)
- Piping, supports, and valves (10%)
- Concrete and reinforcing steel (29%)
- Miscellaneous steel, roofing, and siding (6%)
- Administration and warehouse buildings (1%)
- Construction consumables (15%)
- Office supplies (2%)
- Contractor mobilization and demobilization (3%)
- Construction equipment delivery and pickup (5%)

All deliveries to the RCEC will occur from Enterprise Avenue, utilizing various cross streets. Based on the city truck routes, the following routes will be used for truck deliveries to the RCEC (Figure 8.12-2):

- From State Route 92 Westbound, exit Clawiter Road northbound, turn left on Enterprise Avenue, and after passing Whitesell Street, turn left onto the project site.
- From State Route 92 Eastbound, exit Eden Landing Road (Clawiter Road) northbound over the freeway, turn left onto Enterprise Avenue, and left onto the site.
- From State Route 92 Westbound, exit Industrial Boulevard. northbound, turn left onto Depot Road, left onto Clawiter, right onto Enterprise Avenue, and left onto the project site.

In general, only small quantities of hazardous materials will be used during the construction period as described in Section 8.5, Hazardous Materials Handling, which will be shipped by truck. This may consist of welding flux, paint, and various solvents. The pipes and boiler will be cleaned prior to startup using various alkaline solutions. These cleaning chemicals will be used in relatively small quantities and therefore there will probably not be separate truck deliveries of hazardous materials during construction. If this should become necessary, however, all applicable requirements will be met, including the use of transporters with a Hazardous Material Transportation License. Additionally, all deliveries will follow the City-designated truck route, which offers the shortest overall transit time possible and avoids congested thoroughfares, places where crowds are assembled, and residential districts. This route runs along State Route 92, Clawiter Road, and Enterprise Avenue.

Certain components of the facility are of such dimension and weight that special delivery will be required during construction. There are two alternatives for oversize/overweight shipments: onsite rail and heavy-load truck delivery. Onsite rail delivery will be provided by a Union Pacific Railroad track that extends to the southern part of the project site. Transport from the railroad would avoid highway usage and be confined to the project site. According to the City of Hayward, there are no substandard bridges along any city roadways. Any necessary ground shipment exceeding the size and/or weight/load limits described will require a Single Trip Transportation Permit (State of California Vehicle Code, Sections 35780-35796). Appropriate permits will be obtained for all deliveries to comply with local laws and ordinances.

In conclusion, significant effects on the local transportation system are not expected from power plant construction activities for the following reasons:

- The only noticeable effects on traffic will be localized near the construction site.
- The RCEC construction shift will begin at 7:00 and finish at 3:30, limiting the number of vehicles during peak hour traffic periods (7:00 to 8:30 at Enterprise and Clawiter) and thus reducing potential traffic effects.
- Although there are significant numbers of projected truck deliveries over the construction period, any noticeable impact in traffic composition will likely be limited to a relatively small number of days when concrete deliveries will be made. Other deliveries will be spread over the construction period and will not significantly affect local traffic.
- The project will use the existing railway facility for the delivery of heavy equipment, further reducing any traffic delays due to the movement of large trucks.

Electric Transmission Line and Eastshore Substation Expansion—From the switchyard, power will be transmitted through new overhead conductors to PG&E's existing Eastshore Substation. Zone designations for the parcels adjacent to the transmission line are Industrial (I). The transmission lines will cross the following parcels: the Bay City Rebar Company, Tuscarora, Johnson Controls, and Caltrans. Construction should occur during the 18-21 month overall project construction timetable.

Natural Gas Pipeline—The natural gas pipeline route runs east on Enterprise Avenue to Clawiter Road, then runs east through the southern portion of Berkeley Farms property to the existing PG&E gas line located at the railway right-of-way. Section 8.6, Land Use, describes the route. Pipeline construction will involve trenching, stringing, welding, radiographic inspection, coating, lowering-in, backfilling, street repair, hydrostatic testing, and clean-up activities. These will each be completed as a single, sequenced, construction effort. Access during pipeline construction will be along existing road and rights-of-way. An encroachment permit will be obtained from the City of Hayward Public Works Department prior to construction. Construction damage to existing roads will be repaired to original or as near original condition as possible.

There is a potential for minor, short-term increases in motor vehicle hazards due to the nature of pipeline construction and operation of construction equipment. For example, there may be temporary lane closures and detours necessary to complete construction. Using standard linear construction practices (i.e., warning signs and lights, cones, and "reduce speed" notices), however, will reduce these impacts. Traffic control, including signage and flag persons, will be required on all road segments during construction. Overall, construction of the proposed gas pipeline route is not anticipated to create long-term effects on the transportation system in the area.

Wastewater Return Pipeline—Water supply for the RCEC will come from the advanced wastewater treatment plant, located next to the RCEC. A wastewater return pipeline will cross Enterprise Avenue to the City's Water Pollution Control Facility (WPCF). Construction of the street section would involve typical city road/street segment construction. Access during pipeline construction will be along existing roads and rights-of-way. An encroachment permit will be obtained from the City of Hayward Public Works Department prior to construction. Construction damage to existing roads will be repaired to original or as near original condition as possible. Standard construction practices described above will be used to minimize any construction effects at the intersection of the site driveway and the street.

As with the construction of the natural gas pipeline, there is a potential for minor, short-term increases in traffic and hazards due to the nature of construction and operation of equipment. However, standard construction practices described above will be used to minimize any such effects.

Overall, construction of the water pipeline should not have a significant impact on local transportation. There may be increased traffic during construction due to the scope of construction and proximity of the WPCF, but this effect will be temporary.

Construction Laydown Areas—There is a potential for minor traffic delays due to the movement of materials and equipment between the construction laydown areas and the RCEC site. Laydown areas currently identified include a 10-acre lot on the south side of Depot Road, the Mag Trucking lot east across Whitesell Street from the project, a portion of the City of Hayward Water Pollution Control Facility, and vacant land surrounding the PG&E Eastshore Substation. Any use of these areas for off-site parking (with bussing from the off-site parking areas) would help to alleviate existing traffic congestion at Clawiter Road and Enterprise Avenue during project construction and possibly at other intersections as well.

AWT Plant

Construction traffic effects for the advanced wastewater treatment plant would be the same as for the RCEC plant.

Operation Phase Impacts

RCEC Plant Site

The proposed project will generate a maximum of 42 round trips per day to the facility. These include 32 round trips by employees and 10 round trips by tradespeople, vendors, consultants, and management personnel. There will be a maximum of 25 full-time employees working at the plant. The RCEC plant will be operated by a staff consisting of 2 operators per 12-hour rotating shift (8 a.m. to 8 p.m.), with two relief operators; there will also be 5 maintenance technicians and 5 administrative personnel during the standard 8-hour workday. The facility will be operated 7 days per week, 24 hours per day. The additional 42 trips generated by power plant operation represent, for example, an increase of 0.30 percent to the 13,800 daily traffic volume on Clawiter Road near the project, a negligible amount, which will not result in any change in LOS classification of the affected roadways.

- During plant operations, trucks will periodically deliver/pickup replacement parts, lubricants, liquid fuels, aqueous ammonia, sulfuric acid, trash and other consumables. On average, there will be two truck deliveries to the project site per day. Table 8.12-10 provides a summary of hazardous materials transportation frequencies.
- According to Section 31303 of the California State Vehicle Code, the transportation of hazardous materials shall occur on state or interstate highways offering the shortest possible overall transit time. In addition, the transporter shall avoid, whenever practicable, congested thoroughfares, places where crowds are assembled, and residential districts. According to Vehicle Code 3200.5, transporters of hazardous materials must contact the CHP and apply for a Hazardous Material.
- All transporters of hazardous materials to the project site will be required to have a Hazardous Materials Transportation License. The licensed shipper will obtain a handbook specifying the routes approved to ship such materials. In addition, all shipments will follow the City-designated hazardous materials truck routes.
- Transportation effects associated with power plant operations will not be significant for the following reasons:
- If the 42 trips generated by the operations workforce occur during the peak commute hour periods (6 a.m. to 9 a.m. and 3 p.m. to 6 p.m.), the LOS classifications of potentially affected roadway intersections would not change. Visits by tradespeople, vendors, consultants, and other non-plant personnel will be limited in number and will occur primarily during non-peak commute periods.
- Deliveries of hazardous materials will be limited. Delivery of these materials will occur over prearranged routes and will be in compliance with all LORS governing the safe transportation of hazardous materials.

Electric Transmission Line, Natural Gas, and Wastewater Discharge Pipeline—The only traffic associated with the operation of these interconnections and pipeline would be occasional preventative maintenance vehicles, or repair vehicles in the event of damage to any of the lines. This traffic would not cause any significant change to local traffic conditions.

Construction Laydown and Worker Parking Areas—These areas will be returned to their previous uses after construction of the RCEC and other facilities. There will be no traffic impacts.

Table 8.12-10. Truck transportation of hazardous materials and hazardous waste to and from the site.

Delivery Type	Number and Occurrence of Trucks
Aqueous Ammonia	1 every 3 days
Sulfuric Acid	1 per month (8,000-gallong truck)
Cleaning Chemicals	1 per month
Trash Pickup	1 per week
Sanitary Waste	1 per month

AWT Plant

The AWT plant would have a maximum of 6 employees, 3 per shift. In addition, there would be at least one removal daily of RO sludge cake. Other deliveries would be intermittent. This traffic would not cause any significant change to local traffic conditions.

8.12.3 Cumulative Effects

There should not be any significant cumulative effects resulting from the project in combination with any other proposed projects within the City, since impacts resulting from the power project will have a negligible affect on LOS parameters. The largest planned development in the general project area is the Duc Development Corporation's planned housing and industrial development south of State Route 92, at the southwest corner of Hesperian and Industrial, about 2 miles southeast of the RCEC site. Traffic volumes generated by the RCEC during the operations phase would be sufficiently low that there should be no significant environmental impact. The Duc Development project has not been constructed and the timing of construction is currently uncertain. If, however, it were to be constructed at the same time as the RCEC, there would be little chance of a significant cumulative effect, since traffic traveling to the Duc Development would mostly be accessing the Duc site via Interstate 880 at the Industrial Boulevard and West Tennyson Road interchanges and via State Route 92 at the Industrial Boulevard interchange.

8.12.4 Proposed Mitigation Measures

This section describes the applicant's proposed mitigation measures that will be implemented to reduce or eliminate potential impacts.

8.12.4.1 Construction Phase

The construction contractor will prepare a construction traffic control plan and implementation program that addresses timing of heavy equipment and building materials deliveries, signage, lighting and traffic control device placement, and the establishment of delivery/work hours outside of peak traffic periods.

Methods for mitigating potential traffic impacts caused by construction will include stationing flag persons at the access road into the site, and advance warning flashes, flag persons, and signage along the roadways associated with the natural gas pipeline. Roadways damaged during construction of the natural gas pipeline will be resurfaced to their existing condition.

It should be noted that most trip reduction strategies are not feasible for the construction phase of the project primarily because of the differing schedules of tradespersons, and the need to transport tools and materials to the job site.

8.12.4.2 Construction Phase

Truck Traffic

Mitigation of potential truck traffic impacts will be in the form of adherence to all laws, ordinances, regulations, and standards (LORS) found in Section 8.12.5 below.

Employee/Other Traffic

Though the total number of trips generated by employees and other personnel during peak hours would not cause a significant adverse impact, it would cause a short-term increase in the congestion that already exists in the immediate project area (particularly at State Route 92 and Clawiter). This congestion could be ameliorated somewhat by off-site parking and bussing of construction workers to the RCEC site, if sufficient parking is not available at the site. If more than one off-site parking area were used, traffic congestion effects during construction would be ameliorated somewhat.

8.12.5 Laws, Ordinances, Regulations, and Standards

All applicable laws, ordinances, regulations, and standards and their conformance measures are detailed in the text below. Table 8.12-11 summarizes this information and provides agency contacts.

8.12.5.1 Federal

The Hazardous Materials Transportation Act of 1974, 49 Code of Federal Regulations (CFR) 397.9, is a federal law applicable to this project. It directs the U.S. Department of Transportation to establish criteria and regulations for the safe transportation of hazardous materials. There are no specific conformance measures necessary for this law.

8.12.5.2 State

State laws that would apply to this project include the following:

- California Vehicle Code Section 35780 requires approval for a permit to transport oversized or excessive loads over state highways. The project will conform to Section 35780 by requiring that shippers obtain a Single Trip Transportation Permit for oversized loads, as required by Caltrans, for each vehicle.
- California Vehicle Code Section 31303(b) requires that the transportation of hazardous materials occur on state or interstate highways offering the shortest overall transit time possible. The project will conform to Section 31303(b) by requiring that shippers of hazardous materials use the shortest route possible to and from the project site.
- California Vehicle Code Section 31303(c) requires that the transporters of hazardous materials avoid, whenever practicable, congested thoroughfares, places where crowds are assembled, and residence districts. The project will conform to Section 31303(c) by requiring transporters to use routes that avoid these areas, if possible.
- California Vehicle Code Section 32000.5 requires that shippers of hazardous materials must contact the California Highway Patrol and apply for and receive a Hazardous Material Transportation License. The project will conform to Section 32000.5 by requiring hazardous materials transporters to be licensed when transporting to and from the project site.

Table 8.12-11. Laws, ordinances, regulations, and standards.

LORS	Document and Page	Applicability	AFC Section Where Conformance is Discussed	Agency/Contact
Federal:				
Transport of Hazardous Materials	Hazardous Materials Transportation Act	Requires transporters to adhere to established regulations	8.12.5.1	NA
State:				
Transport oversized or excessive loads over state highways	California Vehicle Code Section 35780	Requires permit to transport oversized or excessive loads over state highways. Enforced by the California Highway Patrol.	8.12.2.3	California Department of Transportation (District 4) James McCrank (510) 541-6345
Transport hazardous materials on state or interstate highways	California Vehicle Code Section 31303(b)	Requires that the transportation of hazardous materials be on state or interstate highways that offer the shortest overall transit time possible.	8.12.2.3 8.12.2.4	California Highway Patrol Sgt. Debbie Pierce (916) 445-1865
Transport hazardous materials on state or interstate highways	California Vehicle Code Section 31303(c)	Requires that the transportation of hazardous materials avoid, whenever practicable, places where crowds are assembled, and residence districts.	8.12.2.3 8.12.2.4	California Highway Patrol Sgt. Debbie Pierce (916) 445-1865
Licensing of hazardous materials transporters	California Vehicle Code Section 32000.5	Requires that transporters of hazardous materials contact the California Highway Patrol and apply for and receive a Hazardous Material Transportation License.	8.12.2.3 8.12.2.4	California Highway Patrol Sgt. Debbie Pierce (916) 445-1865

Table 8.12-11. (Cont'd)

LORS	Document and Page	Applicability	AFC Section Where Conformance is Discussed	Agency/Contact
Local:				
Provide for the long-range planning and development of Hayward's transportation system	City of Hayward General Plan, Circulation Element	The City shall establish a Truck Route Plan and enforcement regulation to ensure that truck traffic is directed away from residential and other sensitive use areas, and, as practical, arterial section with LOS problems.	Figure 8.12-2 8.12.2.3 8.12.2.4	City of Hayward Fire Department Hugh Murphy, Hazardous Materials Program Coordinator (510) 583-4924
		Strive for LOS "C" or better at all major intersections within Hayward, recognizing that in some cases LOS "D" may be acceptable with appropriate mitigation measures.	8.12.1.3 Table 8.12-1 Table 8.12-6	City of Hayward City Management Office, Sanford Groves, Assistant City Manager (510) 583-4302
		Require new development to implement Transportation Systems Management (TSM) programs, and/or pay for traffic improvements through traffic impact fees or assessment district financing.	8.12.4.2	
Encroachment permit (natural gas pipeline)	California Streets and Highway Code, Division 2 Chapter 5.5 Sections 1460-1470	Require an encroachment permit to make an opening or excavation for any purpose in roadway.	8.12.3.2	City of Hayward City Management Office, Sanford Groves, Assistant City Manager (510) 583-4302
Encroachment permit (water supply pipeline)	California Streets and Highway Code, Division 2 Chapter 5.5 Sections 1460-1470	Require an encroachment permit to make an opening or excavation in roadway.	8.12.3.4	City of Hayward City Management Office, Sanford Groves, Assistant City Manager (510) 583-4302

California State Planning Law, Government Code Section 65302, requires each city and county to adopt a General Plan, consisting of seven mandatory elements, to guide its physical development. Section 65302 (b) requires that a circulation element be one of the mandatory elements. The scope of a circulation element consists of the "general location and extent of existing and proposed major thoroughfares, transportation routes, terminals, and other local public utilities and facilities, all correlated with the land use element of the plan." Compliance with this section is described below under the local LORS

8.12.5.3 Local

Most local governments also stipulate LORS that specifically affect the traffic/transportation conditions associated with local projects. The transportation element of the Hayward General Plan (City of Hayward 1998) sets forth goals, policies, and implementation programs related to traffic issues in the City of Hayward. The General Plan sets forth fifteen goals; these goals address regional traffic on freeways and major arterials promoting public transit and alternate modes of transportation. The applicable goals include:

- Goal 1—Reduce the amount of regional through traffic in the Hayward area.
- Goal 2—Expand or Reconfigure the regional road network to reduce through traffic on city streets.
- Goal 3—Minimize adverse impacts of regional traffic on existing neighborhoods.
- Goal 4—Improve mobility to foster economic vitality
- Goal 5—Improve coordination among public agencies and transit providers
- Goal 6—Expand and reconfigure public transit service to meet demand, provide greater mobility and reduce traffic congestion
- Goal 7—Address special needs of transit users
- Goal 8—Create improved and safer circulation facilities for pedestrians
- Goal 9—Provide the opportunity for safe, convenient and pleasant bicycle travel throughout all areas of Hayward
- Goal 10—Encourage land use patterns that promote transit usage

Although all of the above goals do not necessarily apply to the RCEC and AWT plant, the project will be consistent with each of them due to the minimal amounts of construction and operational traffic associated with it. Furthermore, the RCEC will implement appropriate mitigation measures during construction to ensure that safe, reliable transportation is maintained within the city, for automobiles as well as bicycle and pedestrian traffic. In addition, the project will provide much needed electricity during the peak demand times of the California electric system, which provides the electric power that accommodates much of the public transportation system in the region.

In addition to General Plan requirements, the California Streets and Highways Code, Division 2, Chapter 5.5, Sections 1460-1470, requires an encroachment permit if there is an opening or excavation for any purpose in any county highway. The project will conform to Section 1460-1470 by obtaining an encroachment permit from the Hayward Public Works Department prior to all pipeline construction.

8.12.6 Involved Agencies and Agency Contacts

Table 8.12.11 includes a listing of the agencies involved and their contact names and phone numbers.

8.12.7 Permits Required and Schedule

The following table outlines the permit schedule related to traffic/transportation issues for the project. Permits reflect preferred facility routing. Information required to obtain each permit is also included.

Table 8.12-12. Permit schedule for traffic and transportation.

Permit	Schedule
Encroachment permit for the natural gas pipeline: • Site specific plan • Pipeline routes • Road rights-of-way where pipelines will be constructed	1 to 2 weeks from submittal to approval by Hayward Public Works Department.
Encroachment permit for the water supply interconnect: • Site specific plan • Pipeline routes • Road rights-of-way where pipelines will be constructed	1 to 2 weeks from submittal to approval by Hayward Public Works Departments
Transport of oversized or excessive loads over state highways: • Specific route • Transport time • Load contents	Obtain when necessary from Caltrans, 2-hour processing time

8.12.8 References

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Association of East Bay Governments (ABAG). 1999. The bay trail. Internet site: www.abag.ca.gov/bayarea/baytrail/overview.html

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Transportation Research Board. 1985. Highway capacity manual special report 209.

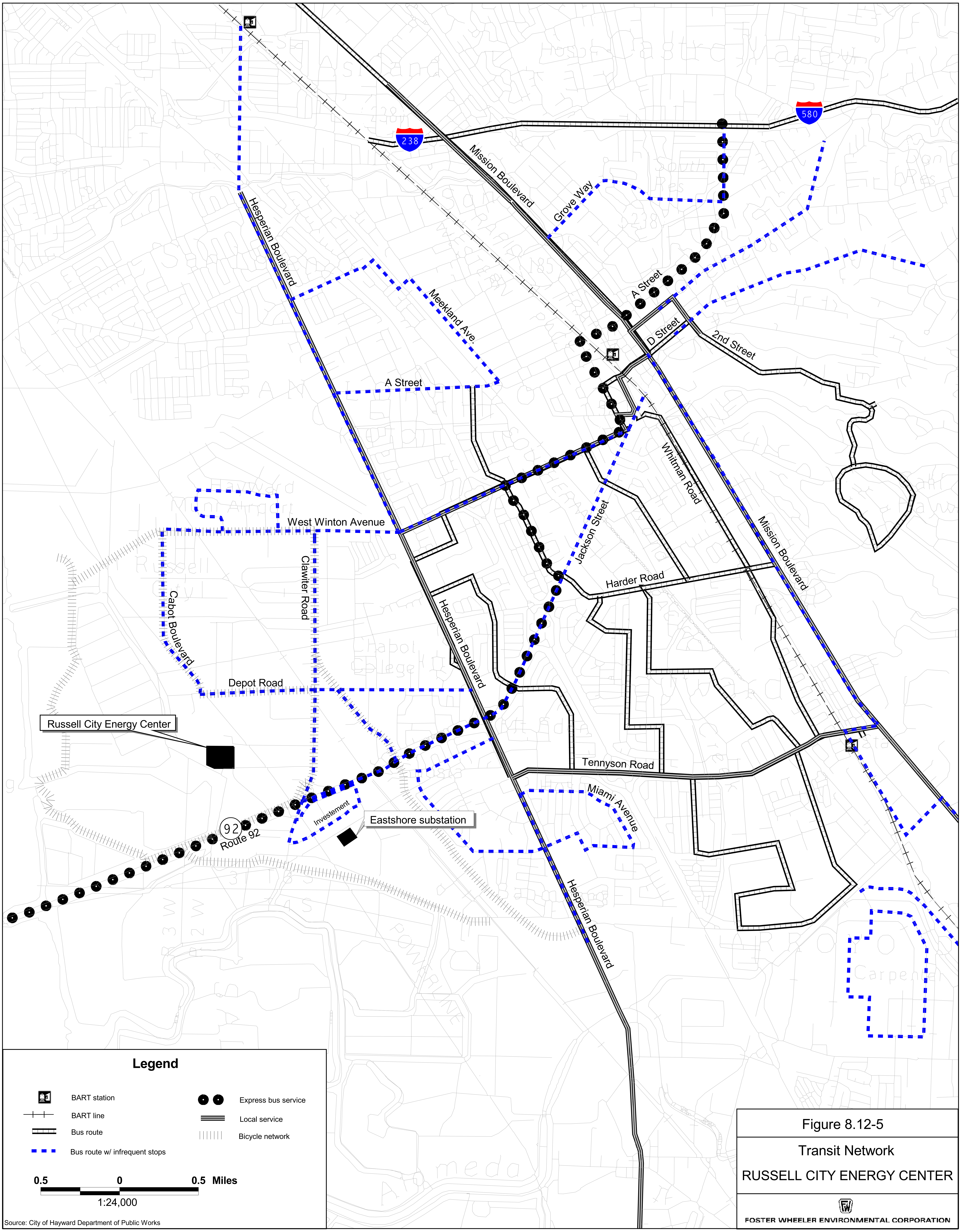

Figure 8.12-5

Transit Network

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

8.13 VISUAL RESOURCES

Visual resources are the natural and cultural features of the landscape that can be seen and that contribute to the public's appreciative enjoyment of the environment. Visual resource or aesthetic impacts are generally defined in terms of a project's physical characteristics and potential visibility, and the extent to which the project's presence will change the perceived visual character and quality of the environment in which it will be located.

This section was prepared following CEC guidelines for preparing visual impact assessments for AFCs. Section 8.13.1 documents the visual conditions that currently exist in the project area. Section 8.13.2 discusses the potential environmental effects as they relate to visual resources. Section 8.13.3 discusses the potential cumulative impacts of this and other visual projects in the area. Section 8.13.4 summarizes the mitigation measures proposed to reduce the project's impacts on visual resources. LORS are described in Section 8.13.5. Required permits are discussed in Section 8.13.6. Section 8.13.7 lists the references used in preparation of this section.

Figures 8.13-1a and 8.13-1b indicate the location of the viewpoints, viewsheds, and key observation points referenced in the section. All illustrations in this section are bound together at the end of the section for reader convenience. These include viewshed maps, visual character photographs, and photographical simulations.

8.13.1 Affected Environment

8.13.1.1 Regional Setting

The various components of the RCEC will be developed in the City of Hayward, a community located along the eastern shore of San Francisco Bay in Alameda County. The physical setting consists of a 1- to 2-mile-wide band of wetlands along the bay that are often referred to as "baylands" and, a flat to gently sloping bay plain extending approximately four miles from the bay to the base of the hills to the east. The hills are a series of northeast to southwest trending ridges that extend up to 1,400 feet in elevation. The project facilities will be located in Hayward's Industrial Corridor, which lies between the open spaces of the baylands to the west and commercial and residential areas on the bay plain and hill lands to the east (Figure 8.13-1a).

Land in the Industrial Corridor surrounding the RCEC site and its ancillary facilities has been developed at varying levels of intensity. Manufacturing facilities, fabrication shops, warehouses, trucking operations, and automotive salvage yards are all located in this Industrial Corridor. The City of Hayward's Water Pollution Control Facility (WPCF) is located directly across Enterprise Avenue from the project site some of the industrial parcels in the vicinity of the site are open in character and used as truck terminals or for equipment storage. Many of the manufacturing and warehouse facilities are housed in relatively new, one-story tilt-up structures surrounded by industrial park-style landscaping. As a result of the City's implementation of its landscaping and street tree requirements over the years, some of the streets in the Industrial Corridor are lined with mature trees and front setback landscaping that create a sense of visual enclosure along the streets and a sense of visual unity. Photo 1 on Figure 8.13-2a, the view west down Enterprise Avenue from Clawiter Road, provides a typical view of the existing landscape in the Industrial Corridor in the general vicinity of the RCEC site. Although much of the development in the Industrial Corridor is horizontal in character, consisting of one and two story buildings, there are a number of prominent vertical features as well. The RCEC site itself is now occupied by the KFAX radio station's four, 228-foot high radio broadcasting towers (Photo 2, Figure 8.13-2a).

The Rohm and Haas paint polymer facility, located approximately 0.25 miles southeast of the site, has a 180-foot high stack (Photo 3, Figure 8.13-2a). Photo 4 on Figure 8.13-2a is a view from Whitesell Street near Breakwater Avenue, looking toward the radio towers now located on the project site. This viewpoint is adjacent to the Rohm and Haas facility, which is successfully hidden by the dense shrub hedge along the east (right) side of the street.

The baylands to the west of the Industrial Corridor and RCEC site are open in character. A large portion of the baylands northwest of the RCEC site is used for sewage oxidation ponds owned and operated by the City of Hayward. In addition, large areas consist of fresh and brackish water marshlands and mudflats supporting stands of tall cord grass. Much of the land in the baylands area is managed for wildlife protection and visitor access by the East Bay Regional Park District and the Hayward Area Recreation (HARD) District. Visitor facilities include the Hayward Shoreline Interpretive Center and a system of walking and biking trails through the area. Portions of the trail system in the baylands are a part of the Bay Trail, a network of multi-use pathways that when complete, will circle San Francisco and San Pablo Bays. At present, the segments of the Bay trail on the south side of State Route 92 are linked to those on the north side by way of the sidewalks on the Clawiter Road overpass. Caltrans has developed plans to construct an overpass over State Route 92 for the exclusive use of pedestrians and bicyclists that is intended to provide an improved linkage between the trail's northern and southern segments. The overpass will extend from the end of Point Eden Way on the south side of the highway to the area at Breakwater Way and Johnson Road on the north side. Engineering drawings for this project are now under review, and completion is expected within two years (Bauman 2001). Figure 8.13-4a is a view across the baylands toward the RCEC site as seen from the Hayward Shoreline Interpretive Center, which is managed by HARD. Figure 8.13-5a is a view across the baylands toward the RCEC site from a pedestrian bridge crossing one of the mud flat areas. The baylands serve as one of the major entrances to Hayward in that they are crossed by State Route 92, a freeway connecting the east and west sides of the bay. Eastbound travelers on the eastern portions of the Hayward-San Mateo Bridge and on the portions of the highway to the east of it are able to look across the open baylands to see the city on the bay plain and in the hills beyond. Figure 8.13-6a is a view from State Route 92 at the Hayward-San Mateo Bridge toll plaza, with the baylands in the foreground and middleground, and the city of Hayward and the East Bay hills beyond.

8.13.1.2 Project Site and Linear Corridors

RCEC Plant Site

The 14.7-acre power plant site is essentially level, with elevations ranging from approximately 5 to 12 feet above sea level. Photo 2 on Figure 8.13-2a is a view of the site as seen from its northwest corner along Enterprise Avenue. Photo 5 on Figure 8.13-2b is a view toward the site as seen from its southeast corner along Whitesell Street. The western portion of the site is generally open in character. It is surrounded by a chain link fence, and the ground surface is vegetated with low-growing grass and weeds. The most important structures on this portion of the site are the four, 228-foot tall radio towers, which are painted in alternating red and white bands. In addition, there is also a small one-story building on this portion of the site. The eastern portion of the site, which fronts along Whitesell Street, is now used by Runnels Industries for a sand blasting and painting operation. The visual elements most prominent on this portion of the site include a collection of one-story metal sheds of various designs, and piles of metal components. A billowing fabric that hangs from the high chain link fence along Whitesell Street has apparently been installed to confine stray sand and paint. Near the right edge of Photo 5, a portion of one of the large tanks in the City's WPCF on the north side of Enterprise Avenue can be seen.

At present, Whitesell Street is a two-lane street that extends for just the relatively short distance between Breakwater Road and Enterprise Avenue. In the longer run, the City of Hayward has plans to convert Whitesell Street into a four-lane boulevard connecting through the current Water Pollution Control Facility with Cabot Boulevard to the north and tying into State Route 92 at a new interchange. This widened and extended street would be part of a four-lane boulevard that would loop through the Industrial Corridor. When built, Whitesell Street will be an at-grade, four lane-boulevard with a landscaped median strip that occupies an 84 foot wide right-of-way.

Electric Transmission Line—The alignment of the proposed transmission line is indicated on Figures 1-2 and 8.13-1a and b. This route extends from a takeoff structure located at the east end of the switchyard, and travels eastwards for about 600 feet before reaching the existing Grant to Eastshore 115-kV transmission line. A portion of this line will be rebuilt to accommodate the additional 230-kV circuits between Enterprise Avenue and the PG&E Eastshore Substation. Photo 6 on Figure 8.13-2b is a view of the existing Grant to Eastshore line tower located on the north side of Enterprise Avenue, to the northeast of the site. The 1.1-mile portion of the Grant-Eastshore alignment that will be affected by the RCEC passes through industrial properties, where the right-of-way has been integrated into parking lots and outdoor storage areas. The most visible portion of the affected Grant-Eastshore alignment is at its crossing of State Route 92. Figure 8-13.9a is a view of the Grant-Eastshoreline as seen from eastbound State Route 92.

Natural Gas Pipeline—Natural gas will be supplied by a pipeline that will extend for a distance of approximately 0.9 mile from an existing pipeline located along the Union Pacific Railroad corridor east of Clawiter Road. The pipeline route is indicated on Figure 1-2. The pipeline will be located on street right-of-ways and on industrial properties. Since the pipeline will be buried underground, it will not be visible.

Wastewater Return Pipeline—The wastewater return line will be underground. See Section 7.3 for details. Since this pipeline will be underground and because surface conditions will be restored after their construction, the pipeline will not produce any impacts on visual resources.

AWT plant

The cooling water and process water makeup used at the RCEC will consist of secondary effluent discharge water that will be supplied by the City of Hayward's WPCF located directly across Enterprise Avenue from the project site. This water will be delivered from WPCF to the new advanced wastewater treatment plant (AWT) at the project site by means of a short segment of pipeline that will follow the route indicated on Figure 2.3-2. Cooling tower blowdown will be discharged to the head works of the City's WPCF by means of a forced main that will parallel the secondary effluent discharge water supply pipeline. The City of Hayward will supply potable water for drinking and sanitary use on site from the existing water main in Enterprise Avenue. Since these pipelines will be located underground and because surface conditions will be restored after their construction, the pipelines will not produce any impacts on visual resources.

8.13.1.3 Potential Project Site Visibility

Figures 8.13-2a and b provide a generalized indication of the project viewshed, that is, the areas from which the RCEC, AWT plant and transmission line are likely to be visible. Since the proposed natural gas and water pipelines would be entirely underground and thus not visible, these project elements were not considered in creating this viewshed map.

Identification of the project's viewshed was based on review of project engineering drawings, visual simulations of the project's appearance from six representative viewpoints, study of topographic maps and air photos, and extensive field observations. The viewshed map indicates two categories of view areas: (1) those in which the RCEC site and its ancillary facilities are likely to be generally visible; and (2) those in which views toward the project site and its ancillary facilities are likely to be blocked for the most part, but may be visible from certain specific locations. In areas to the northwest, west, and southwest of the project site, where there are open views toward the RCEC site across the baylands, the proposed project facilities have the potential to be visible over long distances. However, as a practical matter, the boundaries of the viewshed were set at 3 miles from the plant in directions where views were not otherwise blocked by buildings, trees, or other obstructions. This distance was selected because elements of a view that are 3 miles or more from the viewpoint are considered part of the background—the landscape zone in which little color or texture is apparent, colors blur into values of blue or gray, and individual visual impacts become least apparent (USDA Forest Service 1973, pp. 56-57).

Project facilities will be most visible in views across the baylands, including views from the Hayward-San Mateo Bridge, the Hayward Regional Shoreline, and the Hayward Shoreline Interpretive Center. The facilities will be intermittently visible from the industrial areas to the north, south, and east. In some cases, the taller elements will be visible above buildings, fences, and trees. In other cases, views of the project features will be completely blocked by intervening structures and vegetation. Project features will not be substantially visible from the commercial and residential areas to the east of the Industrial Corridor, in the area to the east of Clawiter Road and Industrial Boulevard. In this area, almost all views toward the site will be blocked by intervening structures.

8.13.1.4 Sensitive Viewing Areas and Key Observation Points

To assess the RCEC's and AWT plant's potential impacts on visual resources, (this combination of facilities herein after referred to as the RCEC site) the view areas most sensitive to the project's potential visual impacts were identified and, in consultation with CEC staff, seven Key Observation Points (KOPs) were selected for detailed analysis. For all of these KOPs, photo simulations were developed to serve as a basis for visualizing the project's potential effects. In evaluating the sensitivity of the viewing areas potentially affected by the project, consideration was given to distance from the project site, number of viewers, and the presence of recreational or residential uses. The potentially sensitive viewing areas selected for analysis are indicated on Figures 8.13-1b, and the views from the KOPs are described below.

In responding to the CEC's requirement that an assessment be made of the visual quality of the landscapes potentially affected by the project, the discussion of the views seen from the KOPs includes ratings of the visual quality of the landscapes. These ratings were developed based on a series of in-field observations carried out during the months of February through April 2001, review of photos of the area, review of local planning documents, review of methods for assessment of visual quality, and review of research on public perception of the environment and scenic beauty ratings of landscape scenes. The final assessment of the visual quality of the views from each of the KOPs was made based on professional judgement, taking into consideration a broad spectrum of landscape assessment factors in a holistic way. Factors considered included an evaluation of:

- Natural features, including topography, water courses, rock outcrops, and natural vegetation
- Positive and negative effects of man-made alterations and structures on visual quality
- Visual composition, including assessment of the complexity and vividness of patterns in the landscape
- Spatial organization, including assessment of criteria such as perceived accessibility, mystery, enclosure, scale, image, refuge, prospect, and contemplation

The relevance of these factors for landscape evaluation has been established by landscape perception and assessment research over the past 20 years. Based on these considerations, a group of landscape scholars at Virginia Technical University (Buhyoff et al., 1994) developed landscape quality ratings, specifically, the six landscape quality classes listed in Table 8.13-1. This scale provides a strong framework for qualitative ratings because it is based on findings of the full range of available research on the ways in which the public evaluates visual quality. In addition, the scale has a common-sense quality and is easily understood because it defines landscape quality in relative terms, contrasting landscapes that are low, below average, average, above average, high, and outstanding in visual quality.

KOP 1—Office/Industrial Facility Located Immediately South of the RCEC Site

Figure 8.13-3a represents the view from KOP 1. This viewpoint was selected to represent views toward the RCEC site from the office/industrial facility located immediately south of the site. This viewpoint is located in the 200-car parking lot of the facility, at a point adjacent to the pathway that provides access to the facility's rear entrance and to an outdoor patio area. This point is approximately 500 feet from the project site's southern property line. This view is seen primarily by the occupants of the office/industrial facility as they walk to and from their cars and as they drive their cars into and out of the parking lot. Although the adjacent one-story office/industrial building has window bands on its north side that face toward the project site, the views toward the RCEC site are in many cases blocked by large trees located directly in front of the windows. The sensitivity of this view is considered to be moderately low at most in that the view is seen by a moderate number of people who are in a work environment located well within the boundaries of a large industrial corridor area that has a clearly industrial character.

From this viewpoint, the RCEC site is partially screened by white plastic slats that have been inserted into the chain link fence bordering the northern edge of the parking lot. The most visually prominent elements in this view are the four, 228-foot high, red and white-banded radio broadcast towers that now occupy much of the project site. In addition, the long, blank east wall of the one-story warehouse building to the west of the RCEC site is highly visible. The tops of the trees lining Enterprise Avenue in front of the City of Hayward Water Pollution Control Facility directly across the street from the RCEC site can also be seen, as well as small portions of some of the domes and tanks in the Water Pollution Control Facility. Due to this view's lack of topographic variation, its lack of significant vegetation, the presence of the tall radio towers, and the warehouse and sewage treatment facilities, the visual quality can be classified as low.

KOP 2—Hayward Shoreline Interpretive Center

Figure 8.13-4a represents the view from KOP 2, which was selected to represent views toward the RCEC site from the Hayward Shoreline Interpretive Center and nearby areas of the Hayward Shoreline Marsh.

The Interpretive Center (Photo 7 on Figure 8.13-2b) is located on Breakwater Avenue in the baylands 0.73 mile to the southwest of the project site. This facility was built in 1986 by the Hayward Area Recreation and Park District, the special use district that provides park and recreation services to Hayward and the adjacent unincorporated communities of San Lorenzo and Castro Valley. The center has exhibits related to the bay and bayland ecosystems, provides ecological education programs for school children, and serves as a staging area for visitors using the network of hiking and biking trails in the adjacent Hayward Shoreline Marsh and Hayward Regional Shoreline. One of the segments of the San Francisco Bay Trail, a regional system of trails that circle the San Francisco and San Pablo Bays, passes by the Interpretive Center and travels north along the bayshore through the Hayward Shoreline open space lands.

The Interpretive Center building is surrounded by elevated wooden decks that provide vantage points for views across the baylands and space for outdoor educational activities. The view represented in Figure 8.13-4a was taken from the deck area directly in front of the main entrance to the Interpretive Center. At present, the Interpretive Center's programs serve approximately 4,500 school children per year who come to the center with their classes for special programs, 1,000 members of the general public who participate in weekend programs at the center, and an additional 9,000 members of the public who drop into the center as part of a visit to the Shoreline to use the trails (Koslosky 2001). Since the center and surrounding baylands are visited by a moderately large number of people, the focus of the activities at this location is to observe and appreciate nature, and the facility is designed to provide views across the baylands, the sensitivity of the view from this KOP can be considered to be high.

The major elements in the existing view include the expanse of open wetlands in the foreground and near middleground, the KFAX radio broadcast towers and a band of large, rectangular industrial buildings in the far middleground, and the ridges of the East Bay hills in the background. Mount Diablo, visible in the far distance, is a regional landmark, and serves as a focal point in this view. Due to the openness of the natural appearing landscape in the foreground of the view, the topographic interest provided by the distant hills, and the specific visual interest provided by the view of Mount Diablo, the quality of this view can be rated as moderately high. This view is not rated as having high visual quality for a number of reasons, including the presence of the radio towers and the large, boxy, and highly contrasting warehouse structures. Although not visible in this photograph, the 180-foot high stack of the Rohm and Haas facility would be visible to viewers in the area just beyond the right side of the photograph presented in Figure 8.13-4a.

KOP 3—Hayward Shoreline Footbridge at Cogswell Marsh

KOP 3 was selected to represent views toward the RCEC site from the trail system in the Hayward Regional Shoreline. Figure 8.13-5a is a photograph of the view taken from the footbridge that crosses Cogswell Marsh. This viewpoint is located approximately 1 mile to the northwest of the project site. The trails in the Hayward Regional Shoreline receive heavy use by walkers, runners, and bicyclists, and the East Bay Regional Park District estimates that the area is visited by 200 to 250 people per day. Since the trails in the Hayward Regional Shoreline are heavily used and are intended for recreation and to provide opportunities for the observation, understanding, and appreciation of the natural environment, the views from this area can be considered to have a high level of sensitivity.

Table 8.13-1. Landscape visual quality scale used in rating project area viewsheds.

Rating	Explanation
Outstanding Visual Quality	A rating reserved for landscapes with exceptionally high visual quality. These landscapes are significant nationally or regionally. They usually contain exceptional natural or cultural features that contribute to this rating. They are what we think of as "picture post card" landscapes. People are attracted to these landscapes to view them.
High Visual Quality	Landscapes that have high quality scenic value. This may be due to cultural or natural features contained in the landscape or to the arrangement of spaces contained in the landscape that causes the landscape to be visually interesting or a particularly comfortable place for people. These are often landscapes which have high potential for recreational activities or in which the visual experience is important.
Moderately High Visual Quality	Landscapes which have above average scenic value but are not of high scenic value. The scenic value of these landscapes may be due to man-made or natural features contained within the landscape, to the arrangement of spaces in the landscape or to the two-dimensional attributes of the landscape.
Moderate Visual Quality	Landscapes that have average scenic value. They usually lack significant man-made or natural features. Their scenic value is primarily a result of the arrangement of spaces contained in the landscape and the two-dimensional visual attributes of the landscape.
Moderately Low Visual Quality	Landscapes that have below average scenic value but not low scenic value. They may contain visually discordant man-made alterations, but the landscape is not dominated by these features. They often lack spaces that people will perceive as inviting and provide little interest in terms of two-dimensional visual attributes of the landscape.
Low Visual Quality	Landscapes with low scenic value. The landscape is often dominated by visually discordant man-made alterations; or they are landscapes that do not include places that people will find inviting and lack interest in terms of two-dimensional visual attributes.

Note: Rating scale based on Buhyoff et al., 1994.

The major elements in this view include the expanse of open water and wetlands in the foreground and near middleground, the KFAX radio towers, the Rohm and Haas stack, the band of large, boxy industrial buildings in the far middleground, and the ridges of the East Bay hills in the background. Due to the openness of the natural appearing landscape in the foreground of the view and the topographic interest provided by the distant hills, the quality of the view from this viewpoint can be rated as moderately high. This view is not rated as having high visual quality because of the presence of the KFAX radio broadcast towers, the Rohm and Haas stack, and the large, boxy, and highly contrasting warehouse structures.

KOP 4—State Route 92 at Toll Plaza

Figure 8.13.6a represents the view from KOP 4, located on State Route 92 at the toll plaza at the east end of the Hayward-San Mateo Bridge, 1.44 mile to the southeast of the project site. This viewpoint is representative of the views experienced by travelers as they head east across the bridge and continue eastwards on State Route 92 through the open baylands landscape. The Average Daily Traffic (ADT) for

State Route 92 in this area is 93,000 vehicles per day in the east bound lanes and 85,000 vehicles per day in the west bound lanes. The RCEC site is detectable within the cone of vision of travelers from about the midpoint of the span up until a point about 0.35 mile west of the Clawiter Road off-ramp. The Urban Design chapter of the City of Hayward's General Policies Plan designates the eastern foot of the Hayward-San Mateo Bridge as a community "gateway" and recommends providing "suitable landmarks or entry features" at gateway areas. Due to the site's visibility to large numbers of viewers using the State Route 92 corridor and because of this area's location at a major entry to the city that has been given formal recognition in the city's urban design plan, views from this KOP can be considered to have a high level of visual sensitivity.

As suggested by Figure 8.13-6a, the near foreground of the view experienced by eastbound travelers is dominated by the roadway, the road divider, and the dense concentrations of vehicles using both the eastbound and westbound lanes. The open expanses of natural-appearing baylands are visible in the far foreground and middleground. The line of large, rectangular industrial buildings, the KFAX radio broadcast towers, and the Rohm and Haas stack are visible in the far middleground, and the ridgeline of the East Bay hills and Mount Diablo provide the backdrop to the view. The presence of the natural-appearing baylands and the hills in the backdrop create a degree of visual interest, but because of the dominance of the roadway elements in the foreground, and the presence of large industrial structures in the middleground, the visual quality of this view would have to be rated as moderate at most.

KOP 5—Cabot Boulevard at Depot Road

Figure 8.13-7a represents the view from KOP 5, a viewpoint located on Cabot Boulevard at its T-intersection with Depot Road. This viewpoint lies approximately 0.38 mile from the northern boundary of the RCEC site. This viewpoint was selected to represent views toward the RCEC site from the portions of the Industrial Corridor directly to the north. From most of the industrial facilities in this area, views toward the RCEC site appear to be screened to a large degree by industrial buildings and by the plantings in their setback areas. To the extent that the RCEC and its ancillary facilities would be visible, they would have the highest probability of being seen from the southern end of Cabot Boulevard and from parallel north-south streets (Foley Street and Connecticut Street) that provide open view corridors oriented toward the project site. Since the views toward the site from this area would be seen by people engaged in work or traveling to and from industrial facilities located in the midst of a large zone set aside for exclusive industrial use, the visual sensitivity of these views would have to be considered to be low.

Views toward the RCEC site from the viewpoint of Figure 8.13-7a are substantially blocked by the screening wall that surrounds the auto salvage yard located along the south side of Depot Road. One of the structures in the auto salvage yard is visible, along with the tops of the radio towers located on the project site. The visual quality of this view is low.

KOP 6—Residential Areas East of Industrial Boulevard

The closest residences to the site are 0.82 mile to the east of Industrial Boulevard. Residences in this area include the Waterford apartment complex, and a dense cluster of two and three story apartment buildings in a heavily landscaped setting that extends from Industrial Boulevard to an area west of Mount Eden Cemetery along Depot Road. From this apartment complex, ground level views toward the RCEC site are blocked by large industrial structures to the west of Industrial Road, as well as by the complex's own buildings and landscaping. It is conceivable that the project could be visible to some degree from third story units located along the complex's western edge. However, because of the large trees located directly in front of the apartment buildings in this area (Photo 8 on Figure 8.13-2b), any potential views toward the RCEC site would be screened to a large degree during much of the year.

North of Depot Road and east of Industrial Boulevard is an area of mixed residential uses. It includes older single family homes on large lots that are remnants from the time when this was a semi-rural unincorporated area, as well as small clusters of dense town homes and single family tract homes that have been developed in more recent years on infill parcels. From most of this area, views toward the RCEC site and the radio towers are completely blocked by foreground buildings and vegetation. In a few small pockets where the density is low, there are views between houses or across open areas in which the tops of the KFAX radio towers can be seen. One of these places is an area along Laguna Drive west of Mohr Drive where the presence of a low density area on the south side of the street permits views toward the site and the KFAX radio towers. This viewpoint has been designated as KOP 6, and the view from this area is presented in Figure 8.13-8a. This view can be seen from the areas in front of and around approximately 12 residences in this area. This view may also be visible from second story windows of a number of the town homes located on the north side of Laguna Drive. Since KOP 6 is the view from a residential area, the visual sensitivity is high.

As is evident in Figure 8.13-8a., the dominant elements in the view are the two older single family residences on large lots. The tops of the radio towers on the RCEC site are barely detectable against the sky in the far distance. This view would be rated as moderate in visual quality.

KOP 7—Electric Transmission Line Crossing of State Route 92

For most of its length, the portion of the Grant-Eastshore 115-kV line that will be rebuilt travels across industrial properties where it is not readily visible to the general public. The major exception is at the point where the transmission line crosses State Route 92, where it is seen by the occupants of 93,000 eastbound vehicles per day that travel this segment of roadway. This KOP was selected to represent views toward the Grant-Eastshore transmission tower located on the south side of State Route 92 at the Clawiter Road intersection. The viewpoint is located just west of the Clawiter Road off-ramp and captures the view of the transmission tower as it is seen by eastbound travelers. In several years, when the Bay Trail pedestrian/bicycle overpass planned for the area 2,600 feet to the west of the transmission line and 1,110 feet west of this viewpoint is complete, users of the overpass will have a view that is somewhat similar to the one that this KOP represents. The view from this KOP is presented in Figure 8.13-9a. Since the transmission tower is visible well within the cone of vision of large numbers of travelers on the highway, and since views are sometimes of long duration because of traffic back-ups, and because the transmission tower will be seen in the middleground of views from the future pedestrian overcrossing, this view can be considered to have a moderately high level of sensitivity.

As suggested by Figure 8.13-9a, the hills in the background and several clusters of trees along the edge of the highway provide a modest level of visual interest, but on the whole, the landscape visible in this view is one in which infrastructure elements, including the State Route 92 roadway, the Clawiter Road overpass, and the existing 120 foot high transmission tower are visually dominant. Visual quality of this view would have to be rated as moderately low.

8.13.2 Environmental Consequences

8.13.2.1 Analysis Procedure

This analysis of visual impacts potentially caused by the RCEC is based on field observations and review of the following information: local planning documents, project maps and drawings, photographs of the project area, computer-generated visual simulations from each of the KOPs, and research on design measures for integrating electric facilities into their environmental settings.

Photographs are presented to represent the "before" conditions from each KOP. Visual simulations were produced to illustrate the "after" visual conditions from each of these points, providing the viewer with a clear image of the location, scale, and visual appearance of the proposed project. The "before" photos and the simulations of the "after" conditions are presented as pairs to facilitate comparison. The computer-generated simulations are the result of an objective analytical and computer modeling process described briefly below. The images are accurate within the constraints of the available site and project data. Site reconnaissance was conducted to view the site and surrounding area, to identify potential key viewpoints, and to take representative photographs of existing visual conditions. A single lens reflex (SLR) 35 mm camera with a 50 mm lens (view angle 40 degrees) was used to photograph the sites.

For the views from the KOPs, computer modeling and rendering techniques were used to produce the simulation images. Existing topographic and site data provided the basis for developing an initial digital model. Project engineers provided site plans and digital data for the proposed generation facility, and site plans and elevations for the components of the transmission system. These were used to create three-dimensional (3-D) digital models of these facilities. These models were combined with the digital site model to produce a complete computer model of the generating facility and portions of the overhead transmission system.

For each viewpoint, a viewer location was digitized from topographic maps and scaled aerial photographs, using five feet as the assumed viewer eye level. Computer "wire frame" perspective plots were then overlaid on the photographs of the views from the KOPs to verify scale and viewpoint location. Digital visual simulation images were produced as a next step based on computer renderings of the 3-D model combined with high-resolution digital versions of base photographs. The final "hardcopy" visual simulation images that appear in this AFC document were produced from the digital image files using a color printer.

8.13.2.2 Significance Criteria

Analysis of the project's impacts was based on evaluation of the changes to the existing visual resources that would result from construction and operation of the RCEC. An important aspect of this analysis was evaluation of the "after" views provided by the computer-generated visual simulations, and their comparison to the existing visual environment. In making a determination of the extent and implications of the visual changes, consideration was given to:

- The specific changes in the affected visual environment's composition, character, and any specially valued qualities
- The affected visual environment's context
- The extent to which the affected environment contains places or features that have been designated in plans and policies for protection or special consideration

- The numbers of viewers, their activities, and the extent to which these activities are related to the aesthetic qualities affected by the likely changes

To make the determination of whether the project's visual effects would be "significant" under the provisions of the California Environmental Policy Act (CEQA), reference was made to Appendix G of the State CEQA Guidelines. The CEQA Guidelines define a "significant effect" on the environment to mean a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including...objects of historic or aesthetic significance" (14 CCR, § 15382). Appendix G of the Guidelines, under Aesthetics, lists the following four questions for lead agencies to address:

- Would the project have a substantial adverse effect on a scenic vista?
- Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?
- Would the project substantially degrade the existing visual character or quality of the site and its surroundings?
- Would the project create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

8.13.2.3 RCEC and Advanced Wastewater Treatment Plant

The features of the 600-MW (nominal gross output) natural gas-fired combined-cycle generating facility and the electrical switching station associated with it are described in detail in Chapter 2.0, Project Description. Figure 2.2-1 is a plan that indicates the layout of the power plant, advanced wastewater treatment plant, and switching station features on the site. Figures 2.2-2a and 2.2-2b provides typical elevation views. Table 8.13-2 summarizes the equipment dimensions of the RCEC's major features.

Most of the power plant's water needs will be met through use of wastewater provided by the City of Hayward's WPCF. To make this water suitable for power plant use, it will be given tertiary treatment in an advanced wastewater treatment (AWT) plant to be located adjacent to the power plant. The location of this facility is indicated on Figure 2.3-1. The AWT plant is described in Chapter 7. In general, the advanced wastewater treatment plant will have a low profile. The dimensions of its larger elements are indicated on Table 8.13-2.

Electrical Transmission System

The transmission system associated with the proposed project is described in Chapter 6. The transmission conductors will leave the switching station using a 108-foot high pull-off structure. From the pull-off structure the first span of conductors will travel a short distance northeast to a 115-foot high turning structure adjacent to Grant-Eastshore transmission line in the area east of the City of Hayward WPCF. This portion of the Grant-Eastshore line from this point south to the Eastshore Substation will be rebuilt, and the existing lattice steel towers that carry two 115-kV circuits will be replaced with tubular steel H-frame towers that carry two new 230-kV circuits as well as the two existing 115-kV circuits. Diagrams of the tower types that will be used are shown in Figures 6.2-4 and 6.2-6 and 6.2-8).

Table 8.13-2. RCEC equipment dimensions.

Feature	Height (feet)	Length (feet)	Width (feet)	Diameter (feet)
HRSG Units				
To top of HRSG casings	72			
To operating decks	90			
To top of highest drums	101			
To top of top works support steel	116			
To top of highest relief valves and vent	122			
HRSG stacks	145	16	16	
Gas Combustion Turbines				
Gas combustion turbines	32	30	23	
Gas turbine air inlet filters	42	40	25	--
Steam Turbine Generator				
STG enclosure	38	75	20	
Cooling Tower (10 cells)		473	cell=48	30 (ea. cell)
Top of cones	64		basin=56	
Architectural Screening Structures				
"Wave" enclosure for HRSGs and stacks	135	222	180	
Cooling tower enclosure	62	500	85	
Tanks				
Demineralized water storage tanks	25	--	--	25
Buildings Along Whitesell Street				
Administration and Control, Warehouse, and Water treatment Building	25	260	75	
Gas compressor building	16	60	30	
Switchyard				
switchyard bus structures	34	25	--	
conductor take-off structures	72	42	--	
north switchyard control building	25	24	23	
south switchyard control building	25	50	23	
Advanced Wastewater Treatment Plant				
microfiltration canopy	20	145	34	
reverse osmosis canopy	20	145	44	
chemical and dewatering area	20	102	47	
lime silo	47			18
sludge loading bay	42	65	24	
final product water storage tanks (2)	36			100

The new transmission structures will be given a neutral gray finish that will minimize reflectivity, be harmonious with the colors of the nearby power plant structures and industrial buildings, and help minimize their contrast with the sky backdrop.

Natural Gas, Water Supply, and Wastewater Return Pipelines

The design features of the natural gas and water supply pipelines that would be built to serve the project are described in Sections 5.0 and 7.0, respectively. The locations of these pipelines are indicated on Figures 1-2 and 2.3-2. Since these lines would be buried and the surface conditions restored, the lines themselves would not be the source of long-term changes to the visual environment. Any noticeable visual effects associated with the pipelines would be restricted to the construction phase. During construction, the area along the rights-of-way would be temporarily disrupted by machinery, excavated piles of dirt, construction vehicles, and other disturbances associated with pipeline construction. However, these effects would be minor and temporary, and would not be significant.

Construction Lay Down Area

As detailed in Section 2.2.15, construction of the project from site preparation and grading to commercial operation is expected to take place during an 18 to 21-month period extending from the summer of 2002 to the summer of 2004. During the construction period, three areas may be used for laydown of equipment and parking for construction workers. One of the areas is a 10-acre site located north of the project on Depot Road. Another is the four-acre site on the east side of Whitesell Street and south of Enterprise Avenue that is now used as a truck terminal. A third is the vacant land around PG&E's Eastshore Substation.

Architectural Treatment

In recognition of the RCEC's location near the edge of the baylands where it has high visibility and at the State Route 92 gateway to Hayward, Calpine/Bechtel has made a commitment implement an architectural treatment that will increase its attractiveness and make it a landmark visual element at the city's western entry. To develop an appropriate architectural treatment, Calpine/Bechtel made use of the services of an international architectural firm specializing in design of power plants and other major infrastructure facilities. In developing the proposed design, Calpine/Bechtel consulted with City staff and elected officials. The design treatment selected for the power plant is presented in Figure 8.13-10 and is visible in the simulations prepared for each of the KOPs. The design scheme being applied makes use of a tubular steel space frame around the HRSG units and HRSG stacks and another space frame around the cooling tower. An open stainless steel mesh will span the members of these space frames, creating a semi-transparent to opaque surface that will, under some lighting conditions, screen the plant's equipment, and under others, reveal it. The intent of the space frame and mesh is to simplify the complexity of the plant's equipment and create a unified visual element that has a sculptural quality. The screen around the power plant has a "wave" shape intended to create a sense of motion and to serve as a distinctive landmark element. The side mesh panels on the "wave" structure span between front and back structural chords, creating a three-dimensional, louvered effect. The bowed space frame around the cooling tower creates an object with curved lines that complement the curves of the adjacent "wave" structure. This space frame also hides the cooling tower cones that would otherwise appear to protrude above the structure. The tubular steel members of the space structures will be painted blue, the stainless steel mesh will have a brushed finish that is non-reflective, and the power plant and switching station equipment will be finished using a palette of soft grays and blue-grays. The one-story buildings housing the facility's administrative offices, warehouse, and water treatment laboratory and fronting on Whitesell Street will be given an appropriate architectural treatment that will be consistent with the design of the project's larger features and which will comply with the City of Hayward's architectural design guidelines for industrial districts.

Landscaping

The layout of the project facilities on the site and the design of the project landscaping take into account the future widening of Whitesell Street and its conversion into a four-lane boulevard. In determining the setback required along Whitesell, the edge of the widened street right-of-way was used as the point of reference. In areas along the perimeter of the site that front on streets, standard street trees will be planted to comply with the requirements of the City of Hayward's zoning ordinance and to provide for a continuation of the Industrial Corridor's tree canopy. The canopy created by the street trees will block views toward stacks, antennas, and other tall features from nearby areas and will integrate the project into the overall visual composition of the area. In the corridor along Whitesell Street, the setback area in front of the long, one-story structure housing the administrative offices and other functions will be landscaped with a mixture of trees, shrubs, and groundcovers to create a visually engaging composition in views from the existing two lane road and the proposed future boulevard. On all the other sides of the site, with the exception of the area that lies between the advanced water treatment plant and the warehouse structure to the west, a border of tall, fast-growing broadleaf trees will be planted to provide maximum screening of views toward the site.

Lighting

The RCEC will require nighttime lighting for operational safety and security. To reduce any offsite impacts of this requirement, lighting at the facility will be restricted to areas required for safety, security, and operation and will be turned off in areas where personnel are not present. Exterior lights will be hooded, and lights will be directed onsite so that significant light or glare will not be created. Fixtures of a non-glare type will be specified.

Visible Plumes

The process of condensing the steam used in generating power in the steam turbine generator can cause the formation of visible water vapor plumes above the cooling tower during periods of cold weather and high humidity. To eliminate this effect, the RCEC will employ a special plume-abated cooling tower design that will eliminate visible plumes except during the most extreme cold weather. This technology is referred to as a "wet/dry" cooling tower, which incorporates an air-cooled or "dry" heat exchanger section along with the conventional wet evaporative cooling section. The dry heat exchanger typically consists of finned tubes, with the warm circulating water passing through the tubes and the ambient cooling air passing over the exterior finned surface of the tubes. The combination of evaporative and non-evaporative heating results in reduction of the relative humidity of the air leaving the wet/dry cooling tower. Since the relative humidity is reduced below the saturation point, the water vapor in the plume will not condense before it mixes with the drier ambient air and therefore will not be visible.

Plume abatement capability for a maximum allowable plume length is specified to be effective for any condition less severe than the winter design point, defined by the ambient dry bulb temperature, relative humidity, cooling range, circulating water flow rate, and maximum and minimum cold water temperatures. The specific design conditions for the RCEC project will be developed to provide the plume abatement capability to restrict plume formation to so visible plumes occur only under the most extreme meteorological conditions. With the design being used for the HRSGs, water vapor plumes will not be seen emanating from the plant's HRSG stacks, under nearly any circumstances.

8.13.2.4 Assessment of Visual Effects

KOP 1—Office/Industrial Facility Located Immediately South of the Energy Center Site

Figure 8.13-3b represents the view of the completed project as it will appear from KOP 1, ten years after completion of construction and installation of the perimeter landscaping. As this simulation suggests, the plant will be clearly visible from the parking lot of the office/industrial facility located immediately south of the site and will become the major element in the foreground of the view. The project will substantially change the existing view. The broadcast towers will be removed, and what is now a generally open view of the sky will be blocked to a large degree by the screened power plant structures and by the tall trees planted along the southern edge of the energy center site.

Although the character of this scene will change substantially, the overall quality of the view, which as indicated previously is now low, will not be changed. The case can be made that, because of the architectural quality of the screening structures and the addition of the row of trees, the view's level of visual interest and visual quality will be improved.

KOP 2—Hayward Shoreline Interpretive Center

Figure 8.13-4b is a simulation of the view toward the project from KOP 2 at the Hayward Shoreline Interpretive Center. This simulation represents the view of the completed project as it will appear from KOP 2 ten years after the installation of the perimeter landscaping.

As this simulation indicates, the KFAX radio broadcast towers now visible on the RCEC site will no longer be a part of the view. Instead, the low vertical structure screening the cooling tower will be visible in the area from which the broadcast towers now rise to the sky, and the tall "wave" structure surrounding the HRSG units and stacks will be visible in the area to the right of the space that the radio towers now occupy. The screening structure around the cooling tower will only be partially visible because of the screening provided by the trees that will be planted along the site's perimeter. Due to its moderate height, horizontal form, tree screening of its lower half, and a background consisting of the distant hills, the cooling tower screening structure will blend well into the view, which already includes a number of horizontal structures that are generally similar in scale. In spite of the project's 0.70-mile distance from this viewpoint, the screening structure around the HRSGs, HRSG stacks, and other major project features will appear as a large and visually prominent element in the view. The vertical form of this screening structure will contrast with the other, largely horizontal elements in the view. Since this structure extends above the hill backdrop, the structure's top portion will be seen against the sky, increasing its visual salience. The structure's visual salience is further increased by its location in the line of sight toward Mount Diablo, which is now one of the points of interest in the view. Although the HRSG stacks are faintly visible behind the screen and the tops of the stacks extend slightly above the top of the structure, the screening structure succeeds in minimizing any industrial connotations that the facility might otherwise have, and rendering it as a more neutral sculptural element in the landscape.

The development of the project will change the composition of this view. At present, the view is one that has a strongly horizontal composition. The "wave" structure around the project's major components will become bulky and prominently visible vertical element, which will contrast with the horizontal trend of the existing scene. In addition, the view toward Mount Diablo will be replaced with a view of the "wave" structure's sculptural form.

The view visible from this KOP is now classified as moderately high on the visual quality scale. Due to the visual prominence of the project's "wave" screening structure in the line of sight toward Mount

Diablo and because of the visual contrast with the setting created by the "wave" structure's verticality, the presence of the generating facility will cause a reduction in the visual quality of this view. Although the visual quality of the view will be reduced to some extent, the change will not be so substantial as to lower the view's visual quality rating to "moderate" the rating class that applies to landscapes of average scenic value.

KOP 3—Hayward Shoreline Footbridge at Cogswell Marsh

Figure 8.13-5b is a simulation of the view of the RCEC as it will appear from KOP 3 at the footbridge crossing Cogswell Marsh in the Hayward Regional Shoreline. The KFAX radio broadcast towers that are currently faintly visible against the sky above the RCEC site will no longer be a part of the view. In their place, viewers will see the project's tall, curved "wave" screening structure, as well as the long, horizontal screening structure around the cooling tower.

Much of the screening structure around the cooling tower will not be visible because of the screening provided by the long warehouse building located west of the RCEC site, and because of the trees to be planted around the site's perimeter. Due to its moderate height, horizontal form, the screening of its lower half, and its visual integration into the hills behind it, the cooling tower screening structure will blend well into the view, which already includes a number of large horizontal structures. It is relevant to note that many of the long, horizontal warehouse and industrial structures now visible in this view have a higher degree of contrast with the backdrop than the RCEC cooling tower will have because of the light tones they are painted.

The "wave" screening structure around the HRSG and HRSG stacks will become the largest vertical element in the view. Although clearly visible, the "wave" structure achieves a good level of visual absorption into its setting because its lower portions are screened by the adjacent warehouse building and cooling tower screening structure, and its curved lines relate it to the lines of the ridges in the background. Also, it is seen against the backdrop of the hills rather than the sky, and the screening mesh creates a rough, dull texture that minimizes the structure's contrast with its backdrop. Even though the HRSGs and HRSG stacks are partially visible behind the screen and the tops of the stacks extend slightly above the top of the structure, the screening structure succeeds in minimizing any industrial connotations that the facility might otherwise have, and renders it as a more neutral sculptural element in the landscape. In addition, from this specific viewpoint, and from many others to the north of it, the "wave" structure will provide partial to full screening of views toward the 180-foot high stack at the Rohm and Haas plant.

Since the RCEC will have a good level of integration into its setting, will not "read" as an industrial facility, and will block views of the stack at the Rohm and Haas facility, it will not have an adverse effect on the visual quality of this view, which will continue to be classified as moderately high.

KOP 4—State Route 92 at Toll Plaza

Figure 8.13-6b is a simulation of the view of the RCEC as it will appear from KOP 4 in the eastbound lanes of State Route 92 at the toll plaza at the eastern end of the Hayward-San Mateo Bridge. This simulation depicts the project as it will appear with landscaping after 10 years of growth.

The radio broadcast towers that are currently faintly detectable against the sky above the RCEC site will no longer be a part of the view. In their place, viewers will see the side and front of the project's tall, curved "wave" screening structure, as well as the long, horizontal screening structure that surrounds the cooling tower.

The lower half of the screening structure around the cooling tower will not be visible because of the screening provided by the trees to be planted around the site's perimeter. Due to its moderate height, horizontal form, the screening of its lower half, and its visual absorption into the hills behind it, the cooling tower screening structure will blend well into the view, which already includes a number of large horizontal structures.

The "wave" screening structure around the HRSG, HRSG stacks, and other large project elements will become the largest vertical element in the view, but it will be shorter than the existing stack at the Rohm and Haas facility. Although the "wave" structure will be large and visible, when seen from this vantage point, it will achieve a good level of integration into its setting because its base will be screened by the trees to be planted around the site's perimeter, and its curved lines relate it to the lines of the ridges in the background. Also, it is seen against the backdrop of the hills rather than the sky, and the screening mesh creates a rough, dull texture that minimizes the structure's contrast with its backdrop. Even though the HRSGs and HRSG stacks are partially visible behind the screen and the tops of the stacks extend slightly above the top of the structure, the screening structure succeeds in minimizing any industrial connotations that the facility might otherwise have, and renders it as a more neutral sculptural element in the landscape. From this viewpoint, the dynamic, curved form of the "wave" structure will be evident, and will add to the structure's value as a distinctive and positive landmark that signifies the transition from the Bay crossing and open baylands to the developed portions of the city to the east.

Since the RCEC will integrate well into its setting, will not "read" as an industrial facility, and will play a role as a distinctive and attractive landmark, it will not have an adverse effect on the visual quality of this view, which is now classified as moderate on the Buhyoff visual quality scale.

KOP 5—Cabot Boulevard at Depot Road

Figure 8.13-7b is a simulated view toward the project from KOP 5 at the intersection of Cabot Boulevard and Depot Road. As this simulation indicates, the project will have relatively little effect on the view from this KOP. The radio broadcast towers now visible in this view will be removed, and in their place, a small portion of the RCEC will be visible. The tops of the stacks and the top portion of the back side of the "wave" screening structure around the HRSGs and HRSG stacks will appear in the area immediately above the fence surrounding the automobile salvage yard in the foreground of the view. The visual quality of the view from this KOP is currently rated as low and, with development of the project, the level of visual quality will not change.

KOP 6—Residential Areas East of Industrial Boulevard

No visual simulation is being presented for the view from KOP 6, the view from the residential area along Laguna Drive east of Mohr Drive. When the wire frame perspective plot of the project facilities was overlaid on the photograph of the view, it was determined that none of the project's features will extend above the foreground elements in the view, and that thus the project will not be visible from this KOP.

Although the project's features will not be visible from the ground level in this area, it is conceivable that the tops of the stacks and the "wave" structure may be visible from the windows on the second story of 8 or so homes on the north side of Mohr Drive. However, because of the distance (a little over 1.0 mile), and the complexity and developed character of the foreground and middleground, the project is not likely to have much of an effect on these views. The visual quality of views from this area, which are now classified as moderate, will not be affected.

KOP 7—Transmission Line Crossing of State Route 92

Figure 8.13-9b is a simulated view of the project's transmission line at the point where it crosses State Route 92 at the interchange with Clawiter Road. As this simulation indicates, the existing 120-foot high lattice steel transmission tower carrying the two 115-kV circuits of the Grant-Eastshore line will be removed, and replaced with a tubular H-frame tower that will carry the two 230-kV circuits required by the project as well as the existing 115-kV circuits. The new transmission tower will be the same height as the existing tower. Although the tower will carry more conductors than the existing structure, because it will have steel tube rather than lattice steel construction, it will not appear to be substantially more massive or more visually complex than the existing tower that it replaces. The overall effect of the rebuilt line on this viewpoint will be very small. There will be no change in the visual quality of the view seen from this KOP, which is now classified as moderately low.

Visible Plumes

The following results are based on computer modeling of a conventional cooling tower, and therefore overstate the potential for visible plumes. A plume-abated cooling tower will be constructed at the RCEC. The plume-abated cooling tower will be designed to prevent the formation of visible plumes under all but the most extreme meteorological conditions.

Under some circumstances, the a conventional cooling tower would produce visible plumes from the 10 cells of the cooling tower. The results of the computerized modeling of plume formation indicate that a plume of some length would theoretically be visible up to 4,031 hours per year; however, only 1,003 (or 25 percent) of these hours would be during daylight. During nighttime hours, an observer could see the plume only if there were sufficient natural or artificial light. Due to the measures that will be taken to reduce lighting at the plant, any plumes that are created will not be highly visible during the nighttime hours.

Of the plumes potentially visible above a conventional cooling tower during daylight hours, 67 percent would be less than 40 meters in length, 19 percent would be between 40 and 100 meters, 11 percent would be between 100 and 400 meters, and 4 percent will be more than 400 meters. It is important to note that visible plumes will tend to form in the winter months and during early morning hours when the temperature would be extremely low and the humidity is relatively high. This is also the time when fog would tend to form, and if fog were present, the plumes would tend to blend into the fog. The fog would not prevent the formation of visible water-vapor plumes; however, it would make it more difficult, if not impossible, for the plumes to be distinguished from the surrounding air. The same would be true during rainy weather.

Under almost all circumstances, no visible plumes will be seen emanating from the RCEC's HRSG exhaust stacks. However, on a few occasions during the year when temperatures are extremely low and humidity is extremely high, very wispy-plumes coming from the stacks may be visible. The times when HRSG plumes are most likely to occur will tend to be at night and in the early morning hours or during rain or fog, when they are least likely to be visible.

Light and Glare

The RCEC's effects on visual conditions during hours of darkness will be very limited. As indicated previously, some night lighting will be required for operational safety and security. High illumination areas not occupied on a regular basis will be provided with switches or motion detectors to light these areas only when occupied. At times when lights are turned on, the lighting level will be limited to that required for personnel safety, and will not be highly visible offsite and will not produce offsite glare effects. The offsite visibility and potential glare of the lighting will be restricted by specification of non-glare fixtures, and placement of lights to direct illumination into only those areas where it is needed. The landscape screening to be installed around the site will further reduce the visibility of facility's night lighting, particularly in views from areas located close by.

8.13.2.5 Construction Laydown Area

Construction laydown areas will be located at various locations along the south side of Depot Road, along Enterprise Avenue and across Whitesell Street from the project site. A portion of the vacant land the Eastshore Substation will be used for construction worker parking These areas will be surrounded by chain link security fences, and solid slats will be inserted into the sides of any portions of these fences that front on public streets to reduce the visibility of the equipment and vehicles stored on these sites. Although the vehicles, equipment, and stored materials in the laydown areas may be visible to a small degree to drivers on nearby streets and users of nearby industrial sites, the activities in the laydown areas will have relatively little effect on the overall character and quality of the Industrial Corridor setting in which they are located. For example, the truck terminal site across Whitesell Street from the RCEC site is now an unscsreened, unpaved area that is already occupied by parked cars and large construction trucks. The Eastshore Substation site is a large site in the midst of the industrial area and is partially developed with substation facilities and partially vacant. A chain-link fence with slats already provides substantial screening of the activities on this site as seen from the surrounding area. Since the laydown areas are located within a large corridor that is very explicitly dedicated to industrial activities, and would only be visible from at close range within this industrial zone, it can be presumed that viewer sensitivity to any visual changes associated with the project would be low. Because of the low level of viewer sensitivity, the minor level of visual change, the limited time period involved, and the fact that the sites will be restored to their previous condition at the end of the construction period, it can be concluded that the project's use of the two construction laydown areas will not create significant adverse visual impacts.

8.13.2.6 Impact Significance

Any visual effects of the project that will be significant under CEQA are identified below. The identification of these impacts has been structured by applying the criteria set forth in Appendix G of the State CEQA Guidelines. The CEQA Guidelines define a "significant effect" on the environment to mean a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including...objects of historic or aesthetic significance (14 CCR, § 15382)." The five questions related to aesthetics that are posed for lead agencies and the answers to them for the RCEC are:

1. *Would the project have a substantial adverse effect on a scenic vista?*

In the project viewshed, there are no developed or officially designated roadside scenic vista areas. However, the trail system in the Hayward Shoreline and Hayward Regional Shoreline open space areas, the area around the Hayward Shoreline Interpretive Center, and the eastern end of the Hayward-San Mateo Bridge and the portion of State route 92 at its eastern foot can be assumed to provide scenic views that are valued by the public.

The project's effects on the view from KOP 3, the viewpoint on the pedestrian bridge over Cogswell Marsh in the Hayward Regional Shoreline will be less than significant. Although the RCEC's larger features, particularly the "wave" structure, will be highly visible in this view, they will have a good level of integration into their setting, will not "read" as industrial facilities, and will block views of the stack at the Rohm and Haas plant. As a result, there will not be a substantial reduction in the overall visual quality of the existing view.

The project's "wave" structure that screens the HRSGs and HRSG stacks will become a prominently visible feature in the view from KOP 2, the Hayward Shoreline Interpretive Center. Since this structure is larger in scale than other existing features in the view, contrasts with the horizontal trend of this landscape, and blocks the view of Mount Diablo from this vantage point, it will cause a perceptible change in the character, but not necessarily the quality of this view. The overall visual effects of the "wave" structure on the view are attenuated by the fact that it neutralizes the industrial character of the HRSGs and stacks and has a high quality of architectural design and use of materials that create a distinctive landmark structure that add a new dimension of visual interest to the view. The project's overall effect on the view will not result in a change in the view's current visual quality rating of moderately high. As a consequence, the project's effects on the view from this KOP will be less than significant. In addition, Calpine/Bechtel will donate funds to the Hayward Area Recreation and Park District (HARD) for providing benches and other amenities on its trail system. The HARD is the entity that operates the Hayward Shoreline Interpretive Center and the adjacent Hayward Shoreline Marsh area. If the District desires, some of these funds can be used to provide enhancements on portions of the trail to the northwest of the Interpretive Center where views toward Mt. Diablo will not be affected by the RCEC.

As indicated in the analyses of views from KOP 4, the project would not have a significant adverse effect on views across the baylands toward Hayward from the Hayward-San Mateo Bridge and the portions of State Route 92 at the bridge's eastern foot. From this viewpoint, the screening structure around the cooling tower will blend unobtrusively into the overall landscape pattern. The larger "wave" structure screening the HRSG and HRSG stacks will not "read' as an industrial facility, will integrate well with its backdrop, and will appear as a distinctive and positive landmark at Hayward's State Route 92 entry from the West Bay.

2. *Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?*

This question does not apply to the RCEC project because none of the project facilities fall within the boundaries or viewshed of a state scenic highway or other important scenic resource.

3. *Would the project substantially degrade the existing visual character or quality of the site and its surroundings?*

Since the project site itself does not contain any special aesthetic resources and does not have a high level of visual quality, and because the project will be carefully designed and landscaped, the changes brought about by the project will not "degrade" the existing character and quality of the site.

Since the site is located in the midst of a corridor that is explicitly dedicated to industrial use and which already has a high degree of utilitarian development, the project will not have a substantial effect on the visual quality and character of views from streets and properties in the industrial area around it. The minimal effect that the project will have on aesthetic conditions in the industrial corridor is illustrated by the analyses presented of project effects on KOP 5.

As indicated in the analyses of KOP 6, the RCEC will not be particularly visible from Hayward's residential areas, which are located 0.82 mile to the east, and thus will have very little effect on these areas.

Although the project will be visible in the open views from the baylands to the west, as indicated in the responses to Question 1, the project will not have a substantial adverse effect on the character and quality of views from these areas.

4. *Would the project create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?*

As described in Section 8.13.2.3.4, project light fixtures will be restricted to areas required for safety, security, and operations; lighting will be directed onsite; lighting will be shielded from public view; and non-glare fixtures and use of switches, sensors, and timers to minimize the time that lights not needed for safety and security are on will be specified. These measures should substantially reduce the offsite visibility of project lighting. Offsite visibility of lighting will be further reduced by the landscape plantings that will provide additional screening of any lighting associated with the project's lower elements. With these measures, lighting associated with the project will not pose a hazard or adversely affect day or nighttime views toward the site. As a consequence, the impacts of the project's visual effects related to lighting will be less than significant.

5. *Would the project conflict with any applicable land use plan, policy, or regulation (including, but not limited to a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an aesthetic effect?*

As documented in the LORS analysis in Section 8.13.5, the project will be in conformance with the applicable implementing policies, ordinances, or other regulations specifically related to visual resources identified in the City of Hayward General Policy Plan and Zoning Ordinance provisions that pertain to this area.

8.13.3 Cumulative Impacts

At present, there are no projects of any significant size or potential visual impact that are in the final planning or approval process for sites in the immediate vicinity of the RCEC project facilities. As a consequence, in the immediate future, it is reasonably foreseeable that there will be no development of new facilities whose visual effects, when combined with those of the RCEC, would constitute significant impacts on visual resources under the CEQA guidelines.

8.13.4 Proposed Mitigation Measures

8.13.4.1 RCEC Site

The following mitigation measures have been included in the project design to reduce the generating facility's impacts on visual resources:

Careful site planning and landscape design, including the following:

- The project's major structures have been located so as to provide generous setbacks from surrounding streets. Along Enterprise Avenue, the cooling tower is set back approximately 90 feet from the edge of the roadway. Along Whitesell Street, the one-story warehouse/administration/water treatment building is set back 50 feet from the roadway, and the HRSG structures are set back 230 feet.
- Placement of the one-story warehouse/administration/water treatment building, 25-foot high water tanks, and other smaller structures on the eastern edge of the site to create a transition in scale between the corridor along Whitesell Street and the plant's taller features.
- Planting of street trees and hedges along the edges of the site bordering Whitesell Street and Enterprise Avenue to create visual continuity with the landscape pattern along other streets in the Industrial Corridor, and to screen near views into the site and toward the site's taller elements.
- Placement of bands of trees consisting of informal groupings of fast-growing broadleaf evergreen trees along all sides of the site to provide partial screening of views toward the site from more distant locations. In the areas along Whitesell Street and Enterprise Avenue, this tree row will be located behind the street trees and hedges.

Architectural measures including:

- Placement of architectural screening structures around the cooling tower, and around the complex major equipment that includes the HRSGs and HRSG stacks. These structures will consist of space frames made of tubular steel from which a stainless steel screening mesh will be suspended.
- Project equipment will be painted using a palette of soft grays and blue-grays. The members of the space frame will be painted blue, a color selected to provide a visual contrast with the muted tones of the project equipment and to blend well with the hill backdrop. The stainless steel screening mesh will have a brushed finish to minimize its reflectivity.

Additional measures will include the following:

- Color treatment of fences to blend with the surrounding environment.
- Minimal signage and construction of project signs using non-glare materials and unobtrusive colors. The design of any signs required by safety regulations will need to conform to the criteria established by those regulations.
- Minimization of lighting to areas required for safety, security, or operations, and shielding of lighting from public view to the extent possible. Timers and sensors will be used to minimize the time that lights are on in areas where lighting is not normally needed for safety, security, or operation.
- Direction and shielding of lighting to reduce light scatter and glare. Highly directional light fixtures will be used.

8.13.4.2 Switchyard and Transmission Line

The following mitigation measures for the RCEC switchyard and transmission line have been included in the project design:

- The switching station will make use of low profile equipment to minimize its visibility beyond the surrounding landscape hedge and tree rows.
- The equipment in the switchyard will have a neutral gray finish.
- The transmission line structures will accommodate both the existing and new transmission lines, avoiding the need to add a new, parallel set of transmission towers to the transmission corridor.
- The towers will be constructed of tubular steel to create a trim profile.
- The towers will be treated with a galvanized neutral gray finish to maximize their visual integration into the backdrop.
- Non-specular conductors will be used.
- Insulators will be non-reflective and non-refractive.

8.13.4.3 Pipelines

The following mitigation measures have been included as a part of the project proposal to reduce the visual impacts of the pipelines:

- After construction, ground surfaces will be restored to their original condition, and any vegetation or paving that had been removed during the construction process will be replaced.

8.13.5 Laws, Ordinances, Regulations, And Standards

This section describes the laws, ordinances, regulations, or standards relevant to the visual resource issues associated with the RCEC project (Table 8.13-3). No federal, state, or regional LORS are known that would apply to the project's visual resource issues. However, visual resource and urban design concerns germane to the project are addressed in the Hayward General Policies Plan and the Hayward Zoning Ordinance.

Table 8.13-3. Laws, ordinances, regulations, and standards applicable to the RCEC visual resources.

Document	Applicability	AFC Section	Agency/Contact
Hayward General Plan	Sets out policies for land use, circulation, community facilities, and environmental resource management for the City. Includes a chapter that specifically addresses urban design issues.	Section 8.13.5.2	Hayward Department of Community and Economic Development Gary Calame Senior Planner 777 B Street Hayward, CA 94541-5007 510.583-4226
Hayward Zoning Ordinance	Establishes classes of zoning districts governing the use of land and placement of buildings and improvements. Includes setback and landscaping requirements.	8.13.5.3	Hayward Department of Community and Economic Development Crescentia Browning 777 B Street Hayward, CA 94541-5007 510.583-238-6190

As indicated in the land use analysis (Section 8.6) of this AFC, the RCEC site, the associate linears, are all located within the boundaries of the City of Hayward and are thus subject to Hayward's planning and zoning requirements.

8.13.5.1 Hayward General Plan

The portion of the Hayward General Plan that specifically addresses visual resource issues is the chapter on Urban Design. This chapter identifies and discusses unique natural resources in the city and other urban design features that are worthy of special consideration. General Plan Map 18 provides a graphic identification of the city's key urban form elements. The mapped form element of most relevance to the project is the Industrial Corridor, which includes all of the industrially zoned lands that lie in the corridor along the eastern edge of the city's baylands. The proposed project is included within this area. The urban design chapter does not include a specific discussion of the Industrial Corridor, and the urban design policies that follow this chapter do not specifically address design issues in industrial areas. The Urban Design chapter designates the area at the eastern foot of the Hayward-San Mateo Bridge as a community "gateway" and suggests installing windmills in this area to create a memorable entrance to the city. The discussion of gateways does not include mention of policies to protect the viewsheds visible from
gateway areas.

8.13.5.2 Hayward Zoning Ordinance

The RCEC site lies within an area designated by the Hayward Zoning Ordinance as I, Industrial. This district has been established to "provide for and encourage the development of industrial uses in areas suitable for same, and to promote a desirable and attractive working environment with a minimum of detriment to surrounding properties. The district specifies an extensive list of permitted uses and includes provisions for conditional approval of uses not specifically enumerated. The provisions of the ordinance relevant to the visual resource issues associated with the project are summarized in Table 8.13-4 and a description is provided of the project's conformance with them.

Table 8.13-4. Consistency with the Hayward Zoning Ordinance.

Provision	Consistency
10-1.1630 Yard Requirments	
The requirements for setbacks from streets vary from 10 to 20 feet, for side yards from 0 to 10 feet, and for rear yards there is no minimum requirement.	Since the proposed project will be located within a large parcel, and because the project's northern and eastern fence lines will be set back a minimum of 20 feet from the streets on which the parcel fronts, the project is consistent with yard requirements.
10-1.1635 Height Limit	
For industrial buildings, there is no maximum height limit.	Since there is no height limit, the project will be consistent with structure and stack heights.

Provision	Consistency
10-1.1645 Minimum Design and Performance Standards	
Architectural Design Principles A set of detailed design principles include use architectural elements that are harmonious and in proportion with each other, use of attractive colors and materials, and architectural detailing on blank walls.	The architectural screening structures that will be built around the cooling tower and the HRSGs and HRSG stacks, and the careful architectural treatment that will be given to the one-story buildings fronting on Whitesell Street will assure that the project will be in conformance with these guidelines.
Landscaping The ordinance requires landscaping in all required front, side, and rear yards and planting of street trees along all street frontages.	The landscaping planned for the entire perimeter of the project site will exceed the requirements of this standard.

Source: Hayward Zoning Ordinance September 1999

8.13.5.3 Scenic Route Element of the Alameda County General Plan

In 1966, Alameda County adopted a Scenic Route Element as a part of the County's General Plan. In that element, the county designated State Route 92 through Hayward (referred to in the plan as the "Jackson Freeway") as a scenic freeway/expressway. Since this highway and all the land around it falls within the City of Hayward, the county has no jurisdiction in this area, so the provisions of this plan have no legal force in this area. Even if this area were unincorporated and under County jurisdiction, the Scenic Route Element would have limited applicability because in industrial areas, the scenic corridor within which the element's policies apply is defined as 500 feet, while the RCEC lies 1,800 feet to the north of State
Route 92.

8.13.6 Permits Required and Permit Schedule

No visual resource permits are required.

8.13.7 References

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Figure 8.13-1a

Project Visibility

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

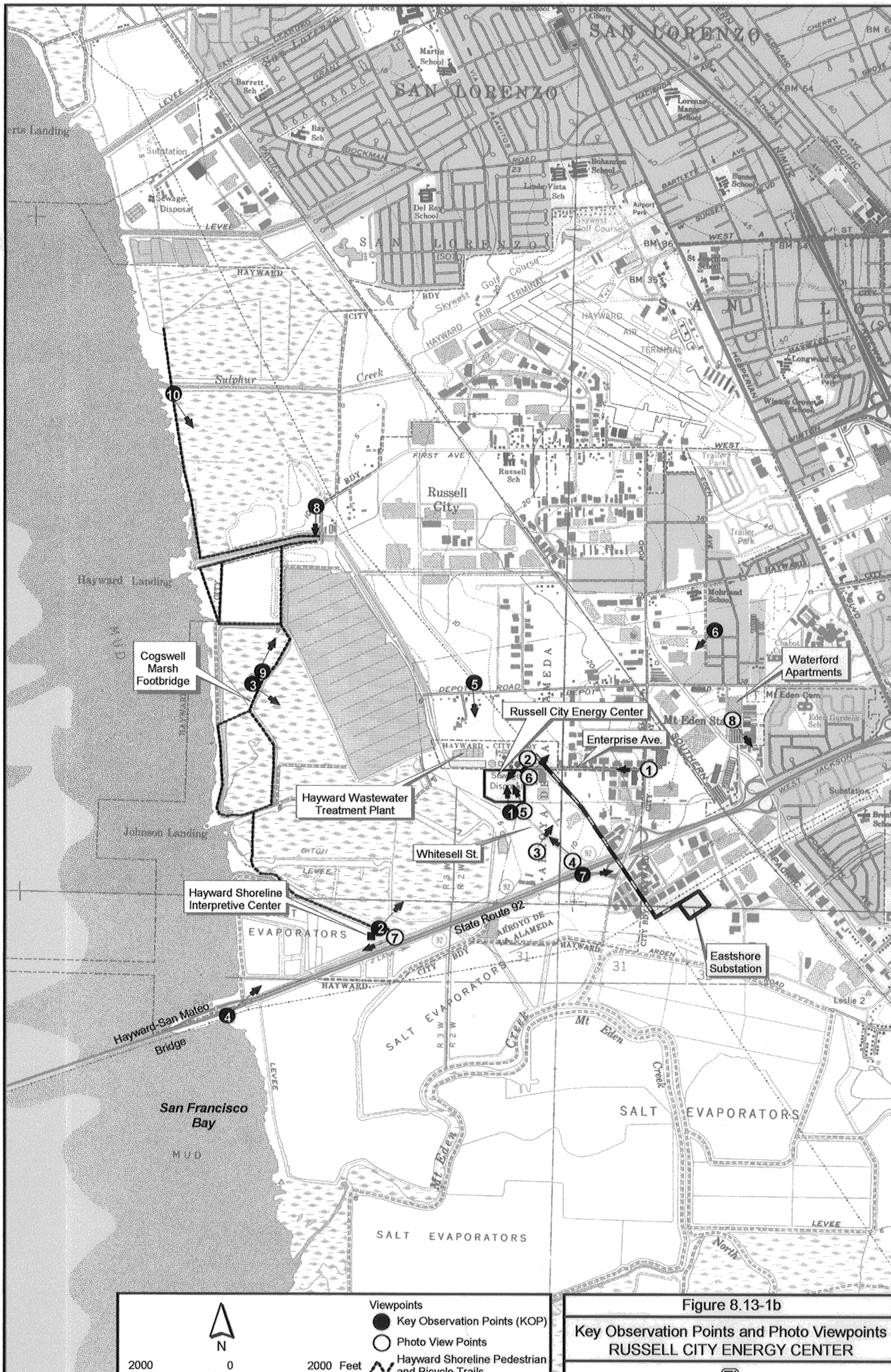
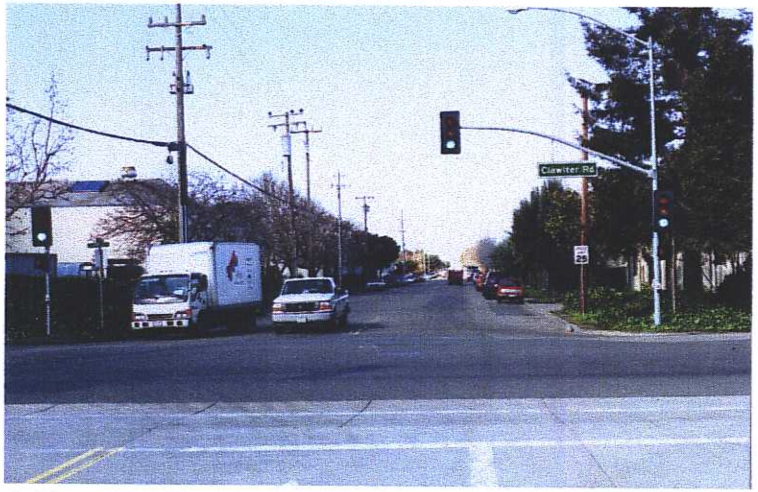


Figure 8.13-1b

Key Observation Points and Photo Viewpoints
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION



1. View west down Enterprise Avenue from Clawiter Road.

2. View of project site and existing radio broadcast towers seen from Enterprise Avenue at Whitesell Street.

3. Rohm and Haas facility and its 180-foot high stack.

4. View toward site and its radio broadcast towers from Whitesell Street near Breakwater Avenue.

Figure 8.13-2a. Visual character photographs.

5. View of project site seen from southeast corner along Whitesell Street.

6. View of Grant-Eastshore transmission line in area to the northeast of the project site.

7. Hayward Shoreline Interpretive Center.

8. Trees screening view from upper floor units at the Waterford Apartments.

Figure 8.13-2b. Visual character photographs.

Figure 8.13-3a. KOP 1—Existing view from office/industrial facility looking north.

Figure 8.13-3b. KOP 1—Visual simulation of proposed project (photograph and simulation by Environmental Vision).

Figure 8.13-4a. KOP 2—Existing view from Hayward Shoreline Interpretive Center looking northeast.

Figure 8.13-4b. KOP 2—Visual simulation of proposed project (photograph and simulation by Environmental Vision).

Figure 8.13-5a. KOP 3—Existing view from Hayward Shoreline footbridge at Cogswell Marsh looking southeast.

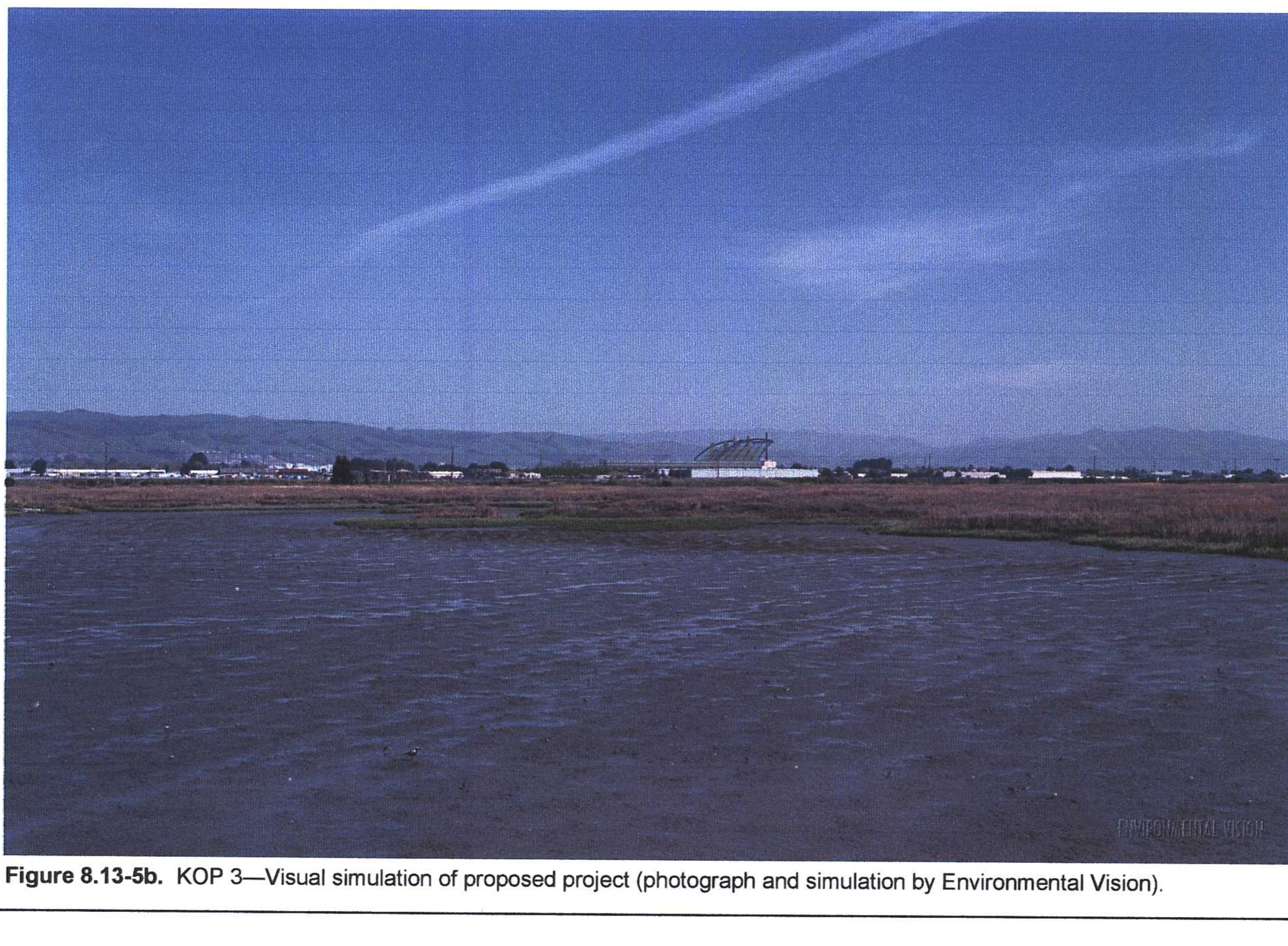


Figure 8.13-5b. KOP 3—Visual simulation of proposed project (photograph and simulation by Environmental Vision).

Figure 8.13-6a. KOP 4—Existing view from Hayward-San Mateo Bridge Toll Plaza looking east.

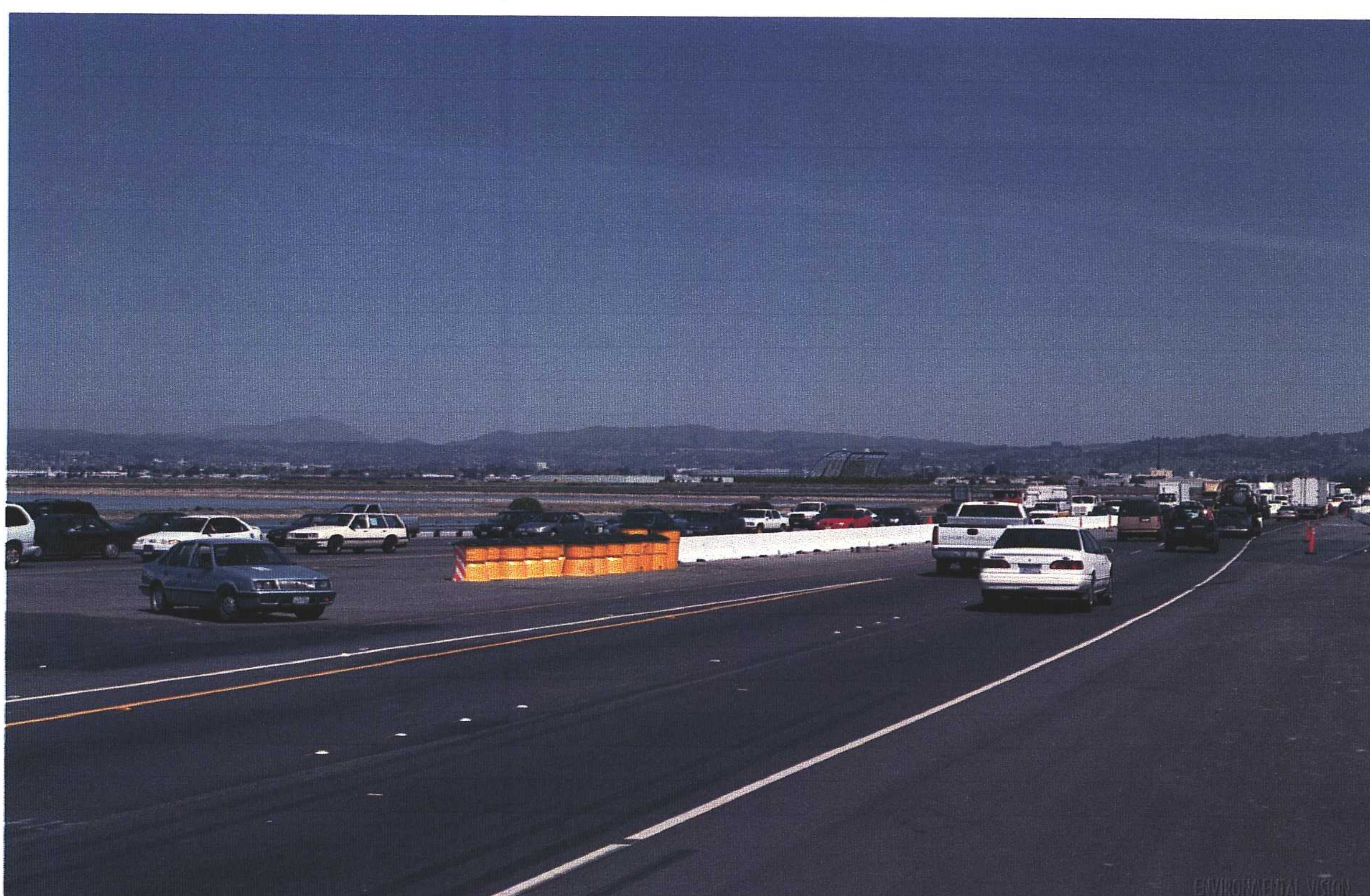


Figure 8.13-6b. KOP 4—Visual simulation of proposed project (photograph and simulation by Environmental Vision).

Figure 8.13-7a. KOP 5—Existing view from Cabot Boulevard and Depot Road.

Figure 8.13-7b. KOP 5—Visual simulation of proposed project (photograph and simulation by Environmental Vision).

Figure 8.13-8a. KOP 6—Existing view from Laguna Drive looking southwest (photograph by Environmental Vision).

Note: Project will not be visible from this location and thus no simulation is provided.

Figure 8.13-9a. KOP 7—Existing view from State Route 92 at Clawiter Road looking east.

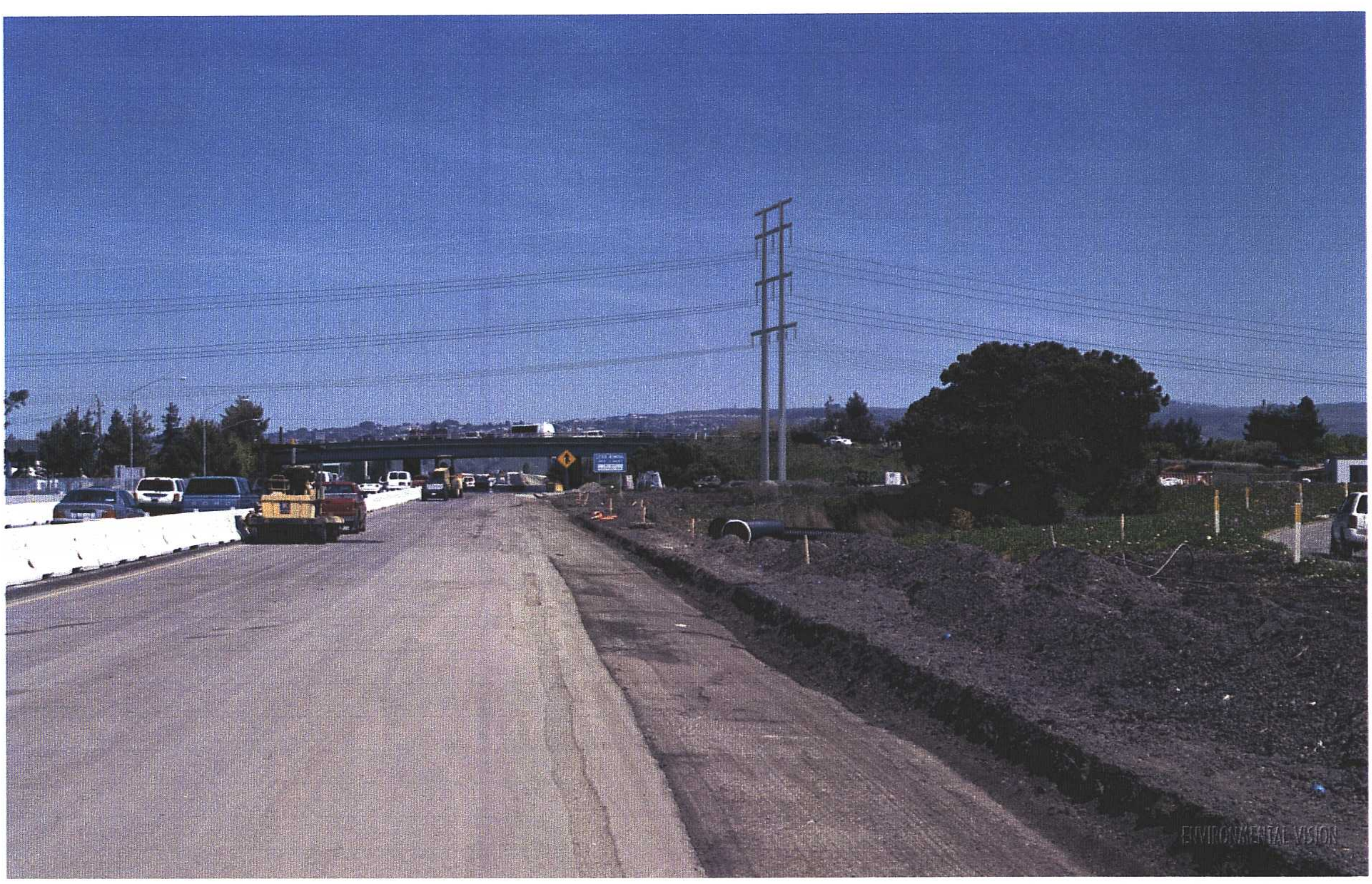
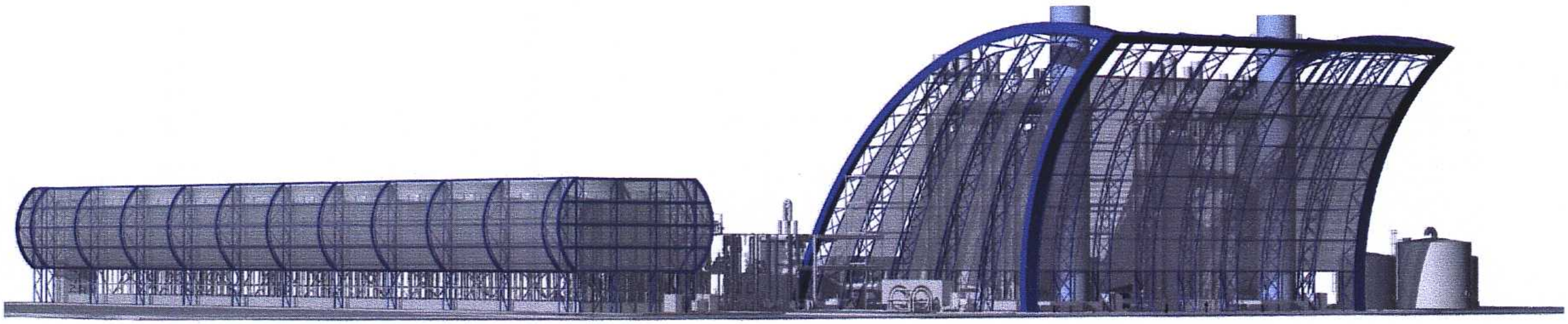


Figure 8.13-9b. KOP 7—Visual simulation of proposed project (photograph and simulation by Environmental Vision).



F:\Calpine Russell City\Arcview Figures\Russel City Energy Centerbase.apr

Source: The Hillier Group

Figure 8.13-13

Proposed Architectural Treatment
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

8.14 WASTE MANAGEMENT

This section presents an evaluation of potential effects on human health and the environment from non-hazardous and hazardous waste generated by the RCEC and the advanced water treatment (AWT) Plant. Section 8.14.1 describes the current condition of the proposed site. Section 8.14.2 describes the waste and waste streams that are expected to be generated by the project. Section 8.14.3 describes waste disposal sites for non-hazardous and hazardous waste. Section 8.14.4 describes Best Management Practices that will be employed to manage the generated waste and mitigate its potential impact on the environment. Section 8.14.5 discusses cumulative impacts and Section 8.14.6 describes waste monitoring. Section 8.14.7 presents laws, ordinances, regulations, and standards (LORS) that apply to the generated waste. Section 8.14.8 describes agencies that have jurisdiction over the generated waste and persons to contact in those agencies. Section 8.14.9 describes permits required for waste generated as well as a schedule for obtaining those permits. Section 8.14.10 provides the reference cited in this section.

8.14.1 Affected Environment

Calpine/Bechtel performed a Phase I Environmental Site Assessment (ESA) in March 2001 (FWENC 2001) for the RCEC and AWT plant site. The ESA was performed in accordance with American Society for Testing and Materials (ASTM) Standard E 1527-94, Standard Practice for Environmental Site Assessments. The purpose of the investigation was to identify recognized environmental conditions at the site resulting from present or past activities. The Phase I ESA is included in Appendix 8.14 and is incorporated here by reference.

The RCEC site investigation, conducted at 3590 Enterprise Avenue (3.6 acres) and 3636 Enterprise Avenue in Hayward (11.1 acres), consisted of a total of 14.7 acres. The property located at 3590 Enterprise Avenue is currently a metal painting and sand blasting company (Runnels Industries), while the property at 3636 Enterprise is owned by Salem Broadcasting Corporation, which has four radio broadcast towers on the property (See Chapter 1). These towers are associated with the operation of the existing KFAX radio station.

8.14.1.1 Historical Uses and Surrounding Areas

As part of the ESA, a historical ownership search of the past 50 years was conducted. The tenant report identified West Coast Painting as the owner of 3590 Enterprise Avenue in 1967. As part of an agency document review, it was determined that the property located at 3590 Enterprise Avenue was developed by the C.E. Freeman Company for a metal painting business in 1970. Freeman sold the property to Runnels Industries in 1976.

Review of historical aerial photography indicates that the project site was primarily used for agricultural purposes from before 1939 until at least 1965. Industrial uses on adjacent parcels are evident in the 1965 aerial photograph. The two parcels appear in the 1993 aerial photograph much as they do today.

8.14.1.2 Investigation Results and Recommendations

Several issues of concern were identified as a result of the data review and site investigation. Contamination concerns are listed below. In-depth discussions on these issues are included in the ESA.

- A small plume of total petroleum hydrocarbons (TPH)-contaminated soil is located downgradient from the washing facility at Runnels Industries and has migrated in a westerly direction onto the adjacent KFAX radio station property. This plume has stablilized (and is probably self-remediating). Its source was probably miscellaneous oils from the Runnels Industries metal washing facility. Runnels Industries has installed an oil-water separator to prevent further contamination.

- VOC-contaminated groundwater exists near the center of the Runnels Industries property and along its eastern boundary. The source of VOC contamination is undetermined. A groundwater monitoring report investigation conducted for Runnels Industries (H_2OGEOL 2000) indicated that this plume may have originated off-site and further up the groundwater flow gradient to the east from an unknown source.
- Three underground storage tanks (USTs) were removed from the Runnels Industries property in 1993. The City of Hayward requested further testing, since the tank area had been backfilled with used blasting stand.
- Visible evidence of waste blasting sand dumping was observed along the property boundary between the Runnels and KFAX parcels. It appears this waste sand was dumped from the Runnels parcel to the KFAX parcel. Sources indicate that the sand was dumped at the request of Salem Broadcasting Corporation, as fill (cite).

Runnels Industries has requested closure on these contamination issues from the Alameda County Health Care Services Agency, Environmental Protection Division and Hayward Fire Department.

8.14.2 Project Waste Generation

Waste will be generated at the RCEC and AWT plant site during both facility construction and operation. Types of waste will include wastewater, solid non-hazardous waste, and liquid and solid hazardous waste. The project will also generate solid non-hazardous waste during the construction of the electric transmission line, natural gas supply line, and water supply and discharge pipelines.

8.14.2.1 Construction Phase

During construction, the primary waste generated at the RCEC and AWT plant site will be solid non-hazardous waste. However, some non-hazardous liquid waste and both solid and liquid hazardous waste will also be generated at the RCEC and AWT plant site. The types of waste and their estimated quantities are described below.

Non-Hazardous Solid Waste

RCEC Site

Potential non-hazardous waste streams and their estimated quantities from removal of existing structures and facilities on the property as well as construction of the generating plant, electric transmission line, natural gas supply line, and wastewater return line are as follows:

Paper, Wood, Glass, and Plastics—Paper, wood, glass, and plastics will be generated from packing materials, waste lumber, insulation, and empty non-hazardous chemical containers. Approximately 100 tons of these wastes will be generated during construction of the project. These wastes will be recycled where practical. Waste that cannot be recycled will be placed in on-site dumpsters and disposed of weekly in a Class III landfill.

Concrete—Approximately 70 tons of excess concrete will be generated during removal of existing foundations and structures as well as during construction. Waste concrete will be disposed of on a weekly basis in a Class III landfill or clean fill sites, if available.

Metal—Waste will include steel from removal of the existing radio towers and buildings/structures, welding/cutting operations, packing materials, and empty non-hazardous chemical containers. Aluminum waste will be generated from packing materials and electrical wiring. Waste copper wiring from the existing radio towers will be recycled. Approximately 25 tons of metal will be generated during removal of existing structures/facilities and during construction. Waste will be recycled where practical, and non-recyclable waste will be deposited in a Class III landfill.

AWT Plant

Potential non-hazardous waste streams and their estimated quantities from construction of the AWT plant are as follows:

Paper, Wood, Glass, and Plastics—Paper, wood, glass, and plastics will be generated from packing materials, waste lumber, insulation, and empty non-hazardous chemical containers. Approximately 50 tons of these wastes will be generated during construction of the project. These wastes will be recycled where practical. Waste that cannot be recycled will be placed in on-site dumpsters and disposed of weekly in a Class III landfill.

Concrete—Approximately 10 tons of excess concrete will be generated during construction. Waste concrete will be disposed of on a weekly basis in a Class III landfill or clean fill sites, if available.

Metal—Waste will include steel from welding/cutting operations, packing materials, and empty non-hazardous chemical containers. Approximately 10 tons of metal will be during construction. Waste will be recycled where practical, and non-recyclable waste will be deposited in a Class III landfill.

Non-Hazardous Wastewater

RCEC Site

Wastewater generated will include sanitary waste and may include equipment wash water, stormwater runoff, wastewater from pressure testing the gas supply line after it is constructed, and water from excavation dewatering during construction. Sanitary waste will be collected in portable, self-contained toilets. Equipment wash water will be contained at specifically designated wash areas and disposed offsite. Stormwater runoff will be managed in accordance with a stormwater management plan that will be approved by the San Francisco Bay Regional Water Quality Control Board prior to the start of construction (see Section 8.15). Water resulting from construction dewatering will be filtered and delivered to the City of Hayward's Water Pollution Control Facility (WPCF).

Electric Transmission Line and Eastshore Substation—Sanitary waste will be generated during construction of the electric transmission line; this waste will be collected in portable, self-contained toilets.

Natural Gas Pipeline—Wastewater generated will include sanitary waste and wastewater from pressure testing the gas supply line after it is constructed. Sanitary waste will be collected in portable, self-contained toilets. The gas supply pipeline hydrostatic test water will be filtered to collect any sediment and welding fragments. The water will be tested and, if not contaminated, will be discharged to the City of Hayward's WPCF in accordance with applicable regulatory requirements. Contaminated water will be delivered to a permitted off-site treatment, storage, and disposal (TSD) facility.

Wastewater Return Pipeline—Sanitary waste will be generated during construction of the wastewater return pipeline; this waste will be collected in portable, self-contained toilets.

AWT Plant

Wastewater generated during construction of the AWT plant will include sanitary waste and may include equipment wash water, stormwater runoff, wastewater from water line testing following construction, and water from excavation dewatering during construction. Sanitary waste will be collected in portable, self-contained toilets. Equipment wash water will be contained at specifically designated wash areas and disposed offsite. Stormwater runoff will be managed in accordance with a stormwater management plan that will be approved by the San Francisco Bay Regional Water Quality Control Board prior to the start of construction (see Section 8.15).

The water supply pipeline test water will be filtered to collect any sediment and welding fragments. The water will be tested and, if not contaminated, will be discharged to the City of Hayward's WPCF in accordance with applicable regulatory requirements. Contaminated water will be delivered to a permitted off-site treatment, storage, and disposal (TSD) facility. Water resulting from construction dewatering will be filtered and delivered to the City of Hayward's WPCF.

Hazardous Waste

RCEC Site

Most of the hazardous waste generated during construction will consist of liquid waste such as flushing and cleaning fluids, passivating fluid (to prepare pipes for use), and solvents. Some hazardous solid waste such as welding materials and dried paint may also be generated.

Flushing and cleaning waste liquid is generated when pipes and boilers are cleaned and flushed. Passivating fluid waste is generated when high temperature piping is treated with either a phosphate or nitrate solution. The volume of flushing and cleaning and passivating liquid waste generated is estimated to be one to two times the internal volume of the pipes cleaned. The quantity of welding, solvent, and paint waste is expected to be minimal.

The construction contractor will be considered the generator of hazardous construction waste and will be responsible for proper handling of hazardous waste in compliance with all applicable federal, state, and local laws and regulations, including licensing, personnel training, accumulation limits and times, and reporting and record keeping. The hazardous waste will be collected in hazardous waste accumulation containers near the points of generation and moved daily to the contractor's 90-day hazardous waste storage area. Prior to expiration of the regulatory 90-day storage period, the waste will be delivered to an authorized hazardous waste management facility.

Electric Transmission Line and Eastshore Substation—Minimal quantities of welding, solvent, and paint waste will be generated during construction of the electric transmission line.

Natural Gas Pipeline—Minimal quantities of welding, solvent, and paint waste will be generated during construction of the natural gas pipeline.

Wastewater Return Pipeline—Minimal quantities of welding, solvent, and paint waste will be generated during construction of the wastewater return pipeline.

AWT Plant

Most of the hazardous waste generated during construction of the AWT plant will consist of liquid waste such as flushing and cleaning fluids, and solvents. Some hazardous solid waste such as welding materials and dried paint may also be generated.

Flushing and cleaning waste liquid is generated when pipes are cleaned and flushed. The volume of flushing and cleaning liquid waste generated is estimated to be one to two times the internal volume of the pipes cleaned. The quantity of welding, solvent, and paint waste is expected to be minimal.

The construction contractor will be considered the generator of hazardous construction waste and will be responsible for proper handling of hazardous waste in compliance with all applicable federal, state, and local laws and regulations, including licensing, personnel training, accumulation limits and times, and reporting and record keeping. The hazardous waste will be collected in hazardous waste accumulation containers near the points of generation and moved daily to the contractor's 90-day hazardous waste storage area. Prior to expiration of the regulatory 90-day storage period, the waste will be delivered to an authorized hazardous waste management facility.

8.14.2.2 Operation Phase

During operation of the RCEC plant and AWT plant, the primary waste generated will be non-hazardous wastewater and dewatered sludge resulting from water treatment. However, non-hazardous solid waste and small quantities of both solid and liquid hazardous waste will also be generated periodically. The electric transmission line, natural gas supply line, and water supply and discharge lines will not generate hazardous waste. The types of waste and their estimated quantities are discussed on the following pages.

Non-Hazardous Solid Waste

RCEC Site

The RCEC plant will produce wastes typical of power generation operations. These will include rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other miscellaneous solid wastes including the typical refuse that workers generate. The RCEC plant will generate about 70 cubic yards per year of non-hazardous solid waste.

Electric Transmission Line and Eastshore Substation—No solid wastes will be generated during operation of the electric transmission line.

Natural Gas Pipeline—No solid wastes will be generated during operation of the natural gas pipeline.

Wastewater Return Pipeline—No solid wastes will be generated during operation of the wastewater return pipeline.

AWT Plant

Dewatered sludge will be generated from the MF backwash treatment and copper removal process. The sludge from the clarifiers will be processed through gravity thickeners, conditioning, and plate and frame presses for dewatering to achieve 50 percent solids quality. After dewatering, the resulting sludge will be transported off-site for ultimate disposal. Approximately 9 tons/day (average) to 12 tons/day of sludge will be generated, requiring one to two truckloads per day.

The dominant species in the residual sludge will be calcium carbonate. Ferric hydroxide will be present to a much lesser extent. Other constituents of the sludge will result from incidental removal from the concentrate stream. The most notable constituent of concern that is removed from the concentrate in the treatment scheme is copper. The projected concentration of copper in the waste sludge resulting from this treatment is less than 100 mg/kg. The Total Threshold Limit Concentration (TTLC) for copper is 2,500 mg/kg (22 CCR 66261.24). The Soluble Threshold Limit Concentration (STLC) is 25 mg/L. Based on a sludge copper concentration of 100 mg/kg, the highest possible result from the Waste Extraction Test (WET) would be 10 mg/L, assuming 100 percent solubility. Therefore, it is unlikely that there will be any restrictions with respect to disposal of this sludge from a hazardous waste standpoint therefore, the dewatered sludge will be disposed of as non-hazardous waste.

The reverse osmosis treatment system includes a cartridge filter with wound polypropylene filter element. The filter media will be replaced approximately once every 9 months and disposed of as non-hazardous solid waste. The total weight of waste filter media per change-out is approximately 440 pounds.

In addition to the dewatered sludge and RO filter cartridges, the AWT plant will produce wastes typical of water treatment operations. These will include rags, defective or broken mechanical equipment parts, empty containers, and other miscellaneous solid wastes including the typical refuse that workers generate. The AWT plant will generate approximately 20 cubic yards per year of these types of non-hazardous solid waste.

Non-Hazardous Wastewater

RCEC Site

Wastewater sources from the RCEC Plant are described in detail in Sections 7.6 and 8.15.2.3.

Electric Transmission Line and Eastshore Substation—No wastewater will be generated from the electric transmission line operations.

Natural Gas Pipeline—No wastewater will be generated from the natural gas pipeline operations.

Wastewater Return Pipeline—The wastewater return pipeline will transport the RCEC plant industrial wastewater to the Hayward WPCF headworks.

AWT Plant

AWT plant wastewater sources are described in detail in Sections 7.6 and 8.15.2.3.

Hazardous Waste

RCEC Site

The RCEC project's hazardous waste includes waste lubricating oil and spent lubrication oil filters from the combustion turbines and selective catalytic reduction (SCR) catalyst units. The catalyst units must be replaced every 3 to 5 years. Because they contain heavy metals they are considered hazardous. Calpine/Bechtel will train workers to handle any hazardous waste generated at the site. Table 8.14-1 summarizes the hazardous wastes and the appropriate disposal location.

Chemical cleaning wastes will consist of alkaline and acid cleaning solutions used during pre-operational chemical cleaning of the HRSGs and acid cleaning solutions used for chemical cleaning of the HRSGs after the units are put into service. These wastes, which are subject to high metal concentrations, will be temporarily stored onsite in portable tanks. They will be disposed of offsite by a chemical cleaning contractor in accordance with applicable regulatory requirements.

Electric Transmission Line and Eastshore Substation—No hazardous wastes will be generated during operation of the electric transmission linear substation.

Natural Gas Pipeline—No hazardous wastes will be generated during operation of the natural gas pipeline.

Wastewater Return Pipeline—No hazardous wastes will be generated during operation of the wastewater return pipeline.

AWT Plant

No hazardous wastes will be generated during operation of the AWT plant.

8.14.3 Waste Disposal Sites

The removal of non-hazardous solid waste (often referred to as solid waste, municipal solid waste [MSW], or garbage) is through recycling or, if not recyclable, through deposit in a Class III landfill. Non-hazardous liquid wastes will be returned to either the headworks or outfall of the City of Hayward's WPCF for ultimate discharge under the East Bay Dischargers Authority (EBDA) National Pollutant Discharge Elimination System (NPDES) permit at the EBDA outfall (as discussed in Section 8.15.2.3). Hazardous wastes, both solid and liquid, will be delivered to a permitted off-site treatment, storage, and disposal (TSD) facility or deposited in a permitted Class I landfill. The following subsections describe the waste disposal sites that are feasible for disposal of wastes associated with the RCEC plant and its ancillary facilities.

Table 8.14-1. Hazardous wastes generated at the RCEC facility during operation.

Waste	Origin	Composition	Quantity	Classification	Disposal
Lubricating oil	Gas and stream turbine lubricating oil system	Hydrocarbons	2,575 gal per year	Hazardous	Disposed by certified oil recycler
Lubricating oil filters	Gas and stream turbine lubricating oil system	Paper, metal, and hydro-carbons	400 lbs per year	Hazardous	Recycled by certified oil recycler
Laboratory analysis waste	Water treatment	Sulfuric acid	Approximately 500 gal per year	Hazardous	Disposed of in a Class I landfill
SCR catalyst units	SCR system	Metal and heavy metals, including vanadium	70,000 lbs every 3 to 5 years	Hazardous	Recycled by SCR manufacturer or disposed in Class I landfill
Oily rags	Maintenance, wipe down of equipment, etc.	Hydrocarbons, cloth	Approximately 800 rags per year	Hazardous	Recycled by certified oil recycler
Oil sorbents	Cleanup of small spills	Hydrocarbons	Approximately 200 pounds per year	Hazardous	Recycled or disposed of by certified oil recycler

Table 8.14-1. (continued)

Waste	Origin	Composition	Quantity	Classification	Disposal
Chemical cleaning wastes	HRSG cleaning	Alkaline and acidic solution, metals	140,000 gal initially and every 10 years	Hazardous	Offsite disposal by contractor
Washwater	Turbine and HRSG fireside washing	Water containing metals	9,480 gal per year	May be hazardous, but usually not	Offsite disposal by contractor
Cooling tower sludge	Deposited in cooling tower basin by cooling water	Dirt from air, arsenic from water	100 to 200 pounds per year	May be hazardous, but usually not	Class II landfill if non-hazardous; Class I if hazardous
Spent Batteries	Station batteries	Lead-Acid batteries	Approx. 200 lbs per year	Hazardous	Battery recycler

8.14.3.1 Non-hazardous Waste Disposal Facilities

Solid waste facilities that could be used for recycling and disposal of solid waste generated during construction and operation of the RCEC and the AWT plant are shown in Table 8.14-2. Franchised waste collection companies, such as Waste Management, will collect non-hazardous solid waste materials and transport them to a transfer station. Recyclables will be removed at the transfer station (i.e., Davis Street Transfer Station in San Leandro), and the remaining residue will be placed in a nearby landfill such as Altamont Landfill. Neither the Davis Street Transfer Station nor the Altamont Landfill facilities have been subject to any enforcement actions within the last 5 years; compliance at these facilities has been very strong (Pantages, 2001).

Waste collection and disposal will be in accordance with applicable regulatory requirements to minimize environmental, health, and safety impacts.

Table 8.14-2. Solid waste disposal facilities for the RCEC waste.

Landfill/ Transfer Station	Location	Class	Permitted Capacity	Current Operating Capacity	Remaining Capacity	Estimated Closure Date	Comment
Davis Street Transfer Station	San Leandro	N/A	5000 tons/day	3800 tons/day	N/A	N/A	
Altamont Landfill	Livermore	III	11,150 tons/day	6,000 tons/day	16.3 million cubic yards (7 years)	2007	Unit 1
Altamont Landfill Expansion	Livermore	III	N/A	N/A	160 million tons (46 years)	N/A	Expansion Approved

8.14.3.2 Hazardous Waste Disposal Facilities

There is a 90-day limit on the storage of hazardous waste generated at the facility. The waste will be transferred by a permitted hazardous waste transporter to a transfer, storage, and disposal (TSD) facility. These facilities vary considerably in what they can do with the hazardous waste they receive. Some can only store waste, others can treat the waste to recover usable products, while others can dispose of the waste through incineration, deep well injection or landfilling (although incineration and deep-well injection are not permitted in California).

According to U.S. Environmental Protection Agency (USEPA's) Preliminary Biennial Resource Conservation and Recovery Act [RCRA] Hazardous Waste Report (based on 1995 data), there are 137 RCRA TSD facilities in California (USEPA, 1997). Many of these facilities are companies such as oil refineries or military facilities that do not take hazardous waste from other generators. The closest commercial facility is Safety-Kleen Corporation in Oakland, which is permitted to store and transfer several hazardous wastes, including solvents, paint, and batteries. Safety-Kleen also recycles used oil. Wastes collected by the facility are shipped to other Safety-Kleen facilities for treatment or disposal. Safety-Kleen is now owned by Laidlaw, which has numerous TSD facilities, including two hazardous waste landfills in California. For ultimate disposal, three hazardous waste (Class I) landfills are available:

Laidlaw Environmental's Buttonwillow Landfill in Kern County

This landfill is permitted at 13.25 million cubic yards and has a remaining capacity of 10.9 million cubic yards (Hicks, 2000). The annual deposit rate is currently 130,000 to 150,000 cubic yards. This landfill has an estimated 50 years of operational life remaining or until 2050. Buttonwillow has been permitted to accept all hazardous wastes except flammables, PCB with a concentration greater than 50 ppm, medical waste, explosives, and radioactive waste with radioactivity greater than 20,000 picocuries. There have been no enforcement actions at this facility within the last year (Ramirez, 2001).

Laidlaw Environmental's Landfill in Imperial County

This landfill is permitted at 4 million cubic yards and has an estimated remaining capacity of 2.4 million cubic yards. The annual deposit rate is approximately 110,000 cubic yards. The remaining life of this landfill is approximately 50 years or until 2050 (Yadvich, 2000). The landfill's conditional use permit prohibits the acceptance of some types of waste, including radioactive (except geothermal) waste, flammables, biological hazardous waste (medical), PCB, dioxins, air- and water-reactive wastes, and strong oxidizers. There have been no enforcement actions at this facility within the last year (Jius, 2001).

Chemical Waste Management's Landfill in Kings County

The Class 1 portion of this landfill has approximately 6.7 million cubic yards of remaining capacity of a total permitted capacity of 10.7 million cubic yards. The annual deposit rate is approximately 200,000 cubic yards. The remaining life of this landfill is approximately 25 years or until 2025 (Vasquez, 2000). The Class I landfill is permitted for and will accept all hazardous wastes except radioactive, medical, and UXO (Yarbrough, 1998). There have been no enforcement actions at this facility within the last year (Fujitsubo, 2001).

There is no shortage of hazardous waste landfill capacity in California. The deposit rate has decreased by about 50 percent in the last several years due to source reduction by generators and transfer of waste out of state that is considered hazardous under California's Hazardous Waste Control Law (HWCL) but not under RCRA.

In addition to landfills, there are about 25 off-site commercial hazardous waste treatment and recycling facilities. These facilities have sufficient capacity to recycle and/or treat hazardous waste generated in

California that does not go to landfills. All hazardous waste will be removed and delivered to a TSD facility. Used oily rags and oil sorbent will be collected by a permitted oil recycler.

8.14.4 Best Management Practices

The handling and management of wastes generated from the RCEC and the AWT plant will follow the hierarchical approach of source reduction, recycling, treatment, and disposal. The first effort will therefore be to reduce the quantity of waste generated, if possible, then to recycle the waste generated for reuse, treatment so the waste is no longer hazardous and, finally, to properly dispose of residual waste that is not treatable or recyclable.

The following subsections present the method for managing both non-hazardous and hazardous waste generated.

8.14.4.1 Construction Phase

Non-hazardous solid waste generated during construction will be collected in on-site dumpsters and one of the franchised collection companies, such as Waste Management, will pick it up periodically. The waste will be taken to one of the nearby transfer stations, such as Davis Street Transfer Station, where recyclables will be removed and the residue will be deposited in one of several nearby landfills, such as Altamont Landfill in Livermore. Wastewater generated will include sanitary waste and may include equipment wash water and stormwater runoff. Sanitary waste will be collected in portable, self-contained toilets. Equipment wash water will be contained at designated wash areas and disposed off-site. Stormwater runoff will be managed in accordance with a stormwater management plan, which will be required prior to the start of construction. The generation of non-hazardous wastewater will be minimized through water conservation and water reuse measures.

Minimal hazardous waste will be generated during construction and will consist of liquid waste such as solvents and solid waste in the form of welding materials and dried paint. The construction contractor will be considered the generator of hazardous construction waste and will be responsible for the proper handling of hazardous waste in compliance with all applicable federal, state, and local laws and regulations, including licensing, training of personnel, accumulation limits and times, and reporting and record keeping. The hazardous waste will be collected in hazardous waste accumulation containers near the points of generation, moved daily to the contractor's 90-day hazardous waste storage area, and then, prior to the expiration of the regulatory 90-day storage period, delivered to an authorized hazardous waste management facility.

Calpine/Bechtel will seek closure of outstanding contamination issues involving the Runnel Industries and Salem Broadcasting (KFAX) properties before construction. These include: 1) possible metals contamination in the area where Runnels removed their USTs due to the use of blasting sand to back fill the tank area, 2) TPH contamination downgradient from the wash facility under the KFAX parcel, and 3) VOC groundwater contamination from an off-site source across Whitesell Street to the east. Any remaining contaminated soils at the UST site and from the wash facility will be capped as part of the process of filling the site to raise the grade. An alternative would be to remove any localized contamination (small TPH plume and UST area). This will prevent any release of contaminated soils to the surface. Calpine/Bechtel will consult with the Alameda County Health Care Services Agency and Hayward Fire Department to achieve final closure.

8.14.4.2 Operation Phase

The primary waste generated during the operation phase of the RCEC and AWT plant will be non-hazardous wastewater from plant operation. Non-hazardous solid waste will also be generated, as well as small quantities of liquid and solid hazardous waste. Handling and mitigation of these wastes is described in the following subsections.

Non-Hazardous Wastes

The wastewater from power plant cooling will be collected and returned to the City of Hayward WPCF. The project will significantly reduce the quantity of treated wastewater that will be discharged to the San Francisco Bay by the City's Water Pollution Control Facility, because the RCEC plant will use recycled water for approximately 95 percent of the process demand. A large percentage of this water will be lost due to evaporation, thereby reducing the freshwater impact on the Bay.

Sanitary wastewater from the RCEC and AWT plant, will be collected from sinks and toilets and routed to the local sewer system. The waste produced will be typical in type and quantity of that generated by facility workers.

A collection company, such as Waste Management or BFI, will collect non-hazardous solid waste or refuse. Most of these collection companies remove recyclable material prior to depositing un-recyclable waste in a landfill. The residue will be deposited in a Class III (non-hazardous) landfill. Waste deposited in the landfill is reduced or mitigated by removal of the material that can be recycled.

Hazardous Wastes

To avoid potential effects on human health and the environment from the handling and disposal of hazardous wastes, Calpine/Bechtel will develop procedures at the RCEC plant that ensure proper labeling, storage, packaging, record keeping, and disposal of all hazardous wastes. Calpine/Bechtel will:

- Apply to the California Environmental Protection Agency (CalEPA) for an USEPA hazardous waste generator identification number before facility startup.
- Accumulate hazardous wastes according to Title 22 of the California Code of Regulations (CCR) and will not store them on-site for more than 90 days.
- Store hazardous wastes in appropriately segregated storage areas surrounded by berms to contain leaks and spills. Size the bermed areas to hold the full contents of the largest single container and, if not roofed, size them for an additional 20 percent to allow for rainfall. Inspect these areas weekly.
- Authorize a licensed hazardous waste hauler to collect hazardous wastes using a hazardous waste manifest and manage these wastes only at an authorized hazardous waste management facility. Calpine Bechtel will prepare biannual hazardous waste generator reports and submit them to the California Department of Toxic Substances Control (DTSC) and will keep copies of manifests, reports, waste analyses, and other documents on-site and accessible for inspection for at least 3 years.
- Train employees in hazardous waste procedures, spill contingencies, and waste minimization.
- Develop procedures to reduce the quantity of hazardous waste generated. Use non-hazardous instead of hazardous materials whenever possible. Recycle wastes whenever possible.

As for more specific measures for hazardous waste handling, Calpine/Bechtel will implement the following procures:

- A waste oil recycling contractor will recover and recycle waste lubricating oil and dispose of spent lubrication oil filters in a Class I landfill. The supplier will recycle spent SCR capsules and catalysts, if possible, or dispose of them in a Class I landfill if recycling is not feasible.
- Chemical cleaning wastes will consist of alkaline and acid cleaning solutions used during pre-operational chemical cleaning of the boiler and pre-boiler systems of the HRSGs, acid cleaning solutions used for chemical cleaning of the HRSG after the unit is put into service, and turbine wash and HRSG fireside wash waters. These wastes, which are subject to high metal concentrations, will be temporarily stored on-site in portable tanks and disposed of off-site in accordance with applicable regulatory requirements. Disposal may consist of treatment, recovery of metals and/or landfilling.

The AWT plant is not expected to generate hazardous waste.

8.14.4.3 Facility Closure

When the RCEC is closed, both non-hazardous and hazardous wastes must be properly handled. Closure can be temporary or permanent. Temporary closure would be for a period of time greater than the time required for normal maintenance, including overhaul or replacement of the combustion turbines. Causes for temporary closure could be a disruption in the supply of natural gas, flooding of the site, or damage to the plant from earthquake, fire, storm, or other natural causes. Permanent closure would consist of a cessation in operations with no intent to restart operations, and could be due to age of the plant, damage to the plant beyond repair, economic conditions or other unforeseen reasons. Handling of wastes for these two types of closure are discussed below.

Temporary Closure

If the RCEC were to be temporarily closed (with no release of hazardous materials) Calpine/Bechtel would deploy security personnel on a 24-hour basis and notify the California Energy Commission (CEC). Depending on the length of shutdown necessary, Calpine/Bechtel would implement a contingency plan for the temporary cessation of operations. This plan will be prepared prior to the RCEC plant startup. The plan will be developed to ensure conformance with all applicable LORS and protection of public health and safety and the environment. The plan will include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment, depending on the expected duration of the shutdown. All wastes will be disposed of according to applicable LORS as discussed in Section 8.14.7.

Where the temporary closure includes damage to the facility, or where there is a release or threatened release of hazardous waste (or materials) into the environment, procedures will be followed as will be set forth in a Risk Management Plan (RMP). The RMP is described in Section 8.12.5.4. Procedures include methods to control releases, notification of applicable authorities and the public, emergency response, and training for power plant personnel in responding to and controlling releases of hazardous materials and hazardous waste. Once the immediate problem of hazardous waste and materials release is contained and cleaned up, temporary closure will proceed as described for a closure where there is no release of hazardous materials or waste.

Permanent Closure

The planned life of the RCEC is 30 years, although operation could be longer. Whenever the RCEC facility is permanently closed, the handling of non-hazardous and hazardous waste and hazardous materials will be part of a general closure plan (see Section 4) that will attempt to maximize the recycling of all facility components. Unused chemicals will be sold back to the suppliers or other purchasers or users. All equipment containing chemicals will be drained and shut down to protect public health and safety and the environment. All non-hazardous wastes will be collected and disposed in appropriate landfills or waste collection facilities. All hazardous wastes will be disposed according to applicable LORS. The site will be secured 24 hours per day during decommissioning activities.

8.14.5 Cumulative Impacts

The RCEC and the AWT plant site will generate non-hazardous solid waste that will add to the total waste generated in Alameda County and in California. However, there is adequate recycling and landfill capacity in Alameda County to recycle and dispose of the waste for the next 30 to 40 years. This capacity is described in Section 8.14.3.1. Therefore, the impact of the project on solid waste recycling and disposal capability is not significant.

Hazardous waste generated at the RCEC plant consists of waste turbine oil and oil filter elements, SCR catalysts, and fluids used to clean the HRSGs and piping. The waste turbine oil and SCR catalysts will be recycled. Cleaning and flushing fluids will be removed and either treated to a non-hazardous condition or disposed of in a Class I landfill. Cleaning and flushing will occur only periodically. Hazardous waste treatment and disposal capacity in California is more than adequate. The AWT plant are not expected to generate hazardous waste. Therefore, the effect of the project on hazardous waste recycling, treatment, and disposal capability is not significant.

8.14.6 Monitoring

Since the environmental impacts caused by construction and operation of the RCEC and the AWT plant are expected to be minimal, extensive monitoring programs are not required. Generated waste, both non-hazardous and hazardous, will be monitored during project construction and operation in accordance with the monitoring and reporting requirements mandated by the regulatory permits to be obtained for construction and operation.

Wastewater discharged from the plant will be monitored in accordance with pretreatment standards mandated by the City (see Section 8.15).

8.14.7 Laws, Ordinances, Regulations and Standards

The handling of non-hazardous and hazardous waste at the RCEC and the AWT plant is governed by federal, state, and local laws. Applicable laws and regulations address the proper handling, storage and disposal of waste to protect the environment from contamination and facility workers and the surrounding community from exposure to non-hazardous and hazardous waste. The following LORS are applicable to the handling of waste at the RCEC and the AWT plant. These LORS are summarized in Table 8.14-3.

8.14.7.1 Federal

Wastewater is regulated by the USEPA under the Clean Water Act (CWA). Water will be returned to the City's WPCF (see Section 8.15) for discharge under the EBDA NPDES permit.

The federal statute that controls both non-hazardous and hazardous waste is RCRA, 42 United States Code (USC) Sections 6901et seq. and its implementing regulations found at 40 Code of Federal Regulations (CFR) 260 et seq. Subtitle D makes the regulation of non-hazardous waste the responsibility of the states; federal involvement is limited to establishing minimum criteria that prescribe the best practicable controls and monitoring requirements for solid waste disposal facilities. Subtitle C controls the generation, transportation, treatment, storage and disposal of hazardous waste through a comprehensive "cradle to grave" system of hazardous waste management techniques and requirements. It applies to all states and to all generators of hazardous waste (above certain levels of waste produced). The RCEC will conform with this law in its generation, storage, transportation and disposal of any hazardous waste generated at the facility. The USEPA is responsible for implementing the law.

8.14.7.2 State

Non-hazardous solid waste is regulated by the California Integrated Waste Management Act (CIWMA) of 1989, found in Public Resources Code (PRC) Sections 40000, et seq. This law provides an integrated statewide system of solid waste management by coordinating state and local efforts in source reduction, recycling, and land disposal safety. Counties are required to submit Integrated Waste Management Plans to the state. This law directly affects Alameda County and the solid waste hauler and disposer that will collect solid waste from the RCEC and the AWT plant. It also affects the RCEC plant to the extent that hazardous wastes are not to be disposed with solid waste.

Wastewater is regulated by the State and Regional Water Quality Control Boards under the Porter-Cologne Water Quality Control Act. Water will be returned to the City of Hayward Water Pollution Control Facility for ultimate discharge, along with the City's discharge at the EBDA outfall (see Sections 7 and 8.15).

RCRA allows the states to develop their own programs to regulate hazardous waste. The programs developed must be at least as stringent as RCRA. California has developed its own program by passage of the California HWCL. This statute is found in Health and Safety Code Sections 25100, et seq. Administration and enforcement of the HWCL was originally with the former Department of Health Services (DHS), which was transferred to the CalEPA and became the DTSC. Some of the elements of implementation of the HWCL were delegated to local health departments by DHS via a Memorandum of Understanding. The DTSC continues to recognize these local programs.

The HWCL performs essentially the same regulatory functions as RCRA and is the law that actually regulates hazardous waste, since California has elected to develop its own program. The HWCL, however, includes hazardous wastes that are not classified as hazardous waste under RCRA. Although the hazardous waste generated at the RCEC and AWT plant during both construction and operation will be removed (e.g., HRSG flushing chemicals, SCR catalysts, and used oil), the HWCL requires the applicant to adhere to storage, record keeping, reporting, and training requirements for these wastes.

8.14.7.3 Local

The Alameda County Department of Environmental Health will have the primary responsibility for administering and enforcing the CIWMA for solid, non-hazardous waste for the RCEC and the AWT plant.

For hazardous waste, local regulation consists primarily of the administration and enforcement of the HWCL. The City of Hayward Fire Department, Hazardous Materials Office, is the local agency that will

Table 8.14-3. LORS applicable to waste management.

LORS	Applicability	Conformance	AFC Reference
Federal:			
RCRA			
Subtitle D	Controls solid waste collectors, recyclers, and depositors.	The RCEC and AWT plant solid waste will be collected and disposed of by a collection company in conformance with Subtitle D.	Sections 8.14.3.1, 8.14.4, and 8.14.7.1
Subtitle C	Controls storage, treatment, disposal of hazardous waste.	Hazardous waste will be handled by contractors in conformance with Subtitle C.	Section 8.14.4
CWA	Controls discharge of waste water to the surface waters of the U.S. Applies to waste water returned to the City of Hayward WPCF.	Discharge will be in accordance with Publicly Owned Treatment Works (POTW) pretreatment standards, which conform to the CWA. Ultimate discharge will take place under the EBDA NPDES permit.	Sections 8.14.2, 8.14.6, and 8.14
California:			
CIWMA	Controls solid waste collectors, recyclers, and depositors.	The RCEC and the AWT plant solid waste will be collected and disposed of by a collection company in conformance with the CIWMA.	Sections 8.14.3.1, 8.14.4.1 and 8.14.4
HWCL	Controls storage, treatment, disposal of hazardous waste.	Hazardous waste will be handled by contractors in conformance with the HWCL.	Sections 8.14.4.1 and 8.14.4.2
Porter-Cologne Water Quality Control Act	Controls discharge of waste water to the surface and ground waters of the State of California. Applies to waste water returned to the City of Hayward WPCF.	Discharge will be in accordance with pretreatment standards under the EBDA NPDES permit.	Sections 8.14.2, 8.14.6 and Section 8.14

regulate hazardous waste at the RCEC plant. For emergency spills, the Alameda County Hazardous Materials Emergency Response Team is responsible for containment and cleanup.

8.14.7.4 Codes

The design, engineering, and construction of hazardous waste storage and handling systems at the RCEC and the AWT plant will be in accordance with all applicable codes and standards, including:

- The Uniform Fire Code, 1997
- The Uniform Building Code, 1997
- The Uniform Plumbing Code, 1997

8.14.8 Involved Agencies

There are a number of agencies regulating non-hazardous and hazardous waste that will be involved in regulation of the waste generated at the RCEC and the AWT plant. At the federal level is the USEPA and at the state level is CalEPA. The administration and enforcement of the hazardous waste laws, however, is primarily through a local agency or agencies. For the RCEC, the local agency will be the City of Hayward Fire Department. The Alameda County Health Care Services Agency, Environmental Protection Division is involved in closure of the contamination issues at the Runnels Industries parcel. The San Francisco Bay Regional Water Quality Control Board could also be involved in resolving any groundwater contamination issues. The agencies and persons to contact for each type of waste are shown in Table 8.14-4.

8.14.9 Permits Required and Permit Schedule

A Consolidated Permit will cover hazardous waste generation at the RCEC plant. A Hazardous Materials Business Plan must be submitted as part of the application for the permit. The permit will be obtained prior to storage of hazardous materials at the site. Specific permitting requirements are discussed in Section 8.5 (Hazardous Materials Handling).

In addition, the project must obtain an USEPA hazardous waste generator identification number. The number will be obtained before construction begins. The Hazardous Materials Business Plan will be

Table 8.14-4. Agency contacts.

Type Waste	Agency	Contact	Title	Telephone
Non-hazardous				
Solid	Alameda County Department of Environmental Health	Dick Pantages	Chief – Solid Waste Management	(510) 567-6700
Solid	Waste Management Authority of Alameda County	Roel Meregillano	Senior Regulated Environmental Health Specialist	(510) 567-6790
Liquid	San Francisco Bay Regional Water Quality Control Board	Keith Lichten	Water Resources Control Engineer	(510) 622-2380
Hazardous				
All	City of Hayward, Fire Department Hazardous Materials Office	Hugh Murphy	Hazardous Materials Program Coordinator	(510) 583-4924
All	Department of Toxic Substances Control	EPA ID Center		(916) 324-1781
All	San Francisco Bay Regional Water Quality Control Board, Toxics Cleanup Division	Roger Brewer	Primary Contact	(510) 688-2374
All	Alameda County Health Care Services Agency, Environmental Protection, Environmental Health Services	Eva Chu	Hazardous Materials Specialist	(510) 567-6700
All—Hazardous Materials Emergency Response Team	Alameda County Hazardous Materials Response Team	Deputy Chief Mark Blanchard	Hazmat Response Team Supervisor	(510) 618-3490

submitted to the City of Hayward Fire Department as discussed in Section 8.5. The NPDES permit that will be required for the discharge of stormwater is discussed in Section 8.15 (Water Resources).

8.14.10 References

Fujitsubo, A.. 2001. Personal communication between Doug Urry (Foster Wheeler Environmental Corporation) and Albert Fujitsubo (Cal-EPA, Department of Toxic Substances Control, Region 1), March 13, 2001.

Foster Wheeler Environmental Corporation (FWENC). 2000a. *Phase I environmental site assessment of 3590 & 3636 Enterprise Avenue, Hayward, California.*

Hicks, M. 2000. Personal communication between Jennifer Amdursky (Foster Wheeler Environmental Corporation) and Melinda Hicks (Customer Service, Buttonwillow Landfill), October 3, 2000.

H_2OGEOL. 2000. Letter from Gary D. Lowe, Hydrologist to Ms. Eva Chu, Hazardous Materials Specialist, Alameda County Health Care Services Agency, Environmental Health Services, May 31, 2000.

Jius, F. 2001. Personal communication between Doug Urry (Foster Wheeler Environmental Corporation) and Fred Jius (Department of Toxic Substances Control, Permitting Department), April 24, 2001.

Pantages, D. 2001. Personal communication between Doug Urry (Foster Wheeler Environmental Corporation) and Dick Pantages (Alameda County Environmental Health Department), March 13, 2001.

Ramirez, L. 2001. Personal communication between Doug Urry (Foster Wheeler Environmental Corporation) and Larry Ramirez (Department of Toxic Substances Control, Fresno Office), April 18, 2001.

U.S. Environmental Protection Agency (USEPA). 1997. *Executive Summary—the preliminary biennial RCRA hazardous waste report* (based on 1995 data). August 1997.

Vasquez, E. 2000. Personal communication between Jennifer Amdursky (Foster Wheeler Environmental Corporation) and Edward Vasquez (Customer Service, Chemical Waste Management), November 7, 2000.

Yadvich, A. 2000. Personal communication between Jennifer Amdursky (Foster Wheeler Environmental Corporation) and Andy Yadvich (Customer Service, Safety Kleen), November 9, 2000.

Russell City Energy Center AFC

May 2001

8.15 WATER RESOURCES

This section provides a discussion of the existing water resources in the vicinity of the RCEC project site the Advanced Wastewater Treatment (AWT) Plant and, along its linear facilities. Section 8.15.1 discusses the existing hydrologic environment. Potential environmental effects of the RCEC and AWT plant construction activities and operations on water resources are then assessed in Section 8.15.2. Section 8.15.3 presents proposed mitigation measures that will prevent significant impacts. Section 8.15.5 discusses cumulative impacts. Section 8.15.6 presents applicable laws, ordinances, regulations, and standards (LORS) related to water resources. Section 8.15.7 lists relevant regulatory agencies and contacts. Section 8.15.8 discusses project permits that relate to water resources and presents a schedule for obtaining those permits. A list of references cited is located in Section 8.15.9.

Water resources that may be potentially impacted by the RCEC project include water supply, water quality, and flooding hazards. Specific discussions of expected impacts are provided (Section 8.15.2) for the following:

- Depletion of water supplies
- Use of reclaimed water for cooling water
- Disposal of wastewater
- Compliance with State water policies
- Groundwater degradation
- Stormwater impacts
- Flooding impacts

8.15.1 Affected Environment

A 14.7-acre power plant site located at 3636 and 3590 Enterprise Avenue, Hayward, California, will accommodate the generating equipment, AWT plant control/administration buildings, a switchyard, storage tanks, water treatment building, and emission control equipment. Overhead transmission lines will extend east, then southeast from the power plant site to the PG&E Eastshore Substation, a distance of approximately 1.1 miles. These areas are located in Alameda County within an area that forms part of the southeastern shoreline of San Francisco Bay, a large semi-enclosed estuary that conveys the freshwater inflows of the Sacramento and San Joaquin Rivers to the Pacific Ocean. The Bay functions as the only drainage outlet for waters of the entire Central Valley region. It also functions as a natural topographic separation between the northern and southern coastal mountain ranges.

The project site is situated on an elongated, northwest-trending, low-lying alluvial fan complex deposited by stream channels. During Pleistocene and Holocene times, this was an area of aggradation. Streams discharged across the area, depositing lenticular bodies of sand and gravel, later to be encased in finer sediments. Physiographically, this area is bordered by the San Francisco Bay on the west, the Diablo Range on the east and south, and the Sacramento-San Joaquin Delta on the north.

8.15.1.1 Climate and Precipitation

The climate in the project area is Mediterranean (NOAA division CA-04: Central Coast) with moderate year-round temperatures and a winter rainy season.

Since 1958, normal temperatures in the area typically have exhibited a seasonal pattern ranging from winters of approximately 40-57°F (mean daily temperature of 49°F) in December and January, to summer temperatures ranging from 53-76°F (mean daily temperature of 65°F) in August and September. The average annual temperature is 59°F. The average annual evaporation pan rate is approximately 55 inches, indicating that the project site experiences evaporation rates significantly exceeding local precipitation.

The closest long-term precipitation gauge is Station 62, located on the Hayward Corporation Yard, at an elevation of 55 feet msl. Between 1957 and 1992, the annual rainfall at that location averaged 17.9 inches per year. The project site falls in an area that typically receives, on average, approximately 16 inches of rain per year. Most of this precipitation occurs during the months of October through April, while summers are relatively dry.

Table 8.15-1 lists the average rainfall amounts by month over a continuous 35-year period from 1957-1992 as recorded at Meteorological Station 62 (Personal communication Frank Codd, Alameda County Public Works Agency, Flood Control and Water Conservation District, 2001).

The California Department of Water Resources and the Alameda County Public Works Agency have compiled precipitation frequency data for all of Alameda County. Table 8.15-2 summarizes the storm duration-recurrence data for the Hayward area for storm events ranging from the 2-year to the 100-year event (Personal communication, Jim Goodridge, California Department of Water Resources, 2001). This precipitation data is used in Section 8.15.2.4 for estimating flooding impacts by calculating the expected stormwater runoff from the project site.

Table 8.15-1. Average monthly rainfall amounts at Station 62: Hayward, CA (inches).

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
0.05	0.05	0.34	1.23	2.57	2.60	3.40	2.95	2.92	1.36	0.28	0.14

Annual Average =17.9 inches Source: Frank Codd, Alameda County Flood Control and Water Conservation District.

Table 8.15-2. Storm duration-recurrence intervals - Station 62: Hayward Corporation Yard.

Recurrence	Maximum precipitation (inches)					
(years)	15-min.	1-hour	6-hour	12-hour	24-hour	Annual Mean
2	0.26	0.53	1.14	1.52	1.98	16.54
10	0.43	0.89	1.92	2.56	3.34	24.58
25	0.52	1.07	2.31	3.08	4.01	27.94
50	0.59	1.20	2.59	3.45	4.50	30.23
100	0.65	1.33	2.86	3.82	4.98	32.37

Sources: Alameda County Public Works Agency: Frank Codd; CA-DWR: Jim Goodridge

8.15.1.2 Groundwater Resources

The project site lies within the South East Bay Plain Groundwater Basin (SEBP Basin), an alluvial aquifer system consisting of poorly consolidated to unconsolidated lenses of gravel, sand, silt, and clay (CH_2MHill 2000). The SEBP Basin falls within the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (Hickenbottom and Muir 1988). These groundwater resources are managed by the Regional Water Quality Control Board (RWQCB) and the East Bay Municipal Utility District (EBMUD).

Covering an area of about 115 square miles, the SEBP Basin is the largest, most productive groundwater basin in the EBMUD service area. As depicted in Figure 8.15-1, the SEBP Basin is bounded to the east by the Hayward Fault, an active fault with low permeability that impedes the flow of groundwater. To the west, the basin extends beneath San Francisco Bay. The basin thins to the north, becoming an insignificant source of groundwater near Berkeley. To the south, the basin merges with the Niles Cone Groundwater Basin south of the San Mateo Bridge. Included in this area are the communities of Oakland, Alameda, San Leandro, San Lorenzo, and the northern portion of the City of Hayward, including the RCEC Project site. The major water-bearing unit in the basin is Older Alluvium of Pleistocene Age. This alluvium is overlain by Merritt Sand, Young Bay Mud, fluvial deposits, and younger alluvium of Holocene Age. Most of the sediments that make up the unconsolidated deposits beneath the East Bay Plain were derived from the Diablo Range to the east.

Hydrostratigraphy

The hydrostratigraphy of the SEBP Basin in the area of the project site correlates closely with aquifer units identified in the adjacent Niles Cone Groundwater Basin, which has been extensively studied (ACWD 1998). Consequently, four main stratigraphic units have been delineated for the SEBP Basin: a Shallow Zone (Layer-1), Old Bay Mud (Layer-2), Upper Alameda Formation (Layer-3), and Lower Alameda Formation (Layer-4).

Layer-1

This Shallow Zone represents a water table aquifer system with relatively high vertical resistance to flow (CH_2MHill 2000). This layer consists of recent marine clay, Young Bay Mud, aeolian sand, and alluvial deposits laid down on top of the Old Bay Mud sequence during the Holocene Age. Layer-1 is about 115 to 130 feet thick in the project area. Perched water and localized aquifers shallower than 50 feet exist in this unit. Depth to groundwater under the project site is only a few feet. The Newark aquifer equivalent is present at a depth of approximately 30 to 100 feet. The quality of this water is degraded due to industrial spills, leaking underground tanks, and general urbanization of the area. The lateral extent of these shallow perched zones has never been evaluated. The perched aquifers are recharged by pipe leakage, stream seepage, precipitation, and percolation from salt evaporation ponds. Salinity in the shallow water table of the San Lorenzo Cone is generally low and shows little influence from saltwater intrusion. Chloride concentrations range from less than 50 to 123 ppm (Muir 1997). Groundwater throughout the area generally flows from east to west, from the Hayward fault towards San Francisco Bay (CH_2MHill 2000).

Layer-2

This layer represents the Old Bay Mud, a relatively homogeneous estuarine mud consisting of unconsolidated dark plastic, organic-rich clay and silty clay of late Pleistocene age. This unit is considered an aquitard, and is expected to be about 35 feet thick under the project site (CH_2MHill 2000).

Layer-3

This layer represents the upper, marine-derived portion of the Alameda Formation. The marine Alameda unit is a sequence of estuarine muds separated by alluvial fan deposits (Figuers 1998). Two aquifers are typically present within this unit. The Centerville Aquifer is encountered at depths of 150-220 feet bgs and consists of individual sand and gravel lenses that vary in thickness from 5 to 60 feet (Maslonkowski 1988). The second, lower aquifer encountered within Layer-3 at about 250 to 375 feet is the Fremont Aquifer. The Fremont and Centerville aquifers are both under confined conditions and are separated by a thick aquitard. Layer-3 is approximately 350 feet thick under the project site.

Layer-4

This layer, which occurs at depths below about 500 feet bgs, represents the lower, continentally derived portion of the Alameda Formation as defined by Figuers 1998. Water-bearing formations within the unit consist of alluvial fan deposits inter-fingered with lake, swamp, river channel, and flood plain deposits. The Deep Aquifer zone associated with this unit is generally found within the upper 100 feet of Layer-4 (CH_2MHill 2000).

Bedrock

In the RCEC Project area, bedrock consists of relatively impermeable graywacke, shale, sandstone, mafic volcanic rocks, melange, and ultramafic rocks (Figuers 1988). Depth to bedrock in the project area is about 1,000 feet.

Hydrogeologic Properties

Hydraulic data for the SEBP Basin is limited. A comprehensive environmental assessment of the area by EDMUD is nearing completion and promises to provide more data. A pumping test of the City of Hayward's Well-9 provided a transmissivity estimate of about 35,000 gallons/day/foot (gpd/ft) and a specific capacity of 25 gallons/minute/foot (gpm/ft) at 1,500 gpm (Brown and Caldwell 1986). Well-9 is screened in multiple aquifers below 285 feet bgs, corresponding to the Fremont and Deep Aquifer. Additional aquifer testing in this area provides information on vertical variations in aquifer properties. Wells screened shallower than 300 feet bgs have specific capacities ranging from 2 to 20 gpm/ft. Wells screened deeper than 300 feet have specific capacities that range from 30 to 50 gpm/ft (Brown and Caldwell 1984).

The San Lorenzo and Hayward areas have the greatest well yields in the SEBP Basin (ACFCWD 1993). Wells tapping the Newark Aquifer have yields of 20 to 100 gpm with large drawdowns (Maslonkowski 1988). Wells screened in the Centerville and Freemont aquifers have yields of 200 to 600 gpm. Wells penetrating to depths greater than 400 feet typically have yields as high as 2,000 gpm. The data indicate that the Deep Aquifer is more productive than shallower units, but it is important to note that most deep wells are screened across multiple aquifers and therefore do not provide specific information regarding Deep Aquifer properties.

Selected hydrographs indicate a relatively steady period of water levels since 1990, although water levels are increasing somewhat in the Deep Aquifer (CH_2MHill 2000). Shallow groundwater in Layer-1 and Layer-2 (Newark Aquifer) flows towards the west at an average horizontal gradient of about 0.2%. Slight mounding of water levels beneath San Leandro and San Lorenzo creeks is evident within this zone due to recharge. Groundwater flow within Layer-3 (Centerville and Fremont aquifers) is also westerly with approximately the same 0.2% horizontal gradient. Water level data for Layer-4 is sparse, with horizontal gradients of about 0.1%. Groundwater in the Deep Aquifer under the project site appears to

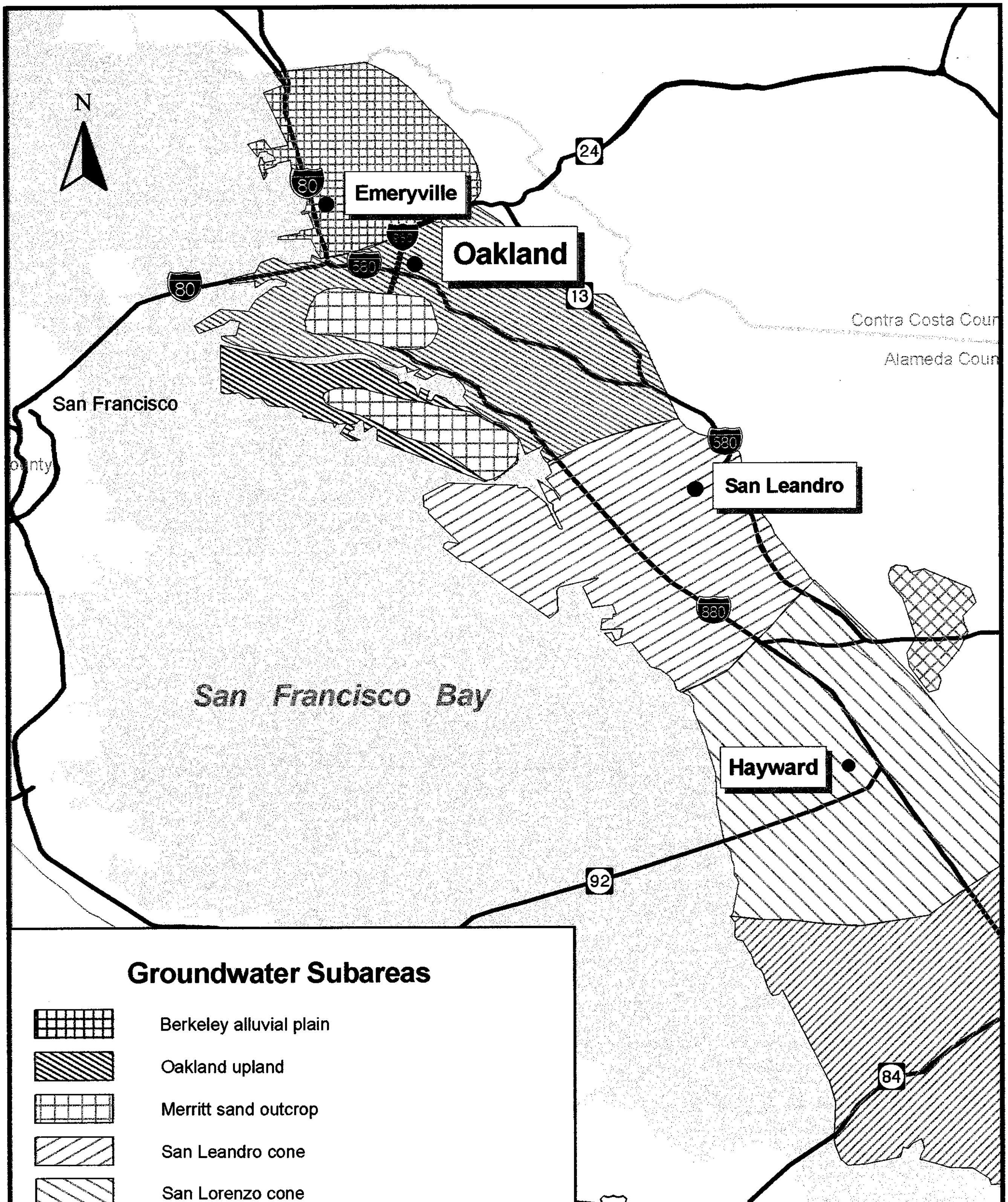


Figure 8.15-1

Groundwater Areas

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Russell City Energy Center AFC

May 2001

flow more towards the north than in shallower zones, possibly indicating recharge from the Niles Cone Basin (Maslonkowski 1988). Water level maps indicate that vertical downward gradients are present throughout the basin where the Old Bay Mud is present (CH_2MHill 2000). Near the margin of San Francisco Bay, vertical gradients are approximately 2% (both from shallow to middle zone, and from middle to deep zone). This downward gradient indicates this is a recharge zone for the basin.

Water Balance

A water budget for the SEBP Basin, and specifically for the San Lorenzo Cone in which the project area lies, has been developed for the mid-1990's (Muir 1993a,b; 1996). Groundwater sources, recharge components, and discharge loses as defined by Muir are summarized in Figure 8.15-2. Total recharge to the basin from pipe leakage, stream seepage, rainfall infiltration, agricultural return flow, and lateral movement of groundwater into the basin at depth was estimated to average about 20,000 acre-feet per year (afy). Discharge outflow at the bay margin, pumpage, and evapotranspiration were estimated to average about 17,000 afy. This water balance results in a net recharge to the SEBP Basin of 3,000 afy, which is reflected in rising water levels observed in the Deep Aquifer.

Beneath the SEBP Basin, there are perhaps 2,500,000 acre-feet of groundwater in storage (CA-DWR 1994). Most of this groundwater resides in aquifers below Layer-2, in a zone of saturation that lies below the elevation of the surface of San Francisco Bay (Hickenbottom and Muir 1988). However, due to the hydrogeologic setting and proximity to San Francisco Bay, only that small percentage of groundwater stored above bay level may be tapped without endangering water quality. If groundwater storage declines to or below bay level, salt water could intrude. This has happened in the San Leandro and San Lorenzo areas. A rough determination of the groundwater storage volume was performed by Hickenbottom and Muir (1988) using the following parameters:

- Zone of saturation is 10 feet (average thickness of the zone of saturation above sea level)
- Area of the SEBP Basin is 114 square miles (9,728 acres for the San Lorenzo Cone sub-area)
- Specific yield of aquifers is 7% (sand and clay classification)

Based on the preceding values, the total volume of groundwater stored in a 10-foot zone above sea level in the SEBP Basin (total useable storage capacity) would be about 51,000 acre-feet. Muir (1994) developed a more sophisticated model and estimated total useable groundwater storage at 80,000 acre-feet. For the San Lorenzo Cone sub-area in which the RCEC project site is located, the volume of useable groundwater in storage is estimated to be about 6,800 acre-feet with the simple model described above.

Groundwater Quality

Native groundwater from below 200 feet in the Hayward area is a sodium-calcium-bicarbonate water chemistry type with total dissolved solids (TDS) of less than 450 mg/l, and a slightly alkaline pH of around 8.2 (CH_2MHill 2000). Data suggest that this groundwater is at saturation with respect to calcium carbonate. This condition probably has arisen through subterranean mixing of a calcium bicarbonate type and sodium bicarbonate water chemistry type resulting in precipitation of calcium carbonate. The silica concentration of 12 mg/l is relatively low and trends higher in the North San Leandro area. Nitrate is present only at very low concentrations (0.1 to 0.3 mg/l). Metals concentrations, particularly iron and manganese, are elevated.

Relative to its inorganic mineral content, groundwater beneath the SEBP Basin seems to be suitable for most beneficial uses. Indications are that the majority of the groundwater would meet the Primary Drinking Water Standards established by the USEPA and the State of California (Muir 1997).

Compared to deep intervals, groundwater shallower than 200 feet bgs may contain relatively high concentrations of TDS, chloride, nitrate, and sulfate (CH_2MHill 2000). Materials toxic to man have been introduced into the shallow aquifer (Layer-1) at a number of different locations. These pollutants include petroleum products, liquids containing heavy metals such as lead and chromium, organic solvents such as acetone and benzene, coliform bacteria, and many others (Hickenbottom and Muir 1988). Point sources that have had a past release or have the potential to experience future releases of hazardous materials include regulated and unregulated hazardous waste generators, leaking tank sites, toxic spills, landfills, etc. A survey of such sites performed by CH_2MHill (2000) shows a high density of sites with potential for contaminant release into the shallow aquifer.

Existing beneficial uses of groundwater pumped from the SEBP Groundwater Basin include municipal, process, industrial, and agricultural uses (SFBRWQCB 1995). Today, groundwater in the basin is used mostly for domestic irrigation and isolated industrial purposes (CA-DWR 1994).

8.15.1.2 Surface Water Resources

Surface Water Drainage

The RCEC site is located within the San Lorenzo Cone drainage basin (Figure 8.15-1). This basin drains an area of west Hayward comprising some 9,700 acres. Old Alameda Creek and the Ward-Zeile creek systems convey most of the precipitation runoff in this area. Surface waters flow into South San Francisco Bay. The watershed of potential impact lies in the Arroyo de Alameda between Sulphur Creek and Mt. Eden Creek, the largest streams in the RCEC vicinity. Sulphur Creek (1.7 miles to the northwest) and Mt. Eden Creek (1 mile to the south) also flow into southern San Francisco Bay. Most of the streams and arroyos in the vicinity of the site are ephemeral in nature. Storm-flow runoff is managed by the Alameda County Public Works Agency-Flood Control and Water Conservation District to mitigate flooding impacts and help recharge the groundwater basin. Surface water runoff to the north of the site flows via Landing Canal and discharges into San Francisco Bay at Hayward Landing.

To the west of the site, a small amount of stormwater runoff flows directly onto an adjacent wetlands parcel owned by Waste Management Corporation. Most local runoff from the RCEC site, as it is today, flows south into an unnamed flood canal (Zone 4, Line F) through which the water is channeled into several nearby marsh and wetland areas at the margin of San Francisco Bay. Both fresh and saltwater flows to these wetland areas are carefully managed by the East Bay Regional Parks District (Mark Taylor, EBRPD, personal communication, 5-4-01). During the dry season, water is distributed to maintain the desired wetland habitat for waterfowl and the endangered salt marsh harvest mouse species (see Section 8.2, Biological Resources). During the wet season, excess water is channeled into San Francisco Bay at the Johnson Landing outfall (Sowers and Lettis 1997). A major upgrade to the present surface water drainage and distribution systems in this area is scheduled to begin in September 2001 and should be completed well before the RCEC activities could impact surface water resources.

The Hetch Hetchy Aqueduct is operated by the San Francisco Water Department and provides a large source of imported surface water to the area from the Tuolume River in the Sierra Nevada Mountains for the City of Hayward, which derives 100% of their drinking water (currently 19 mgd) from this source.

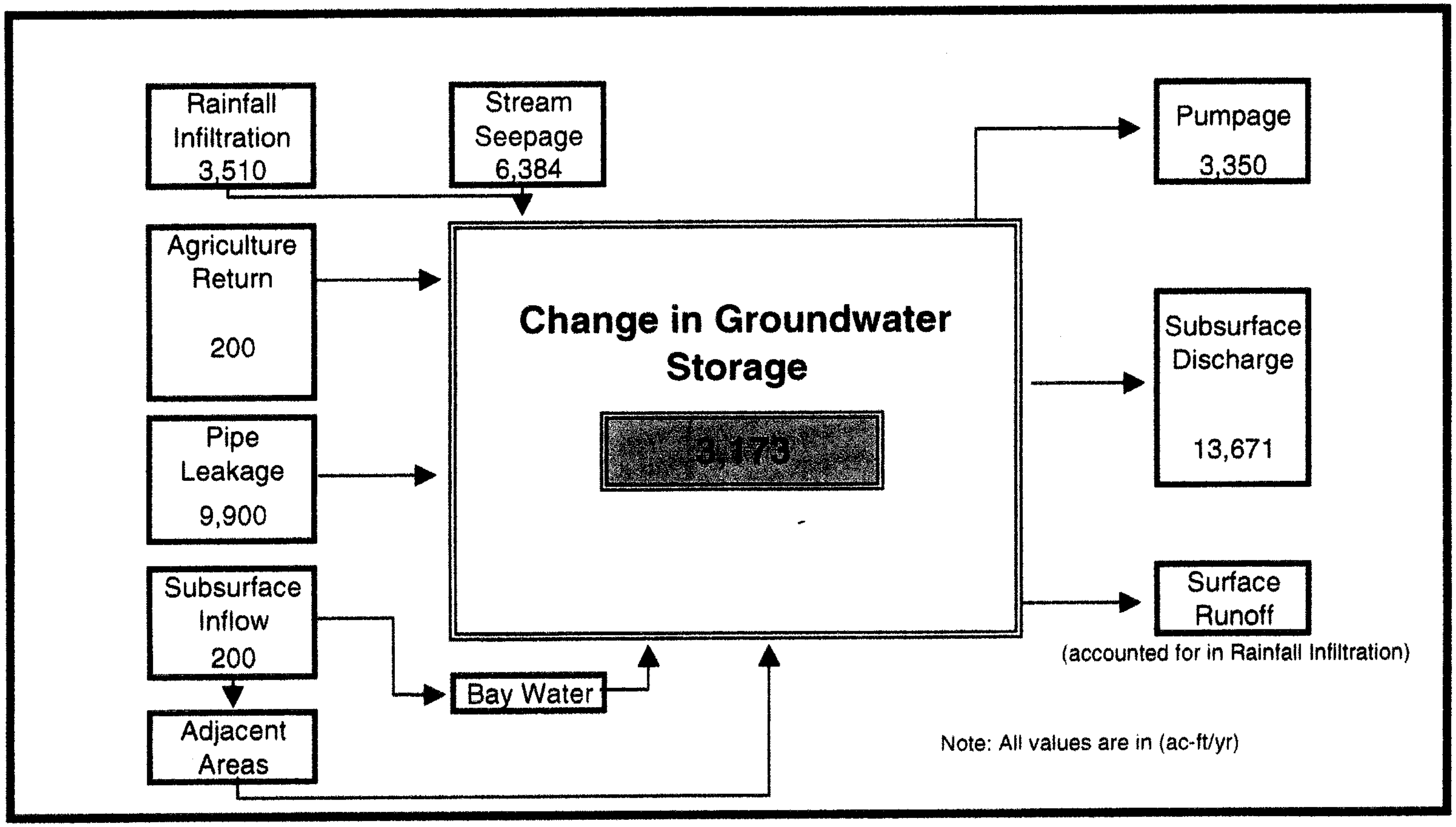

Figure 8.15-2

Groundwater Balance, SEBP Basin
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Wetlands

Small, isolated seasonal wetlands are located on the RCEC site (Section 8.2.1.3). Large areas south of the project site and to the west are brackish or saltwater marshes in various stages of restoration that are located in the Hayward Shoreline zone, between the project site and the San Francisco Bay shore. These areas include several areas that were formerly salt evaporation ponds that are currently open water; areas formerly salt evaporation ponds, but that have returned to natural wetland vegetation (pickleweed dominant); a large area called the HARD Marsh that is a managed and created wetland fed by runoff as well as by secondary treated effluent from USD/EBDA, mixed periodically with bay water; and the Cogswell Marsh, a tidally influenced salt marsh to the northwest of the project area.

Floodplains

The Federal Emergency Management Agency (FEMA) has issued flood insurance rate maps for the Old West Winton landfill (Community-Panel No. 065033-0010-E, revised: 2/09/2000) and for the RCEC plant site and vicinity. A reproduction of the FEMA map showing the flood zones in relation to these sites is provided in Figure 8.15-3. This map indicates that neither the RCEC project site, nor the transmission line route is located within a 100-year floodplain (Zone A) or a 500-year floodplain (Zone X). Clearly, the areas impacted by the RCEC project are subject only to minimal flooding. Additionally, these sites are not located within an area of coastal or tidal flooding hazards (Zone V).

Surface Water Quality

Water quality data from streams in the vicinity of the plant site indicate fair to poor quality water, typical of urban runoff. Water samples collected by the Association of Bay Area Governments (ABAG 1989) showed low to moderate levels of total suspended solids (TSS) (6 to 250 mg/l), moderate levels (6 to 16 mg/l) of biochemical oxygen demand (BOD), heavy metals (copper and lead), and high levels of fecal coliform bacteria. It should be noted that the quality of surface water runoff varies considerably both seasonally and temporally during the course of a storm event. Stormwater runoff was typically of better quality than for low flow periods due to dilution effects from rain. Water quality data from ABAG Station S4 are summarized as "area stormwater runoff" in Table 8.15-3. This data is included to represent typical stormwater runoff generated from areas around the project site.

Surface Hydrology–Current Environmental Assessment

RCEC Plant Site

The proposed project site is located at an elevation of between 5 and 10 feet above mean sea level. The plant site will be located on parcels totaling approximately 14.7 acres, located at 3636 and 3590 Enterprise Avenue, Hayward, California. Prior to 1966, the site was in agricultural use. In 1970, 3590 Enterprise was developed by the C.E. Freeman Company for a metal painting business. In 1976, Freeman sold the property to Runnels Industries, also a metal painting business. The parcel at 3636 Enterprise is home to Salem Broadcasting Company's KFAX radio transmitter facility.

Table 8.15-3 Predicted water quality characteristics for cooling water blowdown along with Hayward industrial source limits.

Constituent	RCEC Cooling Water Discharge *		Hayward Industrial Waste Pretreatment Limits **	
Temperature	100	° F	150	° F
pH	8.1	units	> 6	units
Total Dissolved Solids	2,460	mg/l	-	
Total Suspended Solids	10	mg/l	-	
BOD	< 1	mg/l	-	
Hardness	20	mg/l	-	
Calcium (total)	10	mg/l	-	
Magnesium (total)	10	mg/l	-	
Manganese	< 1	mg/l	-	
Sodium (total)	400	mg/l	-	
Potassium	100	mg/l	-	
Total Alkalinity	310	mg/l	-	
Silica	40	mg/l	-	
Sulfate	100	mg/l	-	
Chloride	840	mg/l	-	
Copper (total)	0.01	mg/l	2	mg/l
Cadmium	ND		0.2	mg/l
Chromium (total)	ND		0.2	mg/l
Cyanide (total)	0.019	mg/l	0.6	mg/l
Iron (total)	1	mg/l	-	
Lead (total)	ND		1	mg/l
Mercury (total)	ND		0.01	mg/l
Nickel (total)	0.01	mg/l	1	mg/l
Nitrate	100	mg/l	-	
Fluoride	ND		-	
Arsenic	ND		1	mg/l
Boron	42	mg/l	-	
Selenium (total)	ND		-	
Silver (total)	ND		0.5	mg/l
Zinc (total)	0.04	mg/l	1	mg/l

* Concentrations predicted after 100 cycles through the cooling tower

** Chemicals used in cooling tower treatment will not contain the priority pollutants listed in 40 CFR 423.17

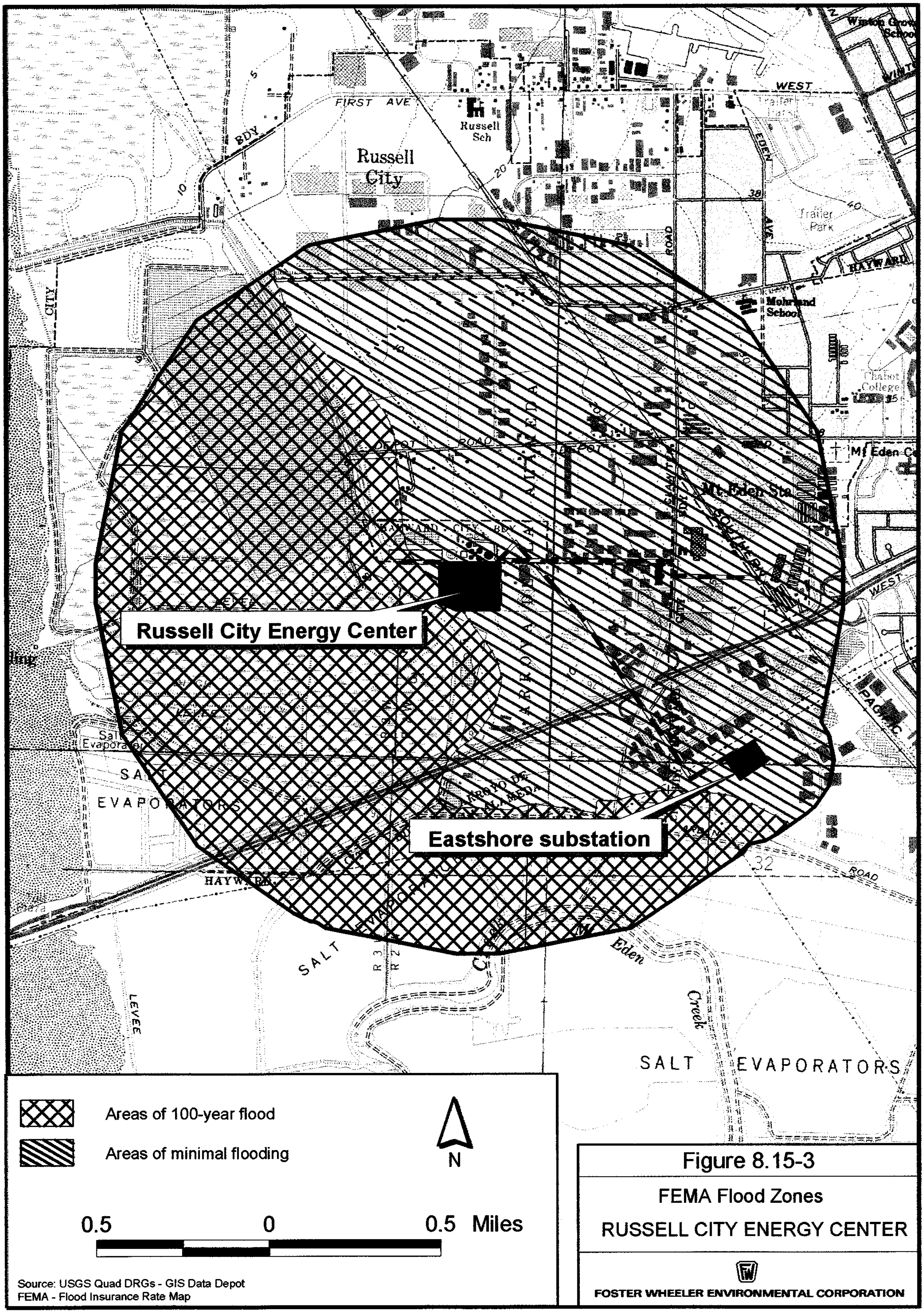

Figure 8.15-3

FEMA Flood Zones

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The Runnels Industries property at 3590 Enterprise has been filled to a height of about 10 feet above sea level, as has the trucking terminal to the west of the KFAX parcel. The KFAX parcel is low-lying and poorly drained, and contains approximately 1.68 acres of isolated, seasonal wetlands (see Section 8.2, Biological Resources). These seasonal wetlands are indicative of previous ground disturbance and poor site drainage. A low berm extends along the southern boundary of the KFAX parcel, but is located on the adjacent lot, which is owned by Waste Management Corporation. This berm has the effect of channeling all runoff on the KFAX property to its southeast corner. A flood control channel with a low levee to prevent all but controlled inlet drainage, runs just south of the adjoining Waste Management lot. Runoff from the KFAX parcel crosses the adjacent Waste Management parcel to the south, to flow into a City of Hayward parcel. Runoff is channeled into a stormwater-retarding basin that is formed by the flood control channel levee and the levee of the HARD marsh, located immediately to the west.

The power plant site parcel lies outside of the 100-year floodplain and does not contain stream channels or flood control ditches.

Electric Transmission Line and Eastshore Substation Expansion—The 1.1-mile-long overhead transmission line route passes southeast from the plant site and will connect with the existing PG&E 115-kV line running north-south to the east of the project site and south to the Eastshore Substation. No flood control resources will be crossed. The transmission line route passes over flood control ditches but no major stream channels. Other than flood control channels, the line will not pass over any other 100-year floodplain zone. The Eastshore Substation is not within a 100-year floodplain zone. The floodplain areas along the transmission line route and at the substation are shown on Figure 8.15-3.

Natural Gas Pipeline—Fuel will be delivered by PG&E from its distribution line No. 153 about 1 mile east of the RCEC site. The proposed natural gas pipeline route will not cross any wetlands, major stream channels, or 100-year floodplain zones.

Wastewater Return Pipeline— The wastewater return line will cross under Enterprise Avenue to the City of Hayward Water Pollution Control Facility. This area is entirely paved.

AWT Plant

Surface hydrology for the AWT plant is the same as for the RCEC plant site.

Construction Laydown and Worker Parking

None of the candidate construction laydown and worker parking areas contain wetlands, streams, drainages, or 100-year floodplain zones.

8.15.1.4 Water Supply Agencies

City of Hayward

Hayward's water source comes from the Hetch Hetchy water system in the Sierra Nevada Mountain Reservoir through an agreement with the San Francisco Water Department. The City of Hayward has a maximum delivery capacity of 32 million gallons per day and an average consumption of about 19 million gallons per day.

8.15.2 Environmental Consequences

The potential effects of the project on water resources have been evaluated based on impacts to:

- Water supplies
- Use of reclaimed water for cooling water
- Disposal of wastewater
- Compliance with State water policies
- Surface water quality and flooding hazards
- Groundwater degradation

8.15.2.1 Significance Criteria

The project would cause a significant environmental impact if it would cause substantial flooding, erosion, or siltation; substantially degrade water quality; substantially degrade or deplete groundwater resources; interfere substantially with groundwater recharge; or contaminate a public water supply.

8.15.2.2 Water Supply Impacts

An estimate of the RCEC plant's average and peak daily water usage is described in Chapters 2 and 7. A water balance diagram for operation, showing the various water requirements and estimated flow rates for the facility, is presented in Figure 2.2-4. Operation of the RCEC will require 3.33 million gallons per day (mgd) (2,313 gallons per minute), or 3,730 acre-ft/year during average water supply demand conditions (assumed at 60°F ambient temperature with no fog injection and power augmentation) and 5.27 mgd (3,660 gpm), or 5,904 acre-ft/year during peak water supply demand conditions (assumed at 90°F ambient temperature with no fog injection and power augmentation). These flow rates account for losses in the water treatment process, to produce the final product demand for the plant of 2.41 mgd during average conditions and 3.8 mgd at peak conditions. In evaluating water supply requirements and impacts, the data for 60°F were used most often because this is essentially the average temperature at the project site (Section 8.15.1.1). Worst-case water impact scenarios should use the data for 90°F.

The primary source of cooling tower makeup water, comprising over 96 percent of the total water requirements of the RCEC project, will be treated secondary effluent provided by the City of Hayward WCPF. The Hayward WPCF typically discharges 13.3 mgd to the EBDA pipeline. The RCEC Project will divert and reclaim, on average, 3.33 mgd of this secondary effluent for plant cooling needs. This action will not impact the supply, which far exceeds demand. A new 300 foot-long pipeline will be constructed to convey secondary effluent from the City of Hayward WCPF to the RCEC plant site. The average concentrations of water quality constituents expected in the secondary effluent to the RCEC plant are summarized in Table 8.15-3, which also includes water quality data for an alternate cooling water source derived from the USD. The secondary effluent wastewater supply will be reclaimed through advanced wastewater treatment using microfiltration, reverse osmosis, and hypochlorite disinfection prior to use as a heat transfer (cooling) medium (see Section 7). The reclaimed wastewater influent has moderate levels of TDS, chloride, sodium, copper, nickel, and nutrients, but is generally of sufficient quality for non-potable uses such as cooling tower use (CH_2MHill 1999). The City of Hayward WPCF is currently planning significant plant upgrades that are designed to improve the water quality of the secondary effluent. These upgrades will occur over the next 5 years; therefore, the water quality of the influent to the RCEC is expected to improve in the near future. However, the proposed

AWT plant is designed to treat secondary effluent of existing quality (Table 8.15-3) to the levels required for use at the power plant.

Use of reclaimed water ensures the least impact to the local environment, but does require special precautions since the water may carry bacteria and other disease-causing microorganisms. Reuse of wastewater is encouraged in water-short areas and is in compliance with State water policy for water conservation and maximum reuse of wastewater (Section 8.15.2.2). In addition, the planned use of a reclaimed water source, presently discharged into the Bay, drastically reduces impacts to surface and groundwater resources which would otherwise be tapped for cooling water, and at the same time, reduces the volume and contaminant loading of wastewater discharged by the City of Hayward through the EBDA outfall.

All recycled water pipelines, storage tanks, and ancillary facilities will be constructed in compliance with California Code of Regulations Titles 17 and 22. Title 17 addresses the requirements for backflow prevention and cross-connections, while Title 22 addresses other health-related issues. A Title 22 Engineer's Report must be submitted and approved by the State Department of Health Services and the Regional Water Control Board (RWQCB). The RWQCB will issue Reclamation Requirements to ensure the recycled water is properly treated and safely used. AWT plant will be provided by a furnished vendor package with full redundancy and reliability. The AWT plant is fully described in Section 2. All reclaimed water pipelines must be clearly marked, "Recycled Water - Do Not Drink". Additionally, all reclaimed water used in cooling towers, evaporative condensers, or other equipment that creates a mist, must be equipped with a drift eliminator and must be treated with a biocide to control growth of *Legionella* and other microorganisms (CH_2MHill 1999).

The City of Hayward will supply approximately 0.002 mgd of potable water (2 gpm or 2.2 acre-feet per year) for the RCEC domestic and fire fighting needs. This water will be supplied from an existing 12-inch pipeline adjacent to the RCEC plant site. No significant expansion of the existing water delivery infrastructure will be necessary.

The average concentrations of water quality constituents in the Hayward water supply are summarized in Table 8.15-3. The water is considered to be of excellent quality, with low levels of TDS, hardness, sodium, and sulfate. This water meets the drinking water standards set by the State of California for maximum contaminant levels (MCLs). Calpine/Bechtel will sign long-term contracts with the City of Hayward to provide the required water supply. All project water requirements will be supplied via the new water conveyance systems described in Section 2.0 (Project Description).

With the RCEC project's annual potable water requirements (2.2 acre-feet), the water deliveries of the City of Hayward will increase by less than 0.01 percent from approximately 19 mgd to approximately 19.002 mgd. This small increase in potable water allocation for this project will not significantly affect available water supplies for the City of Hayward.

An alternate source of cooling water for the RCEC is secondary effluent from the Union Sanitary District (USD) which services Fremont, Union City and Newark through EBDA. Secondary effluent from this agency is considered an alternate source because the City of Hayward's WPCF provides more of an opportunity to integrate supply and discharge to and from the RCEC.

During construction of the proposed project, water will be needed primarily for dust suppression. Due to the limited duration of construction activities (up to 24 months) and the relatively small water requirements (250 gpm for dust control and soil compaction) of the construction phase of the project, no significant adverse impacts to water supply are expected to result. Potential water supply impacts due to electrical transmission lines, natural gas pipeline, cooling water pipeline, demolition and construction of the transmission tower will be limited to surface water runoff during excavation and construction of these elements of the infrastructure. Such construction impacts are small and can be controlled through best management practices and proper housekeeping at individual construction sites.

8.15.2.3 Wastewater Disposal

Wastewater generated by the RCEC project will include the following general categories:

- Cooling blowdown wastewaters
- Non-cooling industrial process wastewaters
- Domestic (sanitary) wastewater
- Plant drainage

The efficiencies inherent in building advanced power generation and advanced water treatment (AWT) facilities (i.e., microfiltration/reverse osmosis [MF/RO]) show their benefit in drastically reducing cooling water blowdown to a mere 33 gpm (46 gpm peak), less than 4 percent of the total wastewater generated by the RCEC project. For many power generation projects using evaporative cooling towers, blowdown wastes comprise 90 to 95 percent of the total wastewater generated. The flow rate and chemical characteristics of the cooling blowdown are dependent upon the number of cycles the water is run through the cooling system. By exploiting advances in membrane construction and employing the technology of tertiary treatment based on ultra-filtration, reclaimed water for cooling can be recycled from 50 to 100 times (cycles), with 100 cycles being considered worst-case for the purpose of evaluating wastewater quality and 50 cycles representing worst-case for flow estimates. Cooling water blowdown wastewaters will be pumped over to the headworks of the City of Hayward WPCF. The chemical characteristics of this wastewater will be similar to the secondary effluent obtained from the City of Hayward WPCF, with representative increases in the total dissolved solids (mineral content) due to evaporation. Table 8.15-3 presents a summary of the water quality characteristics expected for cooling water blowdown along with Hayward's industrial source pretreatment limits. Even after 100 cycles through the cooling tower, these limits are achieved by a wide margin principally because RO-based ultra-filtration is very effective at removing heavy metals and complex organics (e.g., dioxins, furans, PCBs, phthalates, cresols, etc.). Essentially no toxic organic compounds will pass through the tertiary treatment process. Therefore, compliance with federal pretreatment standards for new sources in 40 CFR 423.17, can be assured by starting with a clean source, constructing cooling towers with wetted surfaces that do not leach priority pollutants, purchasing water treatment chemicals that contain no priority pollutants, and carefully controlling chemical dosages to the minimum required for achieving the desired result.

Non-cooling process wastewaters include microfilter backwash, reject concentrate wastewater from the reverse osmosis process, and clarified CIP blowdown. These non-cooling waste streams comprise 94% of the total wastewater discharge requirements from the RCEC. The RO concentrate stream is predicted to contain elevated copper concentrations, therefore, a copper removal process will be performed on this stream before it is combined with the remaining clarified streams prior to discharge. This process is described in detail in AFC Section 7. These combined, treated wastewaters will be disposed through a

Table 8.15-3 Predicted water quality characteristics for cooling water blowdown along with Hayward industrial source limits.

Constituent	RCEC Cooling Water Discharge *		Hayward Industrial Waste Pretreatment Limits **	
Temperature	100	° F	150	° F
pH	8.1	units	> 6	units
Total Dissolved Solids	2,460	mg/l	-	
Total Suspended Solids	10	mg/l	-	
BOD	< 1	mg/l	-	
Hardness	20	mg/l	-	
Calcium (total)	10	mg/l	-	
Magnesium (total)	10	mg/l	-	
Manganese	< 1	mg/l	-	
Sodium (total)	400	mg/l	-	
Potassium	100	mg/l	-	
Total Alkalinity	310	mg/l	-	
Silica	40	mg/l	-	
Sulfate	100	mg/l	-	
Chloride	840	mg/l	-	
Copper (total)	0.01	mg/l	2	mg/l
Cadmium	ND		0.2	mg/l
Chromium (total)	ND		0.2	mg/l
Cyanide (total)	0.019	mg/l	0.6	mg/l
Iron (total)	1	mg/l	-	
Lead (total)	ND		1	mg/l
Mercury (total)	ND		0.01	mg/l
Nickel (total)	0.01	mg/l	1	mg/l
Nitrate	100	mg/l	-	
Fluoride	ND		-	
Arsenic	ND		1	mg/l
Boron	42	mg/l	-	
Selenium (total)	ND		-	
Silver (total)	ND		0.5	mg/l
Zinc (total)	0.04	mg/l	1	mg/l

* Concentrations predicted after 100 cycles through the cooling tower

** Chemicals used in cooling tower treatment will not contain the priority pollutants listed in 40 CFR 423.17

return line from the RCEC which will combine with the City of Hayward WPCF treated effluent discharge, conveyed to the Hayward chlorination facility, upstream of the EBDA outfall. An average flow rate for the combined process wastewater discharge is about 0.92 mgd or 638 gpm (1.46 mgd or 1,014 gpm peak flow). Table 8.15-4 summarizes the chemical characteristics of the combined wastewater streams from the RCEC and the City of Hayward WPCF to be discharged to the EBDA pipe line. Although the total amount of wastewater to be treated by the City of Hayward WPCF will actually increase (albeit marginally) as a result of the Calpine project, the flow contributed to the EBDA outfall by the City of Hayward, including the RCEC discharge, will be reduced from 13.3 mgd to 9.5 mgd, a volume reduction of 27 percent. In addition, due to the copper removal process at the RCEC, mass loadings of copper from the City of Hayward WPCF will be reduced approximately 33 percent during peak power plant operation. The effect of the mass reduction on the total copper discharged to the San Francisco bay (i.e. including the mass loadings from the other five EBDA members) is a reduction of 8 percent.

Other wastewater streams from the RCEC site include the non-process wastewater streams generated by domestic sanitary wastewater (2 gpm) from sinks, toilets, and other sanitary facilities, collected in the existing 39-inch sanitary sewer line and discharged to the City of Hayward WPCF, and from plant drainage consisting of washdown water, equipment leakage, and drainage from the facility equipment areas (average of 53 gpm; peak of 66 gpm). Water draining from these areas will be collected in a system of floor drains, sumps, and pipelines. These wastewaters could potentially contain oil or grease and will be routed through an oil/water separation/adsorption pretreatment process before being pumped over to the headworks of the City of Hayward WPCF. Plant drainage wastes will have to be permitted under Hayward's pretreatment program.

The RCEC project will not cause a significant impact on wastewater disposal activities of the City of Hayward. The amount of wastewater to be generated and disposed at the City of Hayward WPCF is approximately 3 mgd less than the secondary effluent to be provided by the City of Hayward for cooling purposes. Since the final treated wastewater from the RCEC project would not be expected to exceed EBDA's discharge limitations, both the volume and total mass of copper contributed by Hayward's wastewater discharged to San Francisco Bay will be reduced. A summary of EBDA's current NPDES discharge limitations is presented in Table 8.15-4.

Potential wastewater disposal impacts due to electrical transmission lines, natural gas pipeline, and cooling water and wastewater return pipeline, will be limited to a short period during which these appurtenances are constructed.

During construction temporary erosion and sedimentation control measures will direct stormwater runoff to existing surface drainage. Standard construction mitigation measures for erosion prevention and water quality assurance such as filter fabric or hay bale filtration and temporary or permanent settling ponds will be very effective at this site because of the flat topography. Portable toilets will be supplied by a licensed contractor for collection and disposal of sanitary wastes during the construction period.

8.15.2.4 Compliance with State Water Policies

Power Plant Cooling Policy (WRCB Resolution 75-58)

In 1975, the SCWRCB issued a policy on the use and disposal of inland surface waters used for power plant cooling (Resolution No. 75-58). The policy contains the following principles that are applicable to this project:

- The order of priority of water sources for power plant cooling was established subject to site specifics such as environmental, technical, economic, and feasibility considerations. The priority for water sources are: (1) wastewater being discharged to the ocean, (2) ocean water, (3) brackish

Table 8.15-4 Predicted water quality characteristics for project wastewaters along with corresponding EBDA NPDES permit discharge limitations.

Constituent	Hayward + RCEC Wastewater Discharge		Area Stormwater Runoff		EBDA Discharge Limit	
Turbidity	2.0	ntu	-		NA	
pH	7 - 8	units	-		NA	
Total Dissolved Solids	852	mg/l	293	mg/l	NA	
Total Suspended Solids	23	mg/l	130	mg/l	30[‡]	mg/l
BOD	22	mg/l	8	mg/l	25[♦]	mg/l
Hardness	168	mg/l	173	mg/l	NA	
Calcium (total)	38	mg/l	-		NA	
Magnesium (total)	13	mg/l	-		NA	
Manganese	0.1	mg/l	-		NA	
Sodium (total)	123	mg/l	-		NA	
Potassium	23	mg/l	-		NA	
Total Alkalinity	255	mg/l	-		NA	
Silica	13	mg/l	-		NA	
Sulfate	113	mg/l	-		NA	
Chloride	172	mg/l	-		NA	
Copper (total)	0.023	mg/l	0.025	mg/l	0.023	mg/l
Cadmium	0.3	mg/l	0.00075	mg/l	NA	
Chromium (total)	2.7	mg/l	0.01	mg/l	NA	
Cyanide (total)	0.0043	mg/l		mg/l	0.021	mg/l
Iron (total)	1.9	mg/l	-		NA	
Lead (total)	0.0024	mg/l	0.027	mg/l	0.056	mg/l
Mercury (total)	0.00007	mg/l	0.00018	mg/l	0.00021	mg/l
Nickel (total)	0.016	mg/l	0.013	mg/l	0.021	mg/l
Nitrate	5.6	mg/l	4.8	mg/l	NA	
Fluoride	3.2	mg/l	-		NA	
Arsenic	0.9	mg/l	0.00011	mg/l	NA	
Boron	0.5	mg/l	-		NA	
Selenium (total)	0.0017	mg/l	0.00023	mg/l	0.050	mg/l
Silver (total)	0.0025	mg/l	ND		0.023	mg/l
Zinc (total)	0.073	mg/l	0.013	mg/l	0.58	mg/l

water from natural sources or irrigation return flows, (4) inland waste waters of low TDS, and (5) other inland waters.

- The use of inland waters for power plant cooling must analyze the impact on Delta outflow and Delta water quality objectives.

- The discharge of blowdown water from cooling towers must not cause a violation of water quality objectives or waste discharge requirements established by Regional Boards.

Calpine/Bechtel has considered SCWRCB Resolution No. 75-58 in the selection of the cooling water source and blowdown disposal for the RCEC facility. The RCEC project complies with SCWRCB Resolution 75-58 by incorporation of the following:

- Wastewater currently being discharged to San Francisco by the City of Hayward was selected as the preferred source of cooling water for the RCEC. The selection of secondary effluent complies with the state's highest priority for cooling water sources.
- The method of cooling tower blowdown disposal will not cause a violation of water quality objectives or waste discharge requirements established by the San Francisco Bay Regional Water Quality Control Board (RWQCB). The planned method for disposal of wastewater generated from the RCEC cooling tower is conveyance back to the headworks of the City of Hayward WPCF. Therefore, all cooling tower blowdown will be treated and discharged into San Francisco Bay via the combined EBDA outfall. This discharge stream would fall under the existing NPDES permit to discharge wastewater to the Bay through the EBDA outfall. EBDA holds the NPDES permit for all of the EBDA members.

CALFED Bay-Delta Program

The CALFED Bay-Delta Program (Program) is a combined state-federal-stakeholder effort to develop a comprehensive long-term plan to restore ecosystem health and improve water management for beneficial uses of the San Francisco Bay-Delta system. The RCEC will not directly use water from the Delta. The project requires only 2.2 acre-feet of potable water annually from the city of Hayward. Since essentially all of Hayward's water is obtained from the Hetch-Hetchy Aqueduct, the use of State Water Project water from the Delta would be zero.

California Water Conservation Policy

California Water Code, Section 461 requires all water users to conserve and reuse available water supplies to the maximum extent possible. The RCEC will comply with this water conservation policy. The project has been designed to reduce cooling water requirements and discharge of wastewater. Design considerations include the selection of a very efficient combined cycle system that requires less heat rejection than conventional steam cycle systems, and the use of cooling towers that use less cooling water than once-through cooling systems. Water conservation measures include reuse of cooling tower blowdown (cycled 50 to 100 times) and recycling of blowdown from the HRSG for use in the cooling tower. Water reuse measures include the reclamation of 4.18 mgd of treated secondary effluent for cooling purposes.

Bays and Estuaries Policy

The "Water Quality Control Policy for Enclosed Bays and Estuaries of California" established water quality principles and guidelines for the prevention of water quality degradation, and protection of beneficial uses of bay waters. The RCEC will comply with this policy by incorporation of design features that will not discharge industrial wastewater or contaminated stormwater runoff to the San Francisco Bay.

Pollutant Policy for San Francisco Bay and the Delta

In 1990, the State Board adopted the "Pollutant Policy", which identified and characterized the pollutants of greatest concern in the Bay-Delta. This policy required that a monitoring program be implemented and established controls for wastewater treatment plants, drydock facilities, dredge disposal practices, and boatyard discharges. The RCEC will comply with this policy by incorporating design features that will not directly discharge untreated industrial wastewater or contaminated stormwater runoff to San Francisco Bay. In addition, a copper removal treatment process will be installed to lower copper (also nickel) concentrations in the wastewater discharged from the RCEC facility. This pretreatment, combined with the significant evaporative reduction in the total volume of wastewater discharged from Hayward through the EBDA outfall, will result in a significant lowering of the mass load of these metals entering the Bay from the EBDA outfall. Instead, these metals and salt precipitates will become part of the 9 tons per day of filter cake generated from operation of the AWT plant. As a result the average mass of copper discharged from the City of Hayward WPCF (including the RCEC wastewater) will be reduced by one-third.

California Wetlands Conservation Policy (Executive Order W-59-93)

This policy established state guidelines for wetlands conservation. The primary goal is to ensure no overall loss of wetlands and to achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage in California. The RCEC facilities have been located so as avoid disturbance and impacts to wetlands areas (see Section 8.2, Biological Resources).

8.15.2.5 Surface Water Quality and Stormwater Management

During construction, approximately 14.7 acres of land associated with the plant site will be disturbed. Surface water impacts are primarily related to short-term construction periods and consist of increased turbidity due to erosion of newly excavated or placed soils. Activities such as grading can potentially destroy habitat and increase rates of erosion during construction. In addition, construction materials could contaminate runoff or groundwater if not properly stored and used. Compliance with engineering and construction specifications, following approved grading and drainage plans, and adhering to proper material handling procedures will assure effective mitigation of these short-term impacts. In this way, possible erosion and other water quality degradation impacts will be reduced to less than significant levels. This issue is further addressed in Section 8.6, Agriculture and Soils. Calpine/Bechtel will implement Best Management Practices (BMPs) for erosion control and a stormwater management plan to assure there are no significant increases in erosion from construction activities. Additionally, erosion and sediment controls, surface water pollution prevention measures, and other BMPs will be developed and implemented for both construction and operational phases. These plans will be prepared in accordance with the Stormwater Discharge permit requirements of the San Francisco Bay RWQCB.

Stormwater runoff from within the generating and industrial portions of the site will be curbed to contain and route runoff. Rain that falls within the AWT plant curbing will be collected and pumped to the headworks of the City of Hayward WPCF. Rain that falls within areas of the site where impacts from process equipment operation and maintenance could occur will be collected, combined with other site drainage, and sent through an oil-water separator. The oil-water separator will remove floating oil, grease, and other hydrocarbons. This treated runoff will then be transferred to a wastewater holding tank for testing. If appropriate discharge criteria are met, that wastewater will be pumped to the headworks of the City of Hayward WPCF. If surface discharge criteria are not met, the noncompliant batch of wastewater will be treated as necessary before it is discharged to the City of Hayward WPCF. Rain that falls on non-process areas such as roofs and parking lots will drain directly to the on-site stormwater impoundment. The impoundment or retention basin will be located in the southwest and southeast corners of the RCEC site and will be sized to accept the 25-year, 24-hour storm volume of approximately 91,000 gallons without a short-term release flow greater than the model stormwater runoff calculated by Alameda County Flood Control for the site as it currently exists (18 cfs). Design of the containment curbing around process areas of the site will also consider the capacity needed to contain runoff from a catastrophic fire.

All large chemical storage tanks at the plant site will be stored in secondary containment areas to control accidental spills and leaks. All refueling operations and maintenance of construction equipment will be performed only in designated lined and/or bermed areas. A site-specific spill prevention, collection and contingency plan will be prepared for handling of all chemicals and wastes generated at the site.

The drainage design of the facility will conform to the Alameda County Hydrology Manual as stated in Foundations and Civil Engineering Design Criteria, A.3.3.4. Drainage facilities will be designed to handle the flow resulting from a 25-year, 24-hour rainfall event or as per the requirements of the City of Hayward Department of Public Works. The drainage facilities will also be designed to prevent flooding of permanent plant facilities and overflow of plant roads. Drainage of the site will be accomplished through gravity flow. Except for rain that falls within the footprint of the cooling towers and AWT plant, all stormwater runoff will drain to the on-site stormwater retention basins where water quality can be evaluated before ultimate release to the flood control channel (Zone 4, Line F) that runs along the southern boundary of the site. Due to the need to preserve nearby wetland habitat for water fowl nesting and roosting, manage endangered species and their food supply, avoid mosquito infestation, and eliminate the pollution associated with illegal dumping, there is no provision for direct uncontrolled release of stormwater runoff or site drainage directly to the environment. This stormwater management approach includes procedures for carefully controlling inventories of hazardous materials stored on-site, isolating, containing and treating runoff from process areas, removing suspended solids and evaluating the quality of site drainage to preclude discharges of contaminated runoff. Therefore, as long as these plans are followed, no impacts to surface water quality are expected.

These stormwater management systems will be operated in close coordination with the East Bay Regional Parks District so that short-term discharges do not exceed current maximum stormwater flow predictions for the present conditions at the site which were modeled and included in capacity calculations and design of the flood control channel into which site stormwater will be discharged. Thus, the additional runoff from increasing impervious surface areas will be mitigated so as not to cause a significant increase in off-site flooding.

The plant site is located at an elevation 6 feet above mean sea level according to the USGS topographic map. The RCEC plant site is not located within a 100-year or 500-year flood hazard zone as determined by FEMA. Furthermore, the plant site area is not subject to coastal or tidal flooding, according to FEMA. The transmission line and water/wastewater pipelines will pass over several flood hazard zones established by FEMA. Appropriate engineering design of the pipeline crossings will be required to ensure the pipelines are not damaged during a major flooding event. Likewise, proper foundation design and placement of the transmission line poles will be in accordance with the Alameda County Hydrology Manual and Alameda County ordinances related to flooding and drainage control.

Good engineering practices and BMPs will be employed in the project design and operation. Therefore, no significant impacts to surface water quality or quantity are expected during construction or operation of the proposed facility.

8.15.2.6 Groundwater

RCEC Plant Site

RCEC site activities at the plant site will have very little potential to impact groundwater resources in the project area. Although groundwater beneath the site is very shallow (estimated at 5 feet bgs), the groundwater is considered of limited use due to industrial contamination. This perched groundwater zone is separated by a thick clay layer from the deeper, better quality aquifers within Layer-3 and Layer-4. It should be noted that the currently available groundwater quality information indicates that only the shallow zone has been impacted by pollution and contamination. There are no indications that the deeper aquifers have been intruded by toxics (Muir 1997). Since stormwater runoff from the industrial portions of the plant site will be curbed to control and treat the runoff, no releases of contaminated stormwater from the plant site operation are expected. No underground chemical storage tanks are proposed at the project site. All the large above-ground chemical storage tanks will be designed with lined secondary containment structures, and therefore, the potential for release or percolation into the subsurface is remote. Any chemical spills that do occur will be immediately cleaned-up by a corps of individuals trained at rapid spill response. Solid wastes and small amounts of hazardous waste that are generated will be properly accounted for, tracked, handled, and disposed off-site using licensed transporters. No significant impacts to the beneficial use of groundwater are expected from the construction or operation of the RCEC Project.

The project will employ approximately 25 people during operation and will include sanitary facilities designed to handle the plant's domestic sewage needs. Sanitary wastes from the Administration Building will be conveyed across Enterprise Avenue to the City of Hayward WPCF. Cooling tower blowdown and plant drainage will be likewise conveyed. Wastes from these areas will have to be permitted under Hayward's pretreatment program. Since no septic tanks are proposed at the plant site and all wastewaters are disposed offsite, no adverse impacts to groundwater are anticipated.

Use of potable groundwater extracted from the SEBP Groundwater Basin by the City of Hayward is limited to emergencies and is currently of minimal impact. The potable water required by the RCEC project constitutes 0.01 percent of water deliveries by the City of Hayward. Thus, no significant impact to groundwater storage or water levels is expected from this project.

Electric Transmission Line and Eastshore Substation—Construction of the transmission line may result in a small increased potential for erosion due to temporary disturbance of the soil. Construction is anticipated to impact approximately only a small land area along the transmission line route. This includes soil disturbances for pull and tension sites, and land disturbance for pole replacement. These impacts would not occur all at once and would be temporary in duration. The flat topographic gradient of the area will minimize erosion potential at these sites. Only one of the towers is located on or near a significant sloping area. This is the tower located on the State Route 92 offramp to Clawiter-Eden Landing Road. The proposed project will minimize the potential for accelerated erosion through the use of erosion controls, sediment control structures, and re-vegetation measures. The transmission line crosses a single drainage/flood control channel that is covered in this area.

Operation-related impacts of the transmission line would be minor and insignificant. Periodic inspections of the structures and insulators and any minor repairs would not cause surface disturbance outside of the immediate tower area. The same roads used during construction will be used for repairs.

No significant impacts to water resources are expected due to construction and operation of the transmission lines.

Natural Gas Pipeline—Impacts from the natural gas pipeline will be limited to trenching and land disturbance during construction. The natural gas pipeline will be 0.9 miles long, with a 4-foot wide area of disturbance. There is a potential for a small amount of accelerated erosion to occur during construction. The proposed project will minimize the potential for accelerated erosion through the use of appropriate erosion control, prompt backfilling of trenches, and re-paving of the street surface. No significant impacts are expected due to construction of the potable water, sewer, or natural gas lines.

Operation of the pipelines would require periodic inspections. Emergency situations, though unlikely, may require immediate access. Impacts are expected to be minimal and would not significantly affect water resources. Therefore, there would be no significant adverse impacts due to operation of the natural gas pipeline.

Wastewater Return Pipeline—Impacts from the 260-foot secondary effluent pipeline and return line will be limited to trenching, directional drilling, and soil disturbance operations during construction. The estimated land disturbance includes a 4-foot wide area along the length of the pipeline. There is the potential for a small amount of accelerated erosion to occur only during construction of the pipeline. The proposed project will minimize the potential for accelerated erosion by using standard erosion control measures during the rainy season (i.e., sand bags), prompt backfilling of the trench, and re-paving of the street surface. Additionally, the minimal topographic gradient of the route will help to minimize any erosion potential. No significant impacts are expected due to construction of the water supply line.

AWT Plant

Secondary effluent is not suitable for use as process water or cooling water without filtration and disinfection to meet Title 22 standards for turbidity and coliform content. Therefore, a state-of-the-art advanced wastewater treatment plant (AWT plant) will be constructed for on-site treatment of secondary effluent diverted from the City of Hayward WPCF, for use as cooling water and process makeup water. To achieve desired water quality and minimize impacts associated with discharges from the facility, an advanced membrane technology employing microfiltration and reverse osmosis (MF/RO) will be employed. Figure 2.3-2 shows the preliminary layout for the AWT plant. The MF/RO process is described in detail in Section 2.3. Additionally, copper treatment and solids clarification processes will be used to improve the quality of the reverse osmosis concentrate and microfilter backwash before they are discharged to the EBDA system, and ultimately the San Francisco Bay via the EBDA outfall. Treatment of these wastestreams is described in Section 7.3. The AWT plant will be hydraulically designed to meet a peak demand of 2,873 gpm (4.14 mgd), which is the projected peak water need for the power plant operating at 90°F ambient temperature, including a slight safety factor. At peak conditions, the system will divert 5.27 mgd of secondary effluent from the City of Hayward WPCF to the inlet of the MF/RO process for producing the final reclaimed water demand for the RCEC. Activities at the AWT plant will not impact groundwater resources as long as solid waste residues from the clarifiers and strainers undergo proper disposal.

8.15.3 Proposed Mitigation Measures

This section presents mitigation measures that Calpine/Bechtel proposes to reduce impacts to water resources in areas affected by the proposed project, including the plant site, transmission lines, pipelines, and ancillary facilities. Additionally, the measures specified in Section 8.11 (Agriculture and Soils) will be implemented to minimize impacts to the soil resources, erosion control, and associated water quality-related impacts.

- Locate the plant site and other project facilities outside of designated flood hazard zones to the extent possible. Design site drainage to be in conformance with the Alameda County Hydrology Manual and local ordinances.
- Implement Best Management Practices designed to minimize soil erosion and sediment transport during construction of the plant site and project corridor features. Design appropriate erosion and sediment controls for slopes, catch basins, culverts, stream channels, and other areas prone to erosion.
- Perform construction activities at the plant site in accordance with the Stormwater Pollution Prevention Plan (SWPPP) and associated Monitoring Plan, which will likely be required for the project in accordance with the California NPDES General Permit for Stormwater Discharge Associated with Construction Activity. The SWPPP will include Best Management Practices to control erosion, sediment transport, and discharge of pollutants during construction.
- Conduct operations at the plant site in accordance with the Stormwater Pollution Prevention Plan (SWPPP) and with the California NPDES General Permit for Stormwater Discharges Associated with Industrial Activities. Design and implement the Best Management Practices listed in the SWPPP to prevent or control pollutants potentially associated with the operation of the plant from entering stormwaters.
- Perform refueling and maintenance of construction equipment only in designated lined and/or bermed areas located away from stream channels. Prepare and implement spill contingency plans in areas where they are appropriate.
- During construction of pipelines and transmission lines, utilize existing roads as much as possible to limit disturbance. Implement Best Management Practices to control soil erosion. Design and locate foundations and pipeline stream crossings in accordance with the Alameda County Hydrology Manual and local ordinances.
- Define and remove all contaminated soil at the plant site area. Calpine/Bechtel will conduct a Phase II soil contamination investigation and any contaminated soil will be removed from the plant site prior to the start of construction activities.
- Prepare and submit a Title 22 Engineer's Report to the State DOHS and RWQCB to ensure safe use of recycled water for the cooling water. Adhere to Reclamation Requirements issued by the RWQCB.

8.15.4 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts will occur to water resources due to construction or operation of the RCEC Project.

8.15.5 Cumulative Impacts

The RCEC Project will not cause or contribute to cumulative impacts on water resources. Good engineering practices and Best Management Practices (BMPs) will be employed in the project design and operation; therefore, no significant impacts to surface water or groundwater quality are expected during construction or operation of the project. None of the project components coincide or overlap with nearby power projects that would be considered in cumulative impact evaluation.

Since the RCEC project will utilize secondary effluent for cooling purposes, there will be no significant cumulative impact on water supply or wastewater disposal in the South Bay area. The small quantity of potable water used by the RCEC project is considered non-consequential.

8.15.6 Applicable Laws, Ordinances, Regulations and Standards

Construction and operation of the proposed project including transmission lines, pipelines, and ancillary facilities will be conducted in accordance with all LORS related to water resources. The applicable LORS are discussed below.

8.15.6.1 Federal

Clean Water Act

The Clean Water Act (CWA), as amended, Title 40 CFR Parts 112, 122, and 125, strives to protect waters of the U.S. by restoring and maintaining the chemical, physical, and biological properties of these waters. The CWA authorizes the USEPA to regulate discharges of wastewater and stormwater into surface waters by using NPDES permits and pretreatment standards. These permits are implemented at the state level by the State Water Resources Control Board (SWRCB) described in 8.15.4.2. The RCEC will return wastewater to the City of Hayward WPCF, for discharge under their permit.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) of 1976 (40 CFR Part 260 et seq.) seeks to prevent surface and groundwater contamination, sets guidelines for determining hazardous wastes, and identifies proper methods for handling and disposing of those wastes.

Comprehensive Environmental Response, Compensation, and Liabilities Act

The Comprehensive Environmental Response, Compensation, and Liabilities Act of 1980 (CERCLA) (40 CFR Parts 300 to 355) places responsibilities on the government and industry for the release, or threatened release, of hazardous materials into the environment.

8.15.6.2 State

The SWRCB in 1995 adopted the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. It includes water quality objectives for total dissolved solids and other constituents that are considered in this AFC.

California Environmental Quality Act

The California Environmental Quality Act (CEQA) Guidelines (CEQA Appendix G) define water resources impacts. These impacts are discussed in Section 8.15.2.

State Water Resources Control Board

SWRCB Water Quality Order No. 91-B-DWQ (as amended by Water Quality Order No. 92-13-DWQ), General Permit No. CAS000001, authorizes a general permit to regulate industrial stormwater discharges. A Notice of Intent will be filed with the RWQCB prior to the start of construction. A stormwater Pollution Prevention Plan (SWPPP) will be developed in accordance with the guidelines of federal NPDES permit requirements, which addresses both construction and operations stormwater pollution prevention. The SWPPP will identify Best Management Practices (BMPs) to be employed at the facility to prevent stormwater pollution during the project's operating lifetime.

SWRCB Water Quality Order No. 92-08-DWQ, General Permit No. CAS000002, authorizes a general permit for stormwater discharges associated with construction activity disturbing more than five acres.

Porter-Cologne Water Quality Control Act of 1972

The Porter-Cologne Water Quality Control Act of 1972 established jurisdiction of the nine RWQCBs to control pollutant discharges to surface and groundwaters. The RWQCB is the local enforcement agency overseeing the RCEC's SWPPP. The RWQCB will issue a waste discharge permit for project water that is to be discharged from the site.

Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

The Safe Drinking Water and Toxic Enforcement Act (Proposition 65) prohibits the discharge of any substance known to cause birth defects or cancer into sources of drinking water.

California Water Code Section 461 and State Water Resources Control Board Resolution No. 77-1

This code encourages conservation of water resources and maximum reuse of wastewater, particularly in areas where water is in short supply.

8.15.6.3 Local

Local ordinances typically address water-related issues such as drainage, erosion control, hazardous material spill control, facility siting in flood zones, stormwater discharge, and discharge of wastewater to the municipal sewer system.

8.15.6.4 LORS Compliance Strategy

Within the specified regulatory framework, the RCEC will comply with federal, state, and local LORS governing water resources. A conformance summary is provided in Table 8.15-5.

Process wastewater from the RCEC will be discharged in accordance with the City of Hayward's discharge permits for their WPCF. A Pollution Prevention Plan and a Monitoring Plan will be implemented for both construction and operation. The State of California/American Public Works Association Stormwater Task Force's *Manual of Best Management for Industrial Activities* will be used to provide general guidance in permit planning.

For compliance and control of sanitary wastewater, permits will be obtained in accordance with the Environmental Health Program of the City of Hayward. The new sanitary systems will be designed according to the Uniform Plumbing Code.

Table 8.15-5. LORS applicable to water resources.

LORS	Applicability	Conformance
Federal:		
CWA	Regulates discharges of wastewater and stormwater in order to protect nation's waters. Applies to waste water discharged from cooling tower basin and stormwater runoff.	Discharges of wastewater and stormwater subject to NPDES permits and treatment standards (Sections 8.15.2.1 & 8.15.2.2).
RCRA	Controls storage, treatment, disposal of hazardous waste.	Hazardous waste will be handled and stored in conformance with Subtitle C. Section 8.13.4. On-site conditioning, treatment, discharge systems will be monitored under the NPDES permitting process.
CERCLA	Places responsibility for releases of hazardous materials into the environment.	Obtain waste generator number and waste discharge/disposal permits as appropriate.
California:		
SWRCB Water Quality Orders	Regulates industrial stormwater discharges during construction and operation of the facility.	Part of federal NPDES permit requirements. Compliance monitored by RWQCB Section 8.15.2.2.
Porter-Cologne Water Quality Control Act	Controls discharge of wastewater to the surface and groundwaters of the state. Applies to wastewater discharged from cooling tower.	Discharge will be in accordance with CWA/Porter-Cologne NPDES/WDR permit. Sections 8.13. and Section 8.15.
Safe Drinking Water & Toxic Enforcement Act	Proposition 65 prohibits certain discharges to drinking water sources.	Part of federal NPDES permit requirements. Compliance monitored by regional WQCB.
California Water Code Section 461 & SWRCB Resolution77-1	Encourages conservation of water resources.	Effective practices for water conservation and reuse were engineered into the facility design. Section 8.15.
Local:		
City of Hayward Pretreatment Permit	Applies to cooling tower blowdown and plant drainage wastewater from process areas that is sent to the headworks of the City of Hayward WPCF.	Treatment of these aqueous wastes will be performed as required to meet pretreatment limits established by the City of Hayward.
Various	Address issues such as drainage, erosion control, hazardous material spill control, facility siting in flood zones, stormwater discharge, and discharge of wastewater to the municipal sewer system.	Project will comply with the General Plan of City of Hayward. Sections 8.15.3 and 8.15.4.

A Stormwater Pollution Prevention Plan (SWPPP) shall be developed prior to submitting a Notice of Intent (NOI) with the State Water Resources Control Board for stormwater discharge. The SWPPP shall be implemented when the RCEC facility begins operation. A water quality monitoring program shall be developed and implemented concurrently with the commencement of industrial activities.

At least 30 days prior to the beginning of operations, Calpine/Bechtel will file an NOI to comply with the terms of the General Permit to discharge stormwater associated with industrial activities.

8.15.7 Involved Agencies and Agency Contacts

Regulatory agencies and agency contacts related to water resources for the RCEC Project are summarized in Table 8.15-6.

Table 8.15-6. Involved agencies and agency contacts.

Agency/Address	Contact/Telephone No.	Permit Requirement/Reason for Involvement
San Francisco Bay Regional Water Quality Control Board 1515 Clay Street, Suite 1400 Oakland, CA 94612	Mr. Keith Lichten Phone: (510) 622-2380 Mr. Cecil Felix Phone: (510) 622-2309	NPDES Stormwater Discharge Permit for General Construction and Industrial Activities.
Alameda County Public Works Agency 951 Turner Court Hayward, CA 94545	Mr. John Rogers Phone: (510) 670-5429 Mr. Frank Codd Phone: (510) 670-5783	Grading Permit, review of erosion control plan, drainage plans, and flood control issues. Rainfall, temperature and other climatic data for Alameda County.
Alameda County Flood Control and Water Conservation District 951 Turner Court Hayward, CA 94545	Mr. Frank Yoo Phone: (510) 670-6633	Geohydrology and groundwater quality.
California Department of Water Resources	Mr. Jim Goodridge Phone: (707) 937-4709	Storm event and other climatic data for Alameda County
East Bay Municipal Utility District 375 11th Street Oakland, CA 94607	Mr. Michael Tognolini Phone: (510) 287-0125	Groundwater hydrogeology under the RCEC site.
City of Hayward Public Works Engineering & Transportation Division 777 B Street Hayward, CA 94541	Mr. Bob Bauman Phone: (510) 583-4740	Stormwater discharge issues. Secondary effluent purchase, wastewater disposal contracting issues, and pipeline interconnection.
East Bay Regional Parks District Hayward Regional Shoreline 3050 Winton Avenue Hayward, CA 94545	Mr. Mark Taylor Phone: (510) 783-1066	Stormwater discharge, impacts to adjacent managed marshes.
City of Hayward Water Pollution Source Control 24499 Soto Road Hayward, CA 94544	Mr. Joe Lucia Phone: 510-881-7900	Water quality issues for cooling tower blowdown and process area drainage wastestreams sent to City of Hayward WPCF.

8.15.8 Permits Required and Permit Schedule

A schedule for agency required permits related to water resources is summarized in Table 8.15-7. Information required to obtain each permit is also included. Agencies will be contacted to obtain the necessary permits at the appropriate time.

Table 8.15-7. Permits required and permit schedule.

Permit	Schedule
Grading and Excavation Permit: • Erosion Control Plan • Plans to import or export material • Drawings of cuts and fills with quantities • Earth-moving equipment and haul routes • Dust and noise controls • Work schedule	30 days prior to start of construction activities
NPDES General Permit for Stormwater Discharges Associated with Construction Activities: • Submit Notice of Intent (NOI), including facility information, receiving water information, implementation requirements, site map, and certification • Prepare a Stormwater Pollution Prevention Plan (SWPPP) • Prepare a Stormwater Monitoring Plan (SMP)	Submit application 120 days prior to start of construction.
NPDES General Permit for Stormwater Discharges Associated with Industrial Activities: • Submit Notice of Intent (NOI), including facility information, receiving water information, implementation requirements, site map, and certification • Prepare a Stormwater Pollution Prevention Plan (SWPPP) • Prepare a Stormwater Monitoring Plan (SMP)	Submit NOI at least 30 days prior to beginning operations.
Title 22 Reclamation Requirements: • Sufficient information to show treatment and reliability commensurate with proposed use; no health hazard or nuisance • Contingency plans, supplemental supply • Monitoring plan • Transmission and distribution systems • Area uses, description and map • Wind data	Submit Engineer's Report 120 days prior to start of operation.
City of Hayward Pretreatment Permit: • Business activity • Schematic flow diagram • Flow rates and variation • Layout of all site drainage facilities • Water source and uses • Characteristics for all discharge streams	Submit application 90 days prior to start of construction
Flood Canal Tie-in Permit: • Hydrology and hydraulic calculations • Site drainage plan • Off-site improvement plans	Submit application at least 30 days prior to construction, two-week review period is typically required.

8.15.9 References

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Russell City Energy Center AFC

May 2001

8.16 WORKER HEALTH AND SAFETY

This section outlines plans and programs that would be implemented at the Russell City Energy Center (RCEC) and AWT plant to protect the worker health and safety, both during construction and operation. During its construction, the project will provide short-term job opportunities for 277 workers on average and 485 workers at peak construction employment. During its operation, the RCEC is expected to employ approximately 25 people in the RCEC and 6 people in the advanced wastewater treatment (AWT) plant in full-time, on-site positions.

Due to the subject matter, this section follows a slightly different format than other sections in Chapter 8. Instead of a standard discussion of affected environment, followed by the project's environmental consequences and proposed mitigation measures for significant impacts, this section describes the plans and programs that are proposed to protect worker health and safety during construction and operation, then follows with lists of permits required for construction and operation and their issuing agencies. The contractors selected for this project and the operators of the facility will develop specific plans and programs as described.

The analysis presented in this section meets all requirements of the CEC and CAL-OSHA. Section 8.16.1 provides an overview of the proposed RCEC and AWT plant work sites and an explanation of the hazards that may conceivably be encountered during construction and routine operations. Section 8.16.2 outlines the health and safety programs to be implemented at the RCEC. A Fire Protection and Prevention Plan is one of these programs, and Section 8.16.2 discusses the proposed onsite fire suppression system to be used during construction and operation of the RCEC. Section 8.16.3 outlines the safety training programs that Calpine/Bechtel will use to educate workers on hazards and hazard controls. Section 8.16.4 presents applicable laws, ordinances, regulations and standards (LORS). Section 8.16.5 references permit requirements and the schedule to obtain those permits; Section 8.16.6 references agency contacts. At this point, many of the programs presented in Section 8.16 are generic. As the design of the facility proceeds, however, these programs will be updated to reflect current conditions and knowledge. Implementing the programs outlined here will prevent impacts to worker health and safety. No additional mitigation measures will be required.

8.16.1 Workplace Description

Workers will potentially be exposed to hazards during construction and routine operations of the RCEC and AWT plant. Section 2.2 of this AFC contains detailed information regarding the power plant layout, conceptual design, and operation. Section 2.3 discusses facility safety design and Section 2.4 discusses facility reliability. These sections are also relevant to worker health and safety.

Table 8.16-1 provides a general hazard analysis that identifies the anticipated hazards to be encountered during construction of both the RCEC and AWT plant. This table also lists health and safety program components that will be implemented to control each hazard. The project's Health and Safety Officer can expand this hazard analysis to greater detail and implement appropriate hazard controls as each task is scheduled to be performed.

Table 8.16-2 provides a hazard analysis that identifies the anticipated hazards and hazard controls for the operation of the RCEC AWT plant during normal operations after construction. While the types of hazards identified in this table are similar to those

Table 8.16-1. Construction hazard analysis.[1/]

Activity	Hazard	Control
Heavy equipment use	Employee injury and property damage from collisions between people and equipment	Heavy Equipment Safety Program
Forklift operation	Same as heavy equipment	Forklift operator training
Trenching and excavation	Employee injury and property damage from the collapse of trenches and excavations	Trenching and Excavation Safety Program Use of Excavation Permits per Cal-OSHA
Working at elevated locations	Falls from same level and elevated areas	100% Fall Protection Program Scaffolding Safety Program
Use of cranes or derricks	Property damage from falling loads Employee injuries from falling loads Injuries and property damage from contact with crane or derrick	Obtain Crane permits as required per Cal-OSHA Hoisting and Rigging Safety Program
Working with flammable and combustible liquids	Fire	Flammable and Combustible Liquid Storage and Handling program Fire Prevention Program Fire Protection Program Housekeeping Policy and Program
Working with hazardous materials and hazardous waste	Employee injury due to ingestion, inhalation, dermal contact	HAZWOPER[2] training, as required for hazardous wastes Hazard Communication Program (hazardous substances and information training)
Hot work (including cutting and welding)	Employee injury and property damage from fire Exposure to fumes during cutting and welding Ocular exposure to ultraviolet and infrared radiation during cutting and welding	Hot Work Permit Program Respiratory Protection Program Industrial Hygiene Monitoring Program Personal Protective Equipment (PPE) Program Housekeeping Policy and Program
Troubleshooting and maintenance of plant systems and general construction activities	Employee injury and property damage from contact with hazardous energy sources (electrical, thermal, mechanical, etc.)	Hazardous Energy Control (Lockout/Tagout) Program
Working on electrical equipment and systems	Employee contact with live electricity	Electrical Safety Program PPE Program Hazardous Energy Control (Lockout/Tagout) Program
Confined space entry	Employee injury from physical and chemical hazards	Permit Required Confined Space Entry Program
General construction activities	Employee injuries from hand and portable power tools	Hand and Portable Power Tool Safety Program PPE Program

Table 8.16-1. (Continued)

Activity	**Hazard**	**Control**
General construction activities	Employee injury and property damage from inadequate walking and work surfaces	Housekeeping Policy and Program
General construction activities	Employee overexposure to occupational noise	Hearing Conservation Program PPE Program
General construction activities	Employee injury from improper lifting and carrying	Safe Lifting Program—Provide adequate material handling equipment
General construction activities	Employee injury and property damage from unsafe driving	Safe Driving Program
General construction activities	Employee overexposure to hazardous gases, vapors, dusts, and fumes	Hazardous Substances and Information Training Program Respiratory Protection Program PPE Program Industrial Hygiene Exposure Monitoring
Construction, testing, troubleshooting, maintenance and repair of high pressure steam and air systems	Employee injury and property damage due to failure of pressurized system components or unexpected release of pressure	Installation of proper relief valves and institution of a relief valve maintenance and testing program Proof testing of pressure system components Pressure Vessel Permit to Operate (Cal-OSHA) as required by 8 CCR 450 Hazardous Energy Control (Lockout/Tagout) Program Line Breaking Safety Program

[1] The hazard and hazard controls provided are generic to construction activities. As the design and construction of the facility proceeds, these analyses will be updated to reflect current conditions and knowledge.

[2] HAZWOPER = Hazardous Waste Operation Emergency Response

Table 8.16-2. Operations hazard analysis.[1/]

Activity	**Hazard**	**Control**
Heavy equipment use	Employee injury and property damage from collisions between people and equipment	Heavy Equipment Safety Program
Working at elevated locations	Falls from same level and elevated areas	100% Fall Protection Program Scaffolding Safety Program
Use of cranes or derricks	Property damage from falling loads Employee injuries from falling loads Injuries and property damage from contact with crane or derrick	Obtain Crane permits as required per Cal-OSHA Hoisting and Rigging Safety Program

Table 8.16-3. (Continued)

Activity	Hazard	Control
Working with flammable and combustible liquids	Fire	Flammable and Combustible Liquid Storage and Handling program Fire Prevention Program Fire Protection Program Housekeeping Policy and Program
Working with hazardous materials and hazardous waste	Employee injury due to ingestion, inhalation, dermal contact	HAZWOPER[2] training, as required for hazardous wastes Hazard Communication Program (hazardous substances and information training)
Hot work (including cutting and welding)	Employee injury and property damage from fire Exposure to fumes during cutting and welding Ocular exposure to ultraviolet and infrared radiation during cutting and welding	Hot Work Permit Program Respiratory Protection Program Industrial Hygiene Monitoring Program Personal Protective Equipment (PPE) Program Housekeeping Policy and Program
Troubleshooting and maintenance of plant systems and general operation activities	Employee injury and property damage from contact with hazardous energy sources (electrical, thermal, mechanical, etc.)	Hazardous Energy Control (Lockout/Tagout) Program
Working on electrical equipment and systems	Employee contact with live electricity	Electrical Safety Program PPE Program Hazardous Energy Control (Lockout/Tagout) Program
Confined space entry	Employee injury from physical and chemical hazards	Permit Required Confined Space Entry Program
General operation activities	Employee injuries from hand and portable power tools	Hand and Portable Power Tool Safety Program PPE Program
General operation activities	Employee injury and property damage from inadequate walking and work surfaces	Housekeeping Policy and Program
General operation activities	Employee overexposure to occupational noise	Hearing Conservation Program PPE Program
General operation activities	Employee injury from improper lifting and carrying	Safe Lifting Program - Provide adequate material handling equipment
General operation activities	Employee injury and property damage from unsafe driving	Safe Driving Program
General operation activities	Employee overexposure to hazardous gases, vapors, dusts, and fumes	Hazardous Substances and Information Training Program Respiratory Protection Program PPE Program Industrial Hygiene Exposure Monitoring

Table 8.16-3. (Continued)

Activity	Hazard	Control
Operation, testing, troubleshooting, maintenance and repair of high pressure steam and air systems	Employee injury and property damage due to failure of pressurized system components or unexpected release of pressure	Installation of proper relief valves and institution of a relief valve maintenance and testing program Proof testing of pressure system components Pressure Vessel Permit to Operate (Cal-OSHA) as required by 8 CCR 450 Hazardous Energy Control (Lockout/Tagout) Program Line Breaking Safety Program

[1] The hazard and hazard controls provided are generic to operational activities. As the design and construction of the facility proceeds and routine operations are initiated, these analyses will be updated to reflect current conditions and knowledge.

[2] HAZWOPER = Hazardous Waste Operation Emergency Response

identified for construction (Table 8.16-1), workers may encounter these same hazards under different situations during operation than construction. There is considerable duplication between the tables for this reason. A major component of a safety program for normal operations is the development of standard operating procedures that incorporate the elements of the hazard analysis to assure that workers implement the safety measures.

8.16.2 Health and Safety Programs

During construction of both the RCEC and AWT plant a number of programs will be implemented that are designed specifically to mitigate hazards and, in accordance with applicable regulations, to protect the safety and health of the workers. Because the City of Hayward will own and operate the AWT plant, the City will be responsible for implementing the applicable safety programs to protect workers at the AWT plant site during operations, per Cal-OSHA regulations. The following sections outline the content of these programs.

8.16.2.1 Construction Health and Safety Program

The key health and safety programs for project construction include:

- Injury and Illness Prevention Plan
- Fire Protection and Prevention Plan
- Personal Protective Equipment Program
- Construction Written Safety Program

The following are brief outlines of these programs.

Injury and Illness Prevention Plan

This plan implements the requirements of the Cal-OSHA program, as specified in Title 8 CCR Section 1509, for construction and includes:

- Responsibility and authority for implementing the plan
- Safety and Health Policy
- Work rules and safe work practices
- Systems for ensuring that employees comply with safe work practices

- Employee communications protocols
- Identification and evaluation of workplace hazards
- Methods and/or procedures for correcting unsafe or unhealthy conditions, work practices and work procedures in a timely manner based on the severity of the hazards
- Specific safety procedures (e.g. fall protection, lockout/tagout, respiratory protection)
- Training and instruction

Fire Protection and Prevention Plan

This plan implements the requirements of the Cal-OSHA occupational health and safety program, as specified in Title 8 CCR Section 1920, and includes:

- General requirements
- Housekeeping requirements
- Employee alarm/communication system
- Portable fire extinguisher placement and operation
- Fixed fire fighting equipment placement and operation
- Fire control methods and techniques
- Hot work (welding, torches, cutting) safety procedures
- Flammable and combustible liquid storage methods
- Flammable and combustible liquids use procedures
- Techniques for dispensing and disposing of liquids
- Methods for servicing and refueling vehicles
- Fire prevention training programs and requirements

The permanent facility fire suppression system will be placed in service as early as practicable during construction. These fire suppression systems are described in Section 2.3.2.1; the fuel handling system is described in Section 2.2.6. Project staff will pay special attention to operations involving open flames, such as welding, and the use of flammable liquids and gases. Project personnel will maintain a fire watch during hazardous or hot work operations, using the appropriate class of extinguishers or other equipment. Site personnel will not be expected to fight fires past the incipient stage.

The onsite construction fire suppression system will include portable and fixed fire-fighting equipment. Portable fire fighting equipment will consist of fire extinguishers and small hose lines in conformance with Cal-OSHA and the Uniform Fire code Appendices 3A and 3B. The contractor's safety representative will conduct periodic fire prevention inspections. The safety representative will inspect fire extinguishers monthly and replace them immediately if defective or in need of recharge. All fire-fighting equipment will be located to allow for unobstructed access to the equipment and will be conspicuously marked. Flammable materials will be stored in designated and approved storage areas and storage containers with adequate fire prevention systems available in these areas.

The City of Hayward Fire Department will provide offsite fire suppression support. The closest fire station to the RCEC is City of Hayward Fire Station No. 6, approximately 2 miles away, at 1401 W. Winton Ave, Hayward, CA 94545 (phone (510-293-8616)). The City of Hayward Fire Department would be able to respond to any emergencies at the RCEC very rapidly from this location. The contractor's safety representative will contact the City of Hayward Fire Department prior to construction to brief the department on planned construction activities and to cooperatively review the project work plans.

Personal Protective Equipment Program

This RCEC project's program to provide personal protective equipment to construction workers implements the requirements of Cal-OSHA Title 8 CCR Section 1514-1522 and 3401-3411 and includes:

- Head protection equipment (hard hats, etc.)
- Eye and face protection equipment (such as safety glasses)
- Body protection equipment
- Ear plugs
- Hand protection equipment (gloves)
- Foot protection equipment (steel-toed boots)
- Sanitation equipment (hand washing, etc.)
- Safety harnesses and lifelines
- Electric shock protection equipment
- Medical services and first aid equipment
- Respiratory protection equipment (respirators, supplied air equipment)

Construction Written Safety Program

Calpine/Bechtel will make written safety program procedures available to all workers and regulatory agencies during the life of the project. These written procedures include, but are not limited to:

Organization, Communication, and Record Keeping Procedures:

- Employer and employee rights and responsibilities under the health and safety programs
- Hazard communication program including hazardous waste control, hazardous material handling, and California Proposition 65
- Recordkeeping procedures
- Injury and accident reporting and recording procedures
- "Toolbox/tailgate" safety meetings
- Supervisor safety and health orientations
- Communications and information programs
- First aid and medical services
- Smoking policy

Work Safety and Emergency Response Programs and Procedures:

- Confined space entry and rescue procedures
- Electrical equipment safety procedures
- Lockout/tagout procedures
- Hearing conservation and noise control programs
- Bloodborne pathogens program
- Emergency action plan, including evacuation procedure
- Fire prevention and protection plan
- Medical record access procedures

- Housekeeping, material handling and storage procedures
- Welding and cutting procedures
- Crane and hoist procedures
- Project safe work procedures and standard operating procedures
- Subcontractor safety programs
- Security programs
- Excavation and trenching program
- Fall protection
- Inspections
- Sign, tags, and barricades

Equipment and Equipment Use:

- Personal protective equipment
- Respiratory protection program including fit-testing procedures.
- Work clothing
- Ventilation requirements
- Ergonomic precautions
- Compressed gas and air handling procedures
- Equipment inspection programs

8.16.2.2 Operation Health and Safety Program

After construction, the construction-phase safety and health program will transition into a program that is oriented towards routine project operation. Key health and safety programs for project operation are as follows, outlined below:

- Injury and Illness Prevention Program
- Fire Protection and Prevention Plan
- Emergency Action Plan
- PPE Program

Injury and Illness Prevention Program

The Injury and Illness Prevention Plan implements the requirements of the Cal-OSHA program as specified in Title 8 CCR Section 3203 for project operations and includes:

- Responsibility and authority for implementing the plan
- Safety and health Policy
- Work rules and safe work practices
- Systems for ensuring that employee comply with safe work practices
- Employee communication procedures
- Identification and evaluation of workplace hazards
- Methods and/or procedures for correcting unsafe or unhealthy conditions, work practices and work procedures based on the severity of the hazards
- Specific safety procedures (e.g. fall protection, lockout/tagout, respiratory protection)

- Training and instruction plans

Fire Protection and Prevention Plan

The Fire Protection and Prevention Plan implements the requirements of the Cal-OSHA program, as specified in Title 8 CCR Section 3221, and includes:

- General requirements
- Housekeeping requirements
- Employee alarm/communication system
- Portable fire extinguisher placement and operation
- Fixed fire fighting equipment placement and operation
- Fire control methods and techniques
- Hot work (welding, torches, cutting) safety procedures
- Flammable and combustible liquid storage methods
- Flammable and combustible liquids use procedures
- Techniques for dispensing and disposing of liquids
- Methods for servicing and refueling vehicles
- Fire prevention training programs and requirements

The onsite fire suppression system for project operation will include both portable and fixed fire-fighting equipment. Portable fire fighting equipment will consist of fire extinguishers and hose lines in conformance with Cal-OSHA and the NFPA. The contractor's safety representative will conduct periodic fire prevention inspections. The safety representative will inspect fire extinguishers monthly and replace them immediately if defective or in need of recharge. All fire-fighting equipment will be located strategically to allow for unobstructed access to the equipment and will be conspicuously marked. Flammable materials will be stored in designated and approved storage areas and storage containers with adequate fire prevention systems available in these areas.

Fixed fire suppression systems will include:

- FM 200 fire protection systems, which protect the combustion turbine, generator, and its accessory equipment compartments from fire. The system will have fire detection sensors in all appropriate compartments that warrant such protection.
- Deluge spray systems which provide fire protection to the generator transformers (outdoor design), steam turbine oil system, auxiliary power transformers, and cooling tower in the event of fire.
- Fire hydrants and hose stations that will supplement the plant fire protection system.

The City of Hayward Fire Department will provide offsite fire suppression support. The closest fire station to the RCEC is City of Hayward Fire Station No. 6, approximately 2 miles away, at 1401 W. Winton Ave, Hayward, CA 94545. The City of Hayward Fire Department would be able to respond to any emergencies at the RCEC very rapidly from this location. The contractor's safety representative will contact the City of Hayward Fire Department prior to construction to brief the department on planned construction activities and to cooperatively review the project work plans.

Personal Protective Equipment Program

This RCEC project's program to provide personal protective equipment to construction workers implements the requirements of Cal-OSHA Title 8 CCR Section 3401-3411 and includes:

- Head protection equipment (hard hats, etc.)
- Eye and face protection equipment (such as safety glasses)
- Body protection equipment
- Ear plugs
- Hand protection equipment (gloves)
- Foot protection equipment (steel-toed boots)
- Sanitation equipment (hand washing, etc.)
- Safety harnesses and lifelines
- Electric shock protection equipment
- Medical services and first aid equipment
- Respiratory protection equipment (respirators, supplied air equipment)

Emergency Action Plan

The Emergency Action Plan implements the requirements of Cal-OSHA Title 8 CCR Section 3220 and includes:

Organization of Emergency Response:

- Incident reaction responsibilities
- Incident Command System
- Position description assignments
- Response and notification plan (points of contact)
- Supervisor/Emergency Coordinator role
- Health and Safety Manager role

Communications:

- Documentation and recordkeeping procedures
- Public relations (news media, etc.) procedures
- Emergency notification list
- Emergency telephone number list
- Emergency equipment locations
- Plant plans and diagrams
- Accident reporting and investigation procedures
- Hazard communication procedures
- Spill containment and reporting procedures
- Releases into the environment and reporting

Hazard Characteristics:

- Hazardous waste or chemical spill
- Fire

- Earthquake
- Bomb threat
- Pressure vessel release

Emergency Response Procedures:

- Response procedures
- Site security measures
- Evacuation routes, assembly areas, and procedures
- Emergency plant shutdown procedures
- Fire response procedures
- Emergency medical treatment and first aid
- Reference procedures
- Decontamination procedures
- Evacuation plan
- Systems and shut down procedures
- Lockout/Tagout procedures
- Accidents involving serious injury and/or death

Standards and Requirements:

- Respiratory protection requirements
- Personal protective equipment requirements
- Sanitation requirements
- Inspection requirements

8.16.3 Safety Training Programs

For both construction and operation, Calpine/Bechtel will implement comprehensive training programs to ensure that employees recognize and understand how to protect themselves from hazards. Table 8.16-3 (on previous page) provides an overview of training programs that will be provided to personnel.

8.16.4 Laws, Ordinances, Regulations and Standards (LORS)

The construction and operation of the RCEC will be conducted in accordance with all LORS. Tables 8.16-5 through 8.16-8 provide an overview of those LORS relating to worker health and safety.

Table 8.16-4. Construction and operation training program.

Training Course	Target Employees
Injury and Illness Prevention Plan	All
Emergency Action Plan	All
PPE Program	All
Heavy Equipment Safety Program	Employees working on, near, or with heavy equipment
Forklift Operator Training	Employees working on, near, or with forklifts
Trenching and Excavation Safety Program Use of Excavation Permits per Cal-OSHA	Employees involved with the conduct of trenching or excavation
100% Fall Protection Program	Employees required to use fall protection
Scaffolding Safety Program	Employees required to erect or use scaffolding
Hoisting and Rigging Safety Program	Employees responsible for the oversight or conduct of hoisting and rigging
Crane Safety Program	Employees supervising or performing crane operations
Flammable and Combustible Liquid Storage and Handling	Employees responsible for the handling and storage of flammable or combustible liquids or gasses
Hot Work Permits	Employees performing hot work
Hazardous Energy Control (Lockout/Tagout)	Employees performing lockout/tagout
Electrical Safety	Employees required to work on electrical systems and equipment
Permit Required Confined Space Entry	Employees required to supervise or perform confined space entry
Hand and Portable Power Tool Safety	All
Housekeeping Policy and Program	All
Hearing Conservation	All
Safe Lifting Program	All
Safe Driving Program	Employees supervising or driving motor vehicles
Hazardous Substances Program (Hazard Communication)	All
Pressure Safety	Employees supervising or working on pressurized systems or equipment
Line Breaking Safety	Employees performing general maintenance or working on pressurized systems or equipment
Relief Valve Maintenance and Testing	Employees performing maintenance or testing of relief valves
Respiratory Protection Program	All employees required to wear respiratory protection
Fire Prevention Program	All
Fire Protection Program	All
HAZWOPER/First Responder	Employees working around hazardous materials or waste

Table 8.16-5. Federal LORS.

Law, Ordinance, Regulation, or Standard	Applicability
Title 29 Code of Federal Regulations (CFR) Part 1910[1/]	Minimum occupational safety and health standards for general industry in the United States
Title 29 CFR Part 1926 [1/]	Minimum occupational safety and health standards for the United States construction industry

1/ Primary laws and regulations governing worker health and safety in California are provided in Table 8.16-6. These regulations are for reference and apply as referenced by California occupational safety and health regulations. Where a particular situation is not addressed by those regulations, the CFR will be consulted for guidance.

Table 8.16-6. State LORS

Law, Ordinance, Regulation, or Standard	Applicability
California Occupational Safety and Health Act, 1970	The Act establishes minimum safety and health standards for construction and general industry operations in the State of California
8 California Code of Regulations (CCR) 339	Requires list of hazardous chemicals relating to the Hazardous Substance Information and Training Act
8 CCR 450	Addresses the hazards associated with pressurized vessels
8 CCR 750	Addresses hazards associated with high pressure steam
8 CCR 1509	Addresses the requirements for Construction, Accident, and Prevention plans
8 CCR 1509 et seq. and 1684 et seq.	Addresses construction hazards, including head, hand, foot injuries, noise, and electrical shock
8 CCR 1528 et seq. and 3380 et seq.	Requirements for personal protective equipment
8 CCR 1597 et seq. and 1590 et seq.	Requirements addressing the hazards associated with traffic accidents and earth moving
8 CCR 1604 et seq.	Requirements for construction hoist equipment
8 CCR 1620 et seq. and 1723 et seq.	Addresses miscellaneous hazards
8 CCR 1709 et seq.	Requirements for steel reinforcing, concrete pouring, and structural steel erection operations
8 CCR 1920 et seq.	Requirements for fire protection systems
8 CCR 2300 et seq. and 2320 et seq.	Requirements for addressing low voltage electrical hazards
8 CCR 2395 et seq.	Addresses electrical installation requirements
8 CCR 2700 et seq.	Addresses high voltage electrical hazards
8 CCR 3200 et seq. and 5139 et seq.	Requirements for the control of hazardous substances
8 CCR 3203 et seq.	Requirements for operational accident prevention programs
8 CCR 3270 et seq. and 3209 et seq.	Requirements for evacuation plans and procedures
8 CCR 3301 et seq.	Requirements for addressing miscellaneous hazards including hot pipes, hot surfaces, compressed air systems, relief valves, enclosed areas containing flammable or hazardous materials, rotation equipment, pipelines, and vehicle loading dock operations.
8 CCR 3360 et seq.	Addresses requirements for sanitary conditions

Table 8.16-6. (continued)

Law, Ordinance, Regulation, or Standard	Applicability
8 CCR 3511 et seq. and 3555 et seq.	Requirements for addressing hazards associated with stationary engines, compressors, portable, pneumatic, and electrically powered tools
8 CCR 3649 et seq. and 3700 et seq.	Requirements for addressing hazards associated with field vehicles
8 CCR 3940 et seq.	Requirements for addressing hazards associated with power transmission, compressed air, and gas equipment
8 CCR 5109 et seq.	Requirements address construction accident and prevention programs
8 CCR 5139 et seq.	Requirements for addressing hazards associated with welding, sandblasting, grinding and spray-coating
8 CCR 5150 et seq.	Requirements for confined space entry
8 CCR 5160 et seq.	Requirements for addressing hot, flammable, poisonous, corrosive, and irritant substances
8 CCR 5192 et seq.	Requirements for conducting emergency response operations
8 CCR 5194 et seq.	Requirements for employee exposure to dusts, fumes, mists, vapors, and gases
8 CCR 5405 et seq., 5426 et seq., 5465 et seq., 5500 et seq., 5521 et seq., 5545 et seq., 5554 et seq., 5565 et seq., 5583 et seq. and 5606 et seq.	Requirements for flammable liquids, gases and vapors
8 CCR 5583 et seq.	Requirements for the design, construction and installation of venting, dikes, valves, and supports
8 CCR 6150 et seq., 6151 et seq., 6165 et seq., 6170 et seq. And 6175 et seq.	Provides fire protection requirements
24 CCR 3 et seq.	Incorporates current addition of Uniform Building Code
8 CCR, Part 6	Provides health and safety requirements for working with tanks and boilers
La Follette Bill (Health and Safety Code Section 25500 et seq.)	Requires that every new or modified facility that handles, treats, stores, or disposes of more than the threshold quantity of any of the listed acutely hazardous materials prepare and maintain a Risk Management Plan
Health and Safety Code Sections 25500 through 25541	Requires the preparation of a Hazardous Material Business Plan which details emergency response plans for a hazardous materials emergency at the facility

Table 8.16-7. Local LORS.

Law, Ordinance, Regulation, or Standard	Applicability
Required by the local fire department:	
Specific hazardous material handling requirements	Provides response agencies with necessary information to address emergencies
Emergency Response Plan	Allows response agency to integrate the RCEC emergency response activities into any response actions
Business Plan	Provides response agency with overview of the RCEC purpose and operations
Risk Management Plan	Provides response agency with a detailed review of risks and hazards located at the RCEC and the mitigation implemented to control the risks or hazards

Table 8.16-8. Applicable national consensus standards.

LORS	Applicability
Uniform Fire Code, Article 80	Addresses the prevention, control and mitigation of dangerous conditions related to storage, dispensing, use and handling of hazardous materials and information needed by emergency response personnel
National Fire Protection Association (NFPA) 10, Standard for Portable Fire Extinguishers	Requirements for the selection, placement, inspection, maintenance and employee training for portable fire extinguishers
NFPA 11, Standard for Low Expansion Foam and Combined Agent Systems	Requirements for installation and use of low expansion foam and combined agent systems
NFPA 11A, Standard for Medium and High Expansion Foam Systems	Requirements for the installation and use of medium and high expansion foam systems
NFPA 12, Standard on Carbon Dioxide Extinguishing Systems	Requirements for installation and use of carbon dioxide extinguishing systems
NFPA 13, Standard for Installation of Sprinkler Systems	Guidelines for the selection and installation of fire sprinkler systems
NFPA 13A, Recommended Practice for the Inspection, Testing and Maintenance of Sprinkler Systems	Guidance for the inspection, testing, and maintenance of sprinkler systems
NFPA 14, Standard for the Installation of Standpipe and Hose Systems	Guidelines for the selection and installation of standpipe and hose systems
NFPA 15, Standard for Water Spray Fixed Systems	Guidelines for the selection and installation of water spray fixed systems
NFPA 17, Standard for Dry Chemical Extinguishing Systems	Guidance for the selection and use of dry chemical extinguishing systems
NFPA 20, Standard for the Installation of Centrifugal Fire Pumps	Guidance for the selection and installation of centrifugal fire pumps
NFPA 22, Standard for Water Tanks for Private Fire Protection	Requirements for water tanks for private fire protection

Table 8.16-8. (Continued)

LORS	Applicability
NFPA 24, Standard for the Installation of Private Fire Service Mains and their Appurtenances	Requirements for private fire service mains and their appurtenances
NFPA 26, Recommended Practice for the Supervision of Valves Controlling Water Supplies	Supervision guidance for valves controlling water supplies
NFPA 30, Flammable and Combustible Liquid Code	Requirements for the storage and use of flammable and combustible liquids
NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines	Fire protection requirements for the installation and use of combustion engines and gas turbines
NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites	Fire protection requirements for hydrogen systems
NFPA 54, National Fuel Gas Code	Fire protection requirements for the use of fuel gases
NFPA 59A, Standard for the Storage and Handling of Liquefied Petroleum Gases	Requirements for the storage and handling of liquefied petroleum gases
NFPA 68, Guide for Explosion Venting	Guidance in the design of facilities for explosion venting
NFPA 70, National Electric Code	Guidance on the safe selection and design, installation, maintenance and construction of electrical systems
NFPA 70B, Recommended Practice for Electrical Equipment Maintenance	Guidance on electrical equipment maintenance
NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces	Employee safety requirements for working with electrical equipment
NFPA 71, Standard for the Installation, Maintenance, and Use of Central Station Signaling Systems	Requirements for the installation, maintenance, and use of central station signaling systems
NFPA 72A, Standard for the Installation, Maintenance and Use of Local Protective Signaling Systems for Guard's Tour, Fire Alarm and Supervisory Service	Requirements for the installation, maintenance and use of local protective signaling systems
NFPA 72E, Standard on Automatic Fire Detection	Requirements for automatic fire detection
NFPA 72F, Standard for the Installation, Maintenance and Use of Emergency Voice/Alarm of Communication Systems	Requirements for the installation, maintenance, and use of emergency and alarm communications systems
NFPA 72H, Guide for Testing Procedures for Local, Auxiliary, Remote Station and Proprietary Protective Signaling Systems	Testing procedures for the types signaling systems anticipated to be used at the facility
NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment	Requirements for fire protection systems used to protect computer systems
NFPA 78, Lightning Protection Code	Lightning protection requirements
NFPA 80, Standard for Fire Doors and Windows	Requirements for fire doors and windows

Table 8.16-8. (Continued)

LORS	Applicability
NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems	Requirements for the installation of air conditioning and ventilating systems
NFPA 101, Code for Safety to Life from Fire in Buildings and Structures	Requirements for the design of means of exiting the facility
NFPA 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants	Guidelines for the testing and marking of fire hydrants
NFPA 850, Recommended Practice for Fire Protection for Fossil Fuel Steam Electric Generating Plants	Requirements for fire protection in fossil fuel steam electric generating plants
NFPA 1961, Standard for Fire Hose	Specifications for fire hoses
NFPA 1962, Standard for the Care, Maintenance, and Use of Fire Hose Including Connections and Nozzles	Requirements for the care, maintenance, and use of fire hose
NFPA 1963, Standard for Screw Threads and Gaskets for Fire Hose Connections	Specifications for fire hose connections
American National Standards Institute/American Society for Mechanical Engineers (ANSI/ASME), Boiler and Pressure Vessel Code	Specifications and requirements for pressure vessels
ANSI, B31.2, Fuel Gas Piping	Specifications and requirements for fuel gas piping

8.16.5 Permit Requirements and Permit Schedule

Table 8.16-9 provides a list of applicable permits related to the protection of worker health and safety for RCEC certification. This table lists the activities covered for each permit and application requirements to obtain the permit. Permits listed in Table 8.16-9 are supplied on an as needed basis by the nearest Cal-OSHA office. An annual excavation permit or single event permit for excavations requires submittal of health and safety program and procedures to Cal-OSHA for review and issuance of the permit. The permit application should be planned at least two weeks before the first scheduled excavation. Subsequent excavations should be planned to provide at least five days notice to Cal-OSHA prior to excavation activities. Permits for scaffolds and cranes should be scheduled at least five days before planned activity. Permits for the operations of unfired or fired pressure vessels should be scheduled with the Cal-OSHA Pressure Vessel Unit at the time it is anticipated to place the vessel in operation.

Table 8.16-9. Health and safety permits.

Permit	Issuing Agency	Application Requirements	Applicability
Trenching and Excavation Permit	Cal-OSHA district or field office	Required for personnel entry into trenches and excavations 5 feet or more in depth.	Submit completed permit application to any Cal-OSHA office. Review of written health and safety program or safe work procedures may be required. Submit at least 5 days prior to scheduled excavation.
Construction Demolition	Cal-OSHA district or field office.	Construction or demolition of buildings, structures or falsework 3 -feet or higher.	Submit completed permit application to any Cal-OSHA office. Review of written health and safety program or safe work procedures may be required.
Scaffolding	Cal-OSHA district or field office	Scaffolding 36 feet or higher, erection or dismantling	Submit completed permit application to any Cal-OSHA office. Review of written health and safety program or safe work procedures may be required.
Erection of a fixed tower crane	Cal-OSHA district or field office	Erection, climbing and dismantling of fixed tower cranes.	Submit completed permit application to any Cal-OSHA office. Review of written health and safety program or safe work procedures may be required.
Pressure vessel, unfired or fired	Cal-OSHA Pressure Vessel Unit	Pressure vessels covered by the Unfired and the Fired Pressure Vessel Safety Orders require a permit to operate.	Arrange for application and inspection with the nearest Cal-OSHA Pressure Vessel Unit.

8.16.6 Agency Contacts

Agency contacts regarding worker health and safety at the RCEC are shown in Table 8.16-10.

Table 8.16-10. Agency contacts.

Agency	Contact	Title	Telephone and Address
Cal-OSHA District Office Consultation Service	Jay Sekhon	Area Manager	(510) 622-2891 1515 Clay St., Suite 1103 Oakland, CA 94612
Pressure Vessel Unit District Office, Division of Occupational Safety and Health	David Ethier	Sr. Pressure Vessel Engineer	(510) 622-3066 fax: (510) 622-3077 Elihu Harris State Building 1515 Clay Street, Suite 901 Oakland, CA 94621
City of Hayward Fire Dept	Larry Arfsten	Fire Chief	(510) 583-4945 777 B Street Hayward, CA 94541

9.0 ALTERNATIVES

The following sections discuss alternatives to the Russell City Energy Center (RCEC) as proposed in this AFC. These include the "no project" alternative, power plant site alternatives, linear facility route alternatives, technology alternatives, water supply alternatives, and wastewater disposal alternatives. These alternatives are discussed in relation to the environmental, public policy, and business considerations involved in developing the project. The main objective of the RCEC is to produce economical, reliable, and environmentally sound electrical energy and ancillary services for California's restructured energy market.

The Energy Facilities Siting Regulations (Title 20, California Code of Regulations, Appendix B) guidelines titled *Information Requirements for an Application* require:

> A discussion of the range of reasonable alternatives to the project, including the no project alternative... which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and an evaluation of the comparative merits of the alternatives.

They also require:

> A discussion of the applicant's site selection criteria, any alternative sites considered for the project, and the reasons why the applicant chose the proposed site.

9.1 PROJECT OBJECTIVES

The basic objectives of the RCEC project are discussed throughout this application. Some of the key project objectives include the following:

- To sell clean and efficiently generated energy to California's electricity market
- To benefit the electrical supply and transmission system within the San Francisco Bay Area
- To provide system reliability and transmission congestion benefits
- To locate the generating station near the centers of demand for maximum efficiency and system benefit
- To serve the electrical power needs of the East Bay, San Francisco Peninsula, and City of San Francisco
- To begin generating power as soon as possible (currently projected to be by the Summer 2004).

As discussed in Section 3.0, Demand Conformance, the CEC has determined that California will need a substantial amount of additional baseload generation capacity over the next several years to meet rapidly growing demand, and to relieve the current shortage and provide a stable energy supply to Californians at a reasonable cost. The RCEC will provide competitively priced power to the California electricity market to help meet the state's growing demand for electricity and to help replace nuclear and fossil fuel generation resources retired due to age or cost of producing power. It would enhance the reliability of a currently imperiled electrical system by providing baseload power generation near the centers of electrical demand.

9.2 THE "NO PROJECT" ALTERNATIVE

If Calpine/Bechtel were not to build the RCEC (the "no project" alternative), it would be difficult to meet the project objectives. The "no project" alternative would forego all of the benefits associated with the RCEC project. In addition, the "no project" alternative would result in more energy production from existing power plants than would otherwise occur with the RCEC competing for the opportunity to generate power. Since the RCEC will employ advanced combustion turbine technology and state-of-the-art emissions control systems, existing power plants operating in place of the RCEC would most likely consume more fuel and emit more air pollutants per kilowatt-hour generated.

As a merchant power plant, the business risk associated with construction and operation of the RCEC will be borne entirely by the Applicant. No ratepayer or public monies will be placed at risk. The "no project" alternative would not serve to insulate ratepayers or taxpayers from risk, but instead could harm ratepayers by decreasing competition and thereby increasing electricity prices.

In summary, the "no project" alternative would not serve the growing needs of California's residents and businesses for economical, reliable, and environmentally sound generation resources. Furthermore, the project objective of providing such a resource fueled with locally-produced natural gas would not be realized.

9.3 POWER PLANT SITE ALTERNATIVES

For comparison purposes, and to meet the requirements of CEQA and Title 20, alternative sites were chosen that could feasibly attain most of the project's basic objectives. The alternative sites are shown in Figure 9-1.

The key siting criteria in choosing these alternatives and the proposal RCEC site included the following factors:

- Location more than 1,000 feet from the nearest residential uses or other sensitive receptor
- Location near the centers of electrical demand
- Land zoned for industrial use or heavy industry
- Location near a sufficient source of cooling water, preferably treated wastewater
- Location near electrical transmission facilities
- Location near ample natural gas supply
- A parcel or adjoining parcels of sufficient size for a power plant (14-16 acres)
- Site control (lease or ownership) feasible
- Feasible mitigation of potential environmental impacts

9.3.1 Proposed Russell City Energy Center Site

The proposed site for the RCEC on Enterprise Avenue in Hayward, California meets all of the project's objectives and, in addition, would have no significant, unmitigated, environmental impacts. The site is a 14.7-acre area located in the West Industrial District of Hayward, California. The site is zoned Industrial and is located on Enterprise Avenue near its intersection with Whitesell Street. The project would be sited on two existing parcels. One of these is a 11.1-acre parcel that is currently in use as the transmitter site for radio station KFAX. The adjacent parcel, 3.6 acres on the corner of Enterprise Avenue

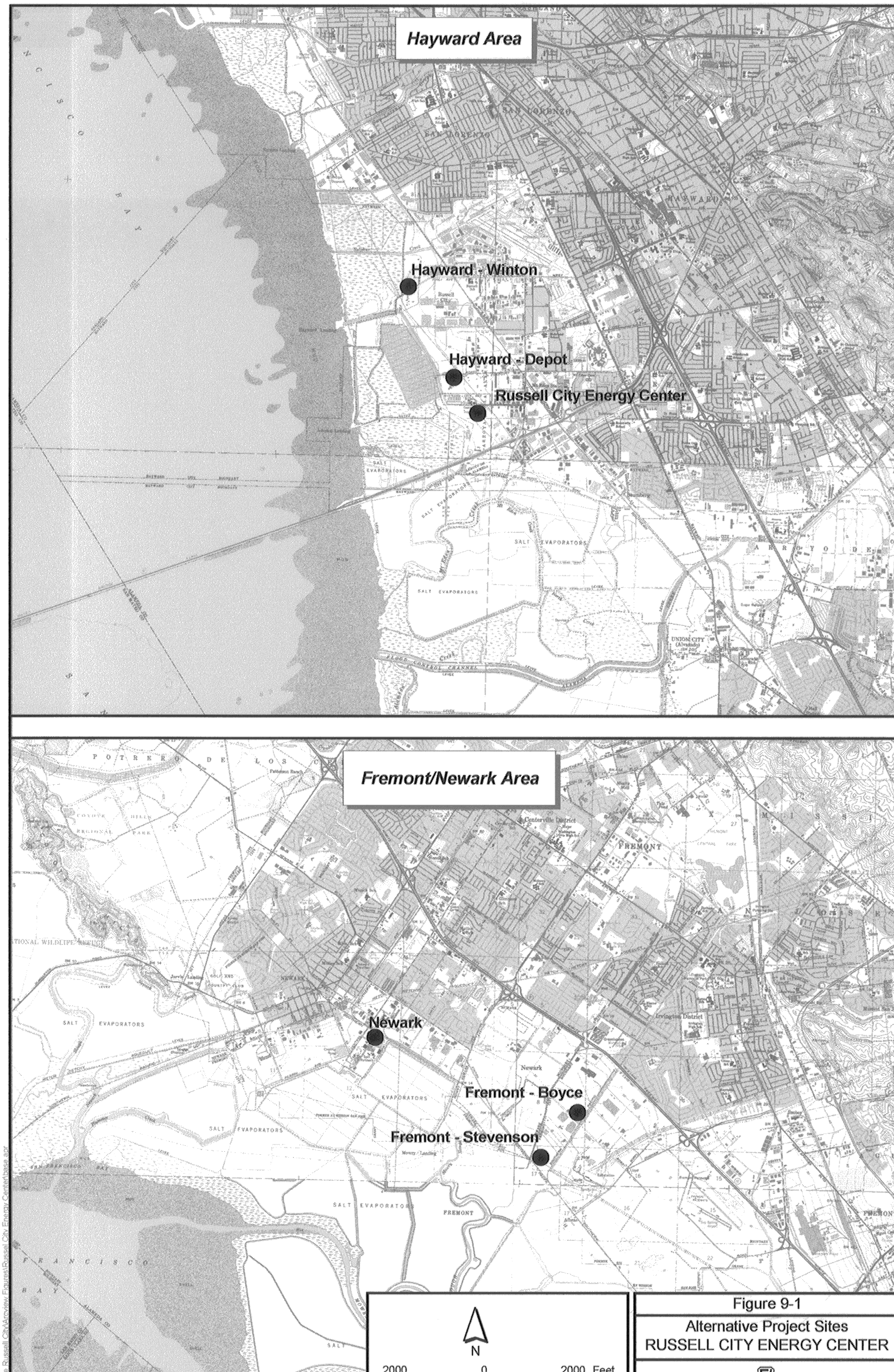

Figure 9-1
Alternative Project Sites
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

F:\Calpine Russell City\Arcview Figures\Russell City Energy Centerbase.apr and Whitesell Street, is currently occupied by Runnels Industries, a metal sandblasting and painting operation. This site was chosen, among other things, because it is:

- Located near the centers of electrical demand in the East Bay Area, San Francisco Peninsula, and City of San Francisco.
- Located adjacent to a source of reclaimed wastewater sufficient for plant cooling (the City of Hayward Water Pollution Control Facility) such that a lengthy pipeline would not be necessary, thus reducing environmental effects.
- Located near transmission facilities, such as the Eastshore Substation, 115-kV north-south line and 230-kV trans-bay line, making it unnecessary to construct significant new transmission facilities, thus reducing environmental effects.
- Zoned for industrial use and meets all City zoning requirements, including visual (height) and noise requirements.
- Located nearly a mile from the nearest residential area and far from any sensitive receptors
- Located approximately one mile from a readily available gas supply through the PG&E system
- A 14.7-acre area (two parcels) is available.

9.3.2 Alternative Site A: Newark-Cargill

Alternative site A is located just off Central Avenue in Newark, Alameda County, at the Cargill Corporation's salt processing complex. Sixteen acres are available at the site of Cargill's cooling water pond, just south of Central Avenue and west of the Union Pacific railway tracks. This site is zoned General Industrial. Cargill has in the past been willing to discuss the replacement of their cooling pond with a different kind of cooling system, such that this parcel would become available for a power plant. Key characteristics are as follows:

- Zoned General Industrial by the City of Newark
- Natural gas would be available to this site at the PG&E Irvington Station, some 3.5 miles distant.
- Access to the transmission system would be by a direct tie-in (loop) to an existing PG&E 230-kV line located about 2 miles south of the project site.
- Union Sanitary District could provide an ample supply of secondary treated wastewater for cooling from the Alvarado Treatment Plant, located 7 miles north of the project site.
- Located one-half mile from the nearest residence.

9.3.3 Alternative Site B: Fremont-Stevenson

Alternative site B is located near the western end of Stevenson Boulevard in Fremont, Alameda County, near the southern boundary of the City of Newark. The site is a 55.62-acre parcel owned by the Catellus Development Corporation and is currently open and undeveloped land. The site is bisected by a PG&E 230-kV transmission line, but has unoccupied land large enough to accommodate a 15-acre power plant development. Key characteristics of the site are as follows:

- Zoned General Industrial (GI) in the City of Fremont
- Located approximately 0.5 mile from the PG&E Newark Substation (which is located in Fremont)

- Natural gas supply is available at PG&E's Irvington station, on PG&E's backbone line 303, located about 1.9 miles from the site
- A supply of recycled water would be available either through the Union Sanitary District's Alvarado Treatment Plant, approximately 9 miles north of the project, or from the Santa Clara/San Jose Wastewater Treatment Plant, which has recycled water available through the South Bay Recycling Program, at an existing pipeline in Milpitas, approximately 8 miles south.
- Union Pacific Railroad tracks are located immediately south for convenient construction transport.
- Located 0.6 mile from the nearest residence.

9.3.4 Alternative Site C: Fremont-Boyce

Alternative C is located on Boyce Road in Fremont, near the Fremont-Stevenson site. The site consists of 15.89 acres, 6 acres of which are occupied by the Borden chemical facility (approximately 10 acres available).

- Zoned General Industrial (GI) in the City of Fremont
- Located approximately 0.6 mile from the PG&E Newark Substation (which is located in Fremont)
- Natural gas supply is available at PG&E's Irvington station, on PG&E's backbone line 303, located about 1.3 miles from the site
- A supply of recycled water would be available either through the Union Sanitary District's Alvarado Treatment Plant, approximately 9 miles north of the project, or from the Santa Clara/San Jose Wastewater Treatment Plant, which has recycled water available through the South Bay Recycling Program, at an existing pipeline in Milpitas, approximately 8 miles south.
- Located 0.25 mile from the nearest residence.

9.3.5 Alternative Site D: Hayward-Depot Road

Alternative site D is a located in an unincorporated portion of Alameda County that is surrounded by the City of Hayward on Depot Road, approximately 0.4 mile north of the project site (3636 to 3798 Depot Road). The site is currently occupied by 7 automobile salvage yards, a pallet storage yard, a recreational vehicle storage yard, and a general contracting firm. Combining several of these lots would create a parcel sufficiently large for a power plant (49 acres). Key characteristics are:

- Zoned for Heavy Industry (M-2) by Alameda County
- The City of Hayward could provide a sufficient supply of treated secondary wastewater for cooling from its wastewater treatment plant located adjacent to this site
- Natural gas would be available on a local distribution line (Line 153) less than a mile from the site
- A PG&E 115-kV transmission line crosses the project site, leading to the Eastshore Substation, 1.5 miles to the south
- Located 0.7 mile from the nearest residence.

9.3.6 Alternative Site E: Hayward-Winton Avenue

Alternative site E is a located in the City of Hayward near the west end of West Winton Avenue. The site currently consists of 10 separate land parcels totaling 22.8 acres, occupying two vehicle salvage yards owned by Pick Your Part and E&J Auto Salvage. Key characteristics are:

- Zoned for Industry (I) by the City of Hayward
- The City of Hayward could provide a sufficient supply of treated secondary wastewater for cooling from the wastewater treatment plant located 1.4 miles south of this site
- Natural gas would be available on a local distribution line within 2 miles of the site
- A PG&E 115-kV transmission line runs approximately 0.1 miles west of the project site, leading to the Eastshore Substation, 4.1 miles to the south.
- Located 1.1 mile from the nearest residence.

9.4 COMPARATIVE EVALUATION OF ALTERNATIVE SITES

In the discussion that follows, the sites are compared in terms of each of the 16 topic areas required in the AFC, as well as in terms of project development constraints. The most useful topics for comparison are as follows:

- **Project Development Constraints**—Are there site characteristics that would prohibit or seriously constrain development, such as significant contamination problems, or lack of fuel, transmission capacity, or water?
- **Land Use Compatibility**—Is the parcel zoned appropriately for industrial use and compatible with local land use policies? What is the distance to the nearest residential area? What is the distance to sensitive receptors?
- **Routing and Length of Linear Facilities**–Can linear facilities be routed to the site along existing transmission lines, pipelines, and roads? Will linear facilities be significantly shorter for a given site?
- **Water Supply**—Is a supply of recycled water readily available such that it is not necessary to use potable water for all or part of the cooling water?
- **Visual Resources**—Are there significant differences between the sites in their potential for impact on visual resources?
- **Biological Resources**—Would there be significant impacts to wetlands or threatened or endangered species such that mitigation of these effects would be unduly expensive or constrain the supply of available mitigation resources?
- **Contamination**—Is there significant contamination on site, such that cleanup expense would be high or such that cleanup would cause significant schedule delay?
- **Noise**—Is the site sufficiently near to a residential or recreation area such that it would be difficult to mitigate potential noise impacts below the level of significance?
- **Use of Previously Disturbed Areas**—Has the site been previously disturbed? Does the site minimize the need for clearing vegetation and otherwise present low potential for impact on biological and cultural resources?
- **Other Environmental Categories**—Are there significant differences between the sites in their potential for impact in other environmental categories?

Table 9-1 compares the alternatives sites in terms of their basic site characteristics.

There is no precise mathematical weighting system established for considering potential impacts in alternatives analyses. Some of the criteria used to compare the alternatives are more or less important to consider than others. For example, an impact that could affect public health and safety or could result in significant environmental impacts is obviously of greater concern than a purely aesthetic issue associated with an advisory design guideline. It is important in comparing alternatives to focus on the key siting advantages and the potential adverse environmental effects of a particular site. Comparing each of the environmental disciplines and giving each discipline equal weight would provide a misleading analysis because effects in one area are not necessarily equivalent in importance to effects in another area.

For example, though the sites may differ in terms of available local road and street capacities and the current levels of traffic congestion, the number of workers during the operational phase of the project is low and would be unlikely to have a significant effect on local traffic. The sites may differ widely in the amount of traffic congestion they would cause during construction, but this is a temporary impact and should not be a strong consideration in site selection, as long as measures to mitigate this impact are feasible. Similarly, some sites are accessible by rail. This may assist in transportation of large items during construction, but is not necessary and provides only a small and temporary advantage. Most sites would not differ significantly in terms of geological hazards, though close proximity to a major fault would call for more rigorous and expensive seismic engineering. Hazardous materials handling and worker health and safety issues would be the same or nearly the same for most sites. Though the risk of a release of hazardous materials during transport might be seen as more or less likely depending on location (roadway hazards, in particular), the record of safe transport and handling of such materials is clear. Further, the sites considered here are all in or near urban areas that are served by good transportation networks and are close to the sources of supply.

Similarly, project effects on paleontological and cultural resources are not often consequential in comparing alternatives. Once an initial screening for effects on highly significant sites is completed, the probabilities of encountering hidden paleontological or cultural resources during construction are difficult to calculate or compare.

9.4.1 Project Development Constraints

As indicated in the introductory descriptions of each of the alternative sites, the basic needs of power plant siting for land, access to electrical transmission, gas supply, and cooling water, are met at each of the alternative sites. There are, however, some differences between the sites in terms of site quality and distance to transmission, gas supply, and recycled water for cooling purposes.

For example, the proposed RCEC project site is located adjacent to a wastewater treatment plant (City of Hayward) that can supply all of its cooling water without the need to construct a long pipeline. The other two Hayward sites (Depot Road and West Winton) are also relatively near the Hayward Water Pollution Control Facility. The Newark and the two Fremont alternatives, by contrast, would involve construction of long pipelines (8+ miles) to supply recycled water for plant cooling. The proposed RCEC site and each of the alternatives are situated relatively near a natural gas pipeline and electric transmission facilities.

Table 9-1. Characteristics of the alternative sites.

Site or Alternative	Proposed Project site	A	B	C	D	E
Characteristic	**Russell City**	**Newark-Cargill**	**Fremont-Stevenson**	**Fremont-Boyce**	**Hayward-Depot Rd.**	**Hayward-Winton Ave.**
Acreage available for building	14.7	16	55.62	10	49	22.8
Number parcels	2	Portion	1	1	14	10 (2 owners)
Current use	Radio station/metal painting	Salt works cooling pond	Undeveloped, conservation easement	Chemical plant, partly vacant	Auto salvage, RV and pallet storage	Auto salvage
Previously disturbed area	Yes	Yes	No	Yes	Yes	Yes
Distance to nearest residence	0.82 mile	0.5 mile	0.6 mile	0.25 mile	0.7 mile	1.1 mile
Transmission line	1.1 mile	2 miles	0.5 mile	0.6 mile	0.1 mile	0.1 mile
Water supply pipeline length	0.1 mile	7 miles	8 miles	8 miles	0.1 mile	1.5 mile
Natural gas line	0.9 mile	3.5 miles	1.9 miles	1.3 miles	1 mile	1.4 mile
Total length, linears	2.1 miles	12.5 miles	10.4 miles	9.9 miles	1.2 miles	3.0 miles
Recycled water available	Yes	Yes	Yes	Yes	Yes	Yes
Zoning	Industrial	General Industrial	General Industrial	General Industrial	Heavy Industrial	Industrial
Height limit	None	Yes (35' for t-line)	Yes (40')	Yes (40')	No	No
Agricultural conversion	No	No	No	No	No	No
Contamination	Small TPH plume	No	Unknown	Unknown	Petroleum hydrocarbons from auto salvage	Petroleum hydrocarbons from fuel spills, auto salvage

Though there is sufficient land at each of these locations to develop a project, the Fremont-Boyce site is more constrained by space than the others. Though nearly 16 acres are available, 6 of these are currently occupied by the Borden chemical facility, possibly leaving a site too small for a power plant that would meet Calpine/Bechtel's project objectives.

Parcel consolidation and site control could be a concern for some of these sites. Only Fremont-Stevenson and Newark are located on single parcels. These are owned by Catellus Development Corporation and Cargill Corporation, respectively. These are large corporations that may have an interest in land development. The RCEC site involves consolidation of two parcels for the power plant site (Salem Communications and Runnels Industries). Calpine/Bechtel has secured legal control of both parcels. The Hayward-Depot site would involve consolidation of up to 14 parcels with different ownership. These owners would all have to agree to sell and would have to be compensated for any business loss. The Hayward-Winton site would be more manageable, since it would involve consolidation of 10 parcels that currently have only two owners.

9.4.2 Air Quality

The quantity of emissions from project operation would be the same at any of the sites. Each of the sites is located in the Bay Area Air Quality Management District and would, therefore, be subject to the same review, emission reduction crediting, and permitting requirements. Each of the sites is located in relatively flat terrain that will help to promote dispersion of emissions. The two Fremont sites and the Newark site are slightly nearer to the Berkeley Hills, however, than the Hayward sites. Small differences between the sites in distance from the nearest residences should not make a significant difference in air quality impacts at these residences. Mitigation would bring any potential impacts to a level below significance for any of the alternatives.

9.4.3 Biological Resources

The Russell City project site contains some seasonal wetlands. Though the power plant site does not provide habitat for threatened and endangered species, it may provide adjacent upland habitat (as a refuge for flooding) for the endangered salt marsh harvest mouse. Potential impacts to wetlands and the salt marsh harvest mouse could be easily mitigated.

The Newark alternative would involve the removal of small amounts of wetland vegetation ringing the cooling pond. This pond may or may not be a jurisdictional wetland, however, since it is an artificially constructed pond that does not communicate with adjacent drainage. Construction of electrical transmission lines across the Cargill salt evaporation ponds to connect with the existing 230-kV line could cause collision obstacles for migratory waterfowl that could be mitigated. Construction of the eight-mile-long water supply pipeline in the existing Union Sanitary District force main right-of-way would cross several large wetland and marsh areas. This would require either open cut construction in the wetlands or very long directional bores, which require large setup and laydown areas, and include some risk of "frac-out," the release of drilling mud to the surface through ground seams. Though impacts would be temporary, they would involve consultation with the U.S. Fish and Wildlife Service, California Department of Fish and Game, and U.S. Army Corps of Engineers because of potential effects on populations of protected species, including the salt marsh harvest mouse, salt marsh harvesting shrew, clapper rail, and black-crowned night heron, among others.

The Fremont-Stevenson site currently consists of open land that contains seasonal wetlands. This area is likely to be habitat for protected species, including the red-legged frog. The site is currently under conservation easement as partial mitigation for the potential effects of Catellus Land Corporation's construction of the Pacific Commons project, a large office and industrial development located nearby in Fremont. For this reason, development at this site would involve replacing the Pacific Commons easement with mitigation land of equivalent value, as well as adding additional land to mitigate the potential effects of a project on this parcel. Finding this quantity of mitigation land near the project area may be a limiting factor. If the cooling water supply and return line were constructed to the USD Alvarado Treatment Plant from this site, temporary disturbance of bay marshlands and the habitat of several protected species would occur. If the cooling water pipeline were constructed south in city streets to connect with the South Bay Water Recycling Program (SBWR) pipeline in Milpitas, this disturbance would not take place.

The Fremont-Boyce site currently contains some open field that is periodically mowed or disked. There does not appear to be quality habitat for protected species. As with the Fremont-Stevenson site, if the cooling water supply and return line were constructed to the USD Alvarado Treatment Plant from this site, temporary disturbance of bay marshlands and the habitat of several protected species would occur. If the cooling water pipeline were constructed south in city streets to connect with the SBWR pipeline in Milpitas, this disturbance would not take place.

The Hayward-Depot site would probably not directly affect protected species, since the site is currently occupied by auto salvage yards. There is a possibility of burrowing owls, which are known to nest in vacant lots. This potential effect is easily mitigated, however.

The Hayward-Winton site would, similarly, not directly affect protected species, since the site is also comprised of automobile salvage yards. The site is located adjacent to a marsh restoration project in the Hayward shoreline area, but effects to wildlife and plants would be unlikely with proper mitigation measures.

For each of the Hayward alternatives (RCEC, Depot, Winton), electrical transmission construction would be limited to upgrading an existing right-of-way that runs through a densely developed industrial area. There would be little or no resulting effect on plants or wildlife.

9.4.4 Cultural Resources

There would be few significant differences in cultural resources among the different alternatives, based on current information. Known archaeological sites would not be directly affected (buried sites are possible in any location). There would be a greater possibility of encountering buried archaeological deposits with the alternatives that would involve longer underground linear appurtenances (such as water and gas lines). The water supply pipeline to USD's Alvarado Treatment Plant, and the Alvarado alternative to supply water to the Fremont-Boyce and Fremont-Stevenson alternatives would thus be more likely to encounter significant prehistoric remains. This route (the USD's twin force main easement) passes relatively near prehistoric Native American shell mounds near the Coyote Hills. In this lowland, depositional environment, buried sites are somewhat likely to occur and, if found, would be somewhat likely to qualify as significant archaeological resources. The route between the Fremont alternatives and the SBWR network in Milpitas would also be likely to encounter buried resources, since it would run relatively near the former Bay margins.

At the Newark site, the power plant would be constructed next to the Cargill Corporation's salt production facility, which raises a historical resources issue. The Cargill salt production facility is more than 50 years old and is one of the few remaining reminders of the bayshore salt production industry that has been in operation since the 19th century. Two key questions about the facility are: 1) is the salt production facility a historic property (eligible for listing on the California Register of Historic Places or National Register of Historic Places), and 2) if so, would the presence of a power plant next to Cargill be sufficiently out of keeping with its historical character to cause a significant impact to the integrity of feeling and association of this site and, hence, reduce its significance? Both questions would clearly require additional study to resolve. If the salt facility were to be determined significant and if building a power plant near it would be considered a significant adverse impact, it might be possible to mitigate the impact, either by detailed recording (archival photography and engineering drawings) of the salt production works before building the power plant, or by applying architectural treatment to the power plant exterior that would be compatible with the appearance of the salt production works.

9.4.5 Geological Resources and Hazards

There would be no significant differences between the sites in terms of geological resources and hazards. There are no geological resources located at or near any of the sites. Each of the sites is located approximately the same distance from the Hayward, San Andreas, and Calaveras faults. The Hayward sites (RCEC, Depot, and Winton) are further from the Silver Creek fault (5 miles or more), whereas the Newark and Fremont sites are relatively near (1 mile). This fault, however, is considered inactive. Proper design to the standards of Seismic Zone IV would mitigate geological hazards.

9.4.6 Hazardous Materials Handling

There would be no significant difference between the site locations in terms of hazardous materials handling. The uses of hazardous materials would be the same for any of the sites. Though there might be differences in the distances that trucks carrying hazardous materials would travel to deliver the materials, these differences would be minor and would not necessarily be consequential, given the effective mitigation measures available and the excellent safety record for transport of these materials.

9.4.7 Land Use

Each of the six sites is zoned appropriately for industry. Two of the three Hayward area sites (RCEC and Winton) lie within the City of Hayward in its Industrial Corridor and are zoned Industrial (the only zoning designation for industry in the City of Hayward). The City of Hayward Planning Department staff have made a preliminary determination that energy generation is a use similar to manufacturing and, as such, is a permitted use in the Industrial District (see Appendix 8.6-A). There is no specified height limit for structures in the Hayward Industrial District. Similarly, the City has made a preliminary determination that broadcast studios are a permitted use in the Floodplain district.

The third Hayward area site, Hayward-Depot, is located on unincorporated land under Alameda County jurisdiction that is zoned M-2 (Heavy Industry) and that is surrounded by the City of Hayward. This piece of land is part of the County's Mt. Eden Redevelopment zone. Although electrical generation is not specifically addressed in the County zoning ordinance as a permitted use, the M-2 zone does include "public utilities" and "industrial operations." Electrical generation is frequently not mentioned specifically as a use in city or county zoning ordinances because the zoning ordinances were written before market deregulation; hence, the siting of power plants took place under public utility zoning regulations, which are different from those that apply to private entities.

The Newark site is located in the City of Newark's General Industrial (MG) zone. In general, MG districts are intended to reserve appropriately located areas for heavy industries and other related activities; this district is meant to accommodate a wide range of manufacturing, warehousing and distribution uses and to minimize the impacts of these uses on adjacent properties. There are numerous permitted and conditional uses in MG districts. Public and private utility facilities are not a permitted use in MG districts, but are considered a conditional use requiring a conditional use permit. The project would also be required to apply for a zoning variance for the broadcast towers, since these would be taller than 35 feet, the height limit in the Agricultural zone (Cargill's salt ponds are zoned agricultural), through which the transmission line would pass. Under this zoning designation, public and private utility facilities and equipment are also considered a conditional use.

The two Fremont sites (Stevenson and Boyce), are zoned General Industry (GI) under the Fremont Zoning ordinance. This designation is for all types of industrial uses. As with Alameda County, the Fremont Zoning Ordinance does not specifically identify power plants as a permitted use. The Zoning Administrator can, however, permit uses found to be similar in nature, function, or operation to other uses permitted within the district. The Fremont Zoning Ordinance also restricts building heights in the Industrial District to 40 feet, with exceptions possible for unique building requirements. The project would thus be required to apply for a zoning variance in order to construct the project, with its 145-foot-high HRSG stacks.

All six sites appear to be consistent with existing general plans and zoning, though the Fremont-Stevenson and Fremont-Boyce sites exceed the existing height limitation and the Newark-Cargill and Hayward-Depot sites may require conditional use permits.

9.4.8 Noise

Since it is technically feasible to mitigate potential power plant noise impacts to a level of insignificance, there would be no significant differences between the projects, as mitigated with sound baffling equipment. There are differences in the distance to the nearest residential receptor to the project. The three Hayward sites are furthest from a residence (0.6 mile to 1.1 mile). The Newark site is approximately 0.5 miles from the nearest residence. The Fremont-Boyce site is only 0.25 miles from the nearest receptor, a high-density housing development. The Fremont-Stevenson site is 0.6 miles from this same receptor.

9.4.9 Paleontology

There would be no significant differences between the project sites in terms of potential effects on paleontological resources. None of the sites is located at a known paleontological find spot, though Pleistocene fossils have been found in the alluvial deposits that ring the Bay margins. The probability of encountering significant fossils is approximately the same at all sites.

9.4.10 Public Health

The project would not be likely to cause significant adverse long-term health impacts (either cancer or non-cancer) from exposure to toxic emissions, regardless of the site chosen.

9.4.11 Socioeconomics

All six sites are located in Alameda County. The number of workers, construction costs, payroll, and property tax revenues would be nearly the same for the project at each of the sites. The majority of the workers would come from the East and South bay cities between Oakland and San Jose. Most workers would commute daily or weekly to the plant site. Some may move temporarily to the local area during construction, causing site-specific impacts to schools, utilities, and emergency services. These impacts would be temporary. Disproportionate impacts to minority and low income populations would be unlikely since, though there is a relatively high percentage of minority population in most of the communities near the project sites (30-50 percent), the minority population is widespread and is not concentrated in an area or areas that are also high potential impact areas. The project is not likely to cause significant adverse public health impacts to areas that are disproportionately minority or low income.

9.4.12 Soils and Agriculture

There would not be significant differences between the alternative sites in terms of their potential effects on soils and agriculture. None of the sites would result in the loss of prime and unique farmlands or farmlands of statewide importance.

9.4.13 Traffic and Transportation

Though there are differences between the project sites in terms of the amounts of current traffic congestion in their immediate areas, each of the sites is located in an urban area with relatively congested local traffic and near access to major freeways that are also relatively congested. The number of employees working at a given time during project operation (approximately 18), will not significantly impact local traffic conditions at any of the sites. The peak number of employees during construction (485) will have much more impact, but the impact will be temporary, and can be mitigated by providing off-site parking and busing for workers during peak periods. The effect on construction-phase traffic, therefore, should not figure as a major consideration in evaluating or comparing the sites.

The Hayward area sites (RCEC, Depot, Winton) are located in the Hayward Industrial Corridor, which is congested. Levels of Service in this area and along the major freeway arteries that serve the area (Interstate 880 and State Route 92) are poor. Access to the RCEC and Depot Road is through the Clawiter Road/Eden Landing Road exit to State Route 92. Access to Winton is through the Winton Avenue exit from Interstate 880. Off-site parking during construction might be necessary at these sites. The effects of the project on operation phase traffic would be negligible.

The City of Hayward plans to help ameliorate this traffic congestion by connecting Cabot Boulevard through land belonging to the existing wastewater treatment plant to Whitesell Street and expanding Whitesell to four lanes. Under this plan, Cabot would cross through some of the parcels on Depot Road that would otherwise be part of the Hayward-Depot site. Caltrans has plans to add capacity to State Route 92.

Traffic in the Newark industrial corridor is not particularly congested. There is relatively good access from Interstate 880 through the Thornton and Mowry Avenue interchanges, less than 1.5 miles away. There are plans, however, to install a Central Avenue overpass to the Union Pacific Railroad tracks adjacent to the Cargill salt production works. If this were completed, the most likely access point to the power plant site, at the west end of the Cargill property, would not be feasible, and would require a longer access right-of-way from a point further east.

The Fremont-Boyce and -Stevenson sites are both served by the four-lane Boyce and Stevenson Roads. Stevenson connects with Interstate 880 via an overpass about a half mile from the Boyce site and a mile from the Stevenson site. Automall Parkway and Boyce (in Fremont)/Cherry (in Newark) are four-lane distribution links that are relatively uncongested.

9.4.14 Visual Resources

The project at each of these sites would be visible to a large number of viewers. Viewer sensitivity depends on the distance from recreational areas, scenic highways, and residences.

9.4.14.1 Russell City Energy Center Site

The RCEC site would be visible by commuters on State Route 92 and recreational users along the Bay Trail and at the Hayward Area Recreation District's Shoreline Interpretive Center, at a distance of about 0.7 miles. The project would be most visible to eastbound commuters on the Hayward-San Mateo Bridge, however, since the view for westbound travelers would be blocked by buildings and trees. Commuters on State Route 92 would see the plant to the north in the middleground, at a distance of about 0.4 miles (at the nearest).

The City of Hayward considers the State Route 92 corridor a gateway to the City and has adopted a policy of promoting landmark quality visual treatment in this area (the General Plan suggested windmills or some other landmark of distinction). With its high quality proposed architectural treatment, the RCEC provides this landmark with a dramatic structure. This architectural treatment overshadows and mutes the effect of the existing large Rohm and Haas plant building and its 180-foot-high stack. It will also provide considerable visual interest to commuters and others on the Hayward-San Mateo Bridge.

Recreational viewers at the Shoreline Interpretive Center and along the Bay Trail to the north would see the project as they look east towards the City of Hayward as a taller mass among the buildings of the Industrial Corridor. The trailhead at the Shoreline Interpretive Center is approximately 0.73 miles from the project. From this location, the RCEC is a part of the middleground viewscape. This viewscape includes bay marshlands in the foreground, the Hayward Industrial Corridor in the middleground, and the East Bay Hills and Mount Diablo in the background.

Within the Industrial Corridor, most viewers would be commuters on their way to and from work or to delivery or transport goods and services. Views are obstructed by landscaping and buildings. There is a variety of building types, including warehouses, office buildings, and larger industrial structures for the Berkeley Farms dairy products processing plant, Rohm and Haas chemical plant, Tuscarora Corporation, and others. The RCEC would appear as a large and dominant structure from some viewpoints within this area, particularly those near the project.

Few residential viewers would see the project, none at close range. Most of those who could see the RCEC would do so from the East Bay hills, about 5 miles distant. At this distance the RCEC would be noticeable, but not a dominating presence. Some second floor windows of newer homes at the western edge of the Mount Eden neighborhood may have views of the top structures of the RCEC, about 1 mile distant.

9.4.14.2 Hayward-Depot

The project at the Hayward-Depot site would not be as visible from travelers on State Route 92 as the project at the RCEC site on Enterprise Avenue, because of intervening structures. Recreational viewers along the Bay Trail would see the project in the middleground at a distance of 1.3 miles near the western edge of the Industrial Corridor. As with the RCEC site, the bay marshlands would be in the foreground and the East Bay Hills in the background, with the project among buildings of the Industrial Corridor in the middleground. Viewers within the Industrial Corridor would mostly be commuters and transport and delivery persons.

9.4.14.3 Hayward-Winton

The project at the Hayward-Winton site would be most visible to commuters within the Hayward Industrial Corridor and to recreational viewers along the Bay Trail. Though the project would be located on Winton Avenue, a major thoroughfare of the Industrial Corridor, it would be located at the extreme western end of Winton, where the traffic and number of viewers is smaller than further to the east along Winton. Recreational viewers along the Bay Trail would see the project miles at the western edge of the Hayward Industrial Corridor in the middleground at a distance of 0.7 miles. The PG&E 115-kV transmission line and KCTC radio towers would also be a part of this view. The foreground from the Bay Trail would also include the All Cities landfill and asphalt and concrete crushing operation. As with the RCEC site, the bay marshlands would be in the foreground and the East Bay Hills in the background, with the project among buildings of the Industrial Corridor in the middleground. Recreational users driving down Winton Avenue on their way to the Hayward Shoreline Regional Park trailhead at the end of West Winton Avenue would pass directly by the project at this location. The project would be a dominating element within their field of view at this point.

9.4.14.4 Newark

The project at Newark would be most visible to commuters to the Newark industrial and business park area along Central, Thornton, Cherry, and Mowry avenues. Commuters crossing the Union Pacific railroad tracks on Central Avenue would pass very near to the project, which would be a dominant presence at this range. Recreational viewers at Coyote Hills Regional Park, about 4 miles away, would see the project in the background. Similarly, the project would barely be visible from travelers on the Dumbarton Bridge, also about 4 miles away. Viewers at a recently developed recreational complex located at the end of Mowry Avenue would see the project at a distance of about 1.2 miles against the backdrop of the Newark business park.

A commuter rail line runs directly next to the Newark site and viewers in the train would see the power plant at close range as they pass by. The power plant would block views of the Cargill Salt works and Coyote Hills from the train for a short distance. The Bay Trail also runs near the plant, but the trail in this location runs along paved streets and roads through this area.

9.4.14.5 Fremont-Boyce

Viewers of the project at the Fremont-Boyce site would include commuters along Stevenson , Boyce, and Cherry Streets (Boyce Avenue in Newark). Travelers on Interstate 880 might see the tops of the HRSGs and stacks. The local viewscape consists of open lands to the southwest, along the bay margins, industrial and residential uses in the immediate area, and the East Bay hills to the east, most notably Mission Peak, a local landmark. The large and disparate buildings of the industrial park area, and also the large Newark Substation and several large-scale transmission lines which serve it, help to imprint a largely industrial character to this viewscape. Residential viewers living in a townhouse complex are within one-quarter mile of the Boyce site, however, on Cherry Street (same as Boyce). Views from within and near these residences, without screening, could possibly cause a significant adverse impact. The Bay Trail is planned to run along side Boyce Avenue at some point in the future. This would introduce recreational viewers to the project viewshed.

9.4.14.6 Fremont-Stevenson

The potential project viewers of the Fremont-Stevenson project would be very similar to those at Fremont-Boyce site and would include commuters along Stevenson , Boyce, and Cherry Streets (Boyce Avenue in Newark). The local viewscape is also similar to Fremont-Boyce, except that the Stevenson site is bisected by a large transmission line, is adjacent to the Union Pacific Railroad tracks, and lies near the open spaces along the bayshore floodplain. Residential viewers are located about one half mile away, at Cherry Street/Boyce Avenue. To these viewers, the project would be visible as a large structure rising above the surrounding industrial buildings against the backdrop of the bay and Peninsula hills.

9.4.15 Water Resources

All six sites would be able to use treated wastewater for power plant cooling and so would not differ significantly in their use of water resources. This is consistent with the State Water Resources Control Board's Policy 75-58 indicating that water for power plant cooling should avoid using fresh inland waters other waters (such as treated wastewater) are available. Cooling tower blowdown would, in each case, be returned to the wastewater treatment facility supplying the cooling water, to be discharged under that facility's NPDES permit. Reducing the volume of fresh water discharged into San Francisco Bay would help to increase the salinity of the Bay, and this is important for the health of the Bay ecosystem.

None of the Hayward or Newark sites are located within a 100-year floodplain. The Fremont-Stevenson site is also not located on a 100-year floodplain, but the eastern edge of the Fremont-Boyce parcel is shown on Federal Emergency Management Agency (FEMA) maps as containing some areas where the 100-year average flood depth would be between 1 and 3 feet.

9.4.16 Waste Management

The management of wastes would differ between the project site and the five alternatives, though these differences would not necessarily lead to a site preference. Some of the sites (Fremont-Stevenson and Fremont-Boyce) are currently partly or entirely vacant. This means there would be a smaller quantity of waste generated during demolition to prepare for construction. The RCEC site, by contrast, would require the demolition of the KFAX radio station broadcast towers, a small transmitter building, and a few small structures at the current Runnels Industries. Both Hayward sites would require the removal of a large quantity of automobiles in various states of salvage.

Some of these sites might have contaminated soils, requiring cleanup before constructing the energy generation project. At the Hayward-Depot and Hayward-Winton sites, for example, the salvage of automobiles, as well as the spillage of fuels over the years has led to a petroleum hydrocarbon problem. The Winton property, for example, is under order from the State Water Resources Control Board to collect contaminated surface runoff and resolve several contamination issues. Some of the businesses at the Depot Road site, similarly, have been under order by state and federal agencies to clean up contamination or face penalties. At the Runnels Industries property, part of the RCEC site, there is a small plume of petroleum hydrocarbons that has migrated westward onto the KFAX property. Also at the RCEC, there is a plume of Volatile Organic Compounds (VOC), possibly from an off-site source, in the soil. The pollutant levels are very low, however, and cleanup or closure should be relatively straightforward.

9.4.17 Summary and Comparison

Returning to our original site selection criteria, it is clear that power plant siting is feasible at most of these alternative sites. A summary of environmental and project development constraints is presented in Table 9-2.

- **Location more than 1000 feet from the nearest residential receptor**—All of the sites are more than 1,000 feet from the nearest residential receptor. Most are more than a half-mile from the nearest residence. The RCEC is 0.82 miles from the nearest residence. Hayward-Winton is 1.1 miles. The Fremont-Stevenson site, however, is only about 0.25 miles from a high-density residential development. This may cause a significant visual impact.
- **Location near the centers of electrical demand**—All of the sites are in highly urbanized areas with residential and industrial demand for power.
- **Land zoned for industrial heavy industrial use**—The RCEC site and each alternative site is zoned for industrial or heavy industrial use. There appear to be no zoning restrictions, though the definition of "public utility" and "industrial operation" would have to be clarified to site the project within Alameda County jurisdiction at the Hayward-Depot location.

Table 9-2. Project development and environmental constraints of the RCEC and alternative sites.

Site or Alternative	Project site	A	B	C	D	E
Name	**Russell City**	**Newark-Cargill**	**Fremont-Stevenson**	**Fremont-Boyce**	**Hayward-Depot**	**Hayward-Winton**
Multiple parcels	3 parcels (controlled)	1 parcel	1 parcel	1 parcel	14 lots/14 owners	10 lots, 2 owners
Site control feasible	Yes	Unknown	Unknown	Unknown	May be difficult, given number of owners	Unknownn
Biological Resources						
Wetlands	Seasonal wetlands	Isolated wetland	Seasonal wetlands	None	None	None
Protected species	None	None	California red-legged frog	None	None	None
Other	None	Bird collision with t-line	Land now in conservation easement	None	None	None
Cultural Resources	None	Cargill salt works historic site	None	None	None	None
Land Use and zoning	Permitted use	Conditional Use Permit	Zoning administrator approval, height limit	Zoning administrator approval, height limit	Permitted or conditional use	Permitted Use
Noise	None	None	None	0.23 mile to residence	None	None
Traffic	Congested area	None	None	None	Congested area	Congested area
Visual	View from Bay Trail	Blocks view of salt works and Coyote Hills from train	Future Bay Trail	Residence very near, Future Bay Trail, site on major street	View from Bay Trail	View from Bay Trail
Waste Management	Minor contamination	Remove cooling pond	Open lot (contamination unknown)	Open lot (contamination unknown)	Remove salvaged vehicles, contamination	Remove salvaged vehicles, contamination
Fatal Flaw or significant unmitigated impacts?	No	No	Replacement habitat may be unavailable; conservation easement may be difficult to remove.	May be too near residences; parcel may be too small.	Site control may be difficult (many owners)	Contamination cleanup may be expensive

- **Location near a sufficient source of cooling water, preferably treated wastewater**—There is an excellent match for any one of these sites, with available recycled water. The Hayward Water Pollution Control Facility (the RCEC, Hayward-Depot, Hayward-Winton), USD Alvarado Treatment Plant (Newark, Fremont-Boyce, Fremont-Stevenson), and SBRP wastewater treatment plant (Fremont-Boyce, Fremont-Stevenson) can all provide a sufficient quantity of wastewater to cool a power plant of this size. A project at the RCEC and Hayward-Depot sites would be located adjacent to the water source, so would not require a long pipeline, as the Newark and Fremont sites would. One additional advantage of the Hayward sites is that it would also be possible to obtain backup treated wastewater from the USD downstream of their treatment plant by tapping the East Bay Dischargers Authority pipeline, which runs very near each of these sites.
- **Location near electrical transmission facilities**—Each of the sites is relatively near a feasible tie-in to the transmission system. The Hayward sites are within 1.1 to 2.5 miles of PG&E's Eastshore Substation, and from this location, can help supply much needed power to the San Francisco peninsula and City of San Francisco. It would be possible to loop into a 230-kV transmission line from Newark, and the two Fremont sites are within 0.6 miles of the Newark Substation.
- **Location near ample natural gas supply**—Each of the sites is convenient to ample natural gas supply. The two Fremont sites and the Newark site could connect with the PG&E backbone line 303. The Hayward sites would connect, via a short pipeline, to a PG&E distribution line.
- **Parcel or adjoining parcels of sufficient size for a power plant**—There is sufficient land available at each parcel to develop a power plant, except for the Fremont-Boyce site. The site is 15.89 acres in size but 6 acres are occupied by the Borden Chemical facility. This may mean that a power plant of this scale would not be feasible on this site or would require careful engineering.
- **Site control feasible**—Site control appears to be feasible for most of the sites. There are two owners of the Hayward-Winton site. The most difficult would appear to be the Hayward-Depot site, since there are 14 separate parcels with a number of different owners, and therefore site control may or may not be feasible at this site.
- **Mitigation of potential impacts feasible**—Mitigation of potentially significant environmental impacts appears feasible at each of the sites, with one or two exceptions. Visual impacts at the Fremont-Boyce site may be problematic, because it is located on a major thoroughfare and because it is very near (0.25 miles) a residential area. Also, mitigation of biological resources impacts might be difficult at the Fremont-Stevenson location. Since the property is currently in conservation easement to mitigate for the Pacific Commons development, a large amount of mitigation land would have to be provided to replace this easement and to mitigate potential site effects.

The Fremont-Boyce site may be too small for a large power plant, since much of the project site is taken up by the Borden Chemicals facility. This site may also be too near (0.25) to high-density residential uses to avoid possibly significant impacts. There may be contamination issues at Hayward-Winton and Hayward-Depot due to auto salvage operations that may be expensive to remedy. Also, at the Winton and Depot sites, it would be necessary to combine parcels of multiple ownership.

The Fremont-Stevenson parcel may pose an insurmountable obstacle in that the parcel appears to contain seasonal wetlands and to be habitat for endangered species. Replacing the conservation easement as well as providing additional mitigation might be very expensive or difficult to accomplish due to a scarcity of high quality mitigation land near the project site.

The RCEC site and Newark site appear to present the fewest potentially serious developmental and environmental constraints. Of these, the RCEC is preferred because of its closer proximity to required interconnection facilities (electrical transmission, natural gas, recycled water). Newark, would require much longer pipelines to supply cooling water and these would be expensive to construct, more difficult to permit, and would have greater construction-related impacts on wetlands, local streets, and rights-of-way. The RCEC site, in conclusion, is the most feasible site with the lowest potential environmental impact, in comparison with the other alternatives.

9.5 ALTERNATIVE PROJECT DESIGN FEATURES

The following section addresses alternatives to some of the RCEC design features, such as the locations of the natural gas supply pipeline, electrical transmission line, and water supply pipeline, and the radio broadcast tower relocation.

9.5.1 Alternative Natural Gas Supply Pipeline Routes

Natural gas fuel for the RCEC will be supplied by Pacific Gas and Electric (PG&E) by a 16-inch pipeline from a major gas distribution line (Line 153) that parallels the Union Pacific Railroad tracks about a mile east of the RCEC site. PG&E's preliminary route selection report is presented in Appendix 5-A.

The nearest connection points to the PG&E transmission system lie along the Union Pacific Railroad right-of-way through Hayward. There are several potential routes to access PG&E line 153. The route most feasible, and the that the City of Hayward prefers because it offers less interference with existing underground infrastructure, would run due east along Enterprise Avenue to Clawiter Road, across Clawiter, then along an existing city sewer right-of-way that runs between the Berkeley Farms dairy processing and the Gillig bus manufacturing plants to the railroad right-of-way. Another possible connecting point is located near the intersection of Clawiter and Depot roads. There are several possible routes to reach this point, including Enterprise to Clawiter to Depot, and north across the City's Water Pollution Control Facility and private land to Viking, then north on Viking to Depot and east on Depot to the connecting point.

9.5.1.1 Selection Criteria

In general, the alternative routes for the gas supply pipeline were selected based on engineering and construction feasibility, the expected delivery pressure of the natural gas supply, length of pipeline, cost, and the potential for environmental impacts. Engineering/construction feasibility is an assessment of whether the pipeline can be physically placed along a route. Length of pipeline is important because pressure drop, cost, and potential environmental impacts are usually functions of length. Environmental impacts must be either not significant or mitigatable to a level of insignificance.

No major differences between the routes evaluated were seen with regards to engineering and construction feasibility, the expected delivery pressure of the natural gas supply, length of pipeline, and cost to construct or operate. All routes included pipeline construction along city streets that involve temporary reduction or rerouting of traffic during pipeline construction and the potential for some temporary disruption of utility services.

Since all of the candidate routes follow City streets or otherwise previously disturbed surfaces within Hayward's Industrial Corridor or an unincorporated industrial area of Alameda county, impacts to natural and/or cultural resources are not likely to be significant for any of the candidate routes. In addition, because the lengths of the candidate routes are of the same order of magnitude, noise, visual, air quality, and water quality impacts are not expected to differ significantly for the candidate routes. Pipeline construction impacts on traffic are seen as the most important environmental impact that allows discrimination between the alternates considered. The preferred route is expected to be constructed with less disruption of traffic and streets than the other routes considered.

The selected route (east along Enterprise Avenue, across Clawiter, and along an existing pipeline right-of-way south of Berkeley Farms) was selected because this route will minimize temporary traffic impacts during construction. While nearly the entire length of Enterprise Avenue will be affected, this route has much lower traffic volumes than the alternatives.

9.5.2 Electrical Transmission System Alternatives

Calpine/Bechtel plan to connect the RCEC to the regional transmission grid at the PG&E Eastshore Substation, which is located 1.1 miles south of the project site. A 115-kV transmission line runs north-south through a transmission corridor located 0.1 miles east of the project site, and this corridor is the most feasible location for a transmission system upgrade to carry power from the RCEC.

This section describes alternatives to the proposed electrical transmission interconnection discussed in Section 6.2. One of the results of the transmission resource analysis was the development of several additional conceptual transmission interconnection options. Factors considered in the development and selection of the preferred transmission interconnection were: a) the ability of the existing transmission resources to carry the power generated by the RCEC, b) environmental consequences, c) ability to secure any additional rights-of-way (if needed), and d) engineering considerations and constraints. This location has several interconnection options that all might be feasible.

Several alternatives were identified, analyzed, and discounted due to subjective differences with the proposed transmission interconnection. Figure 6.1-2 illustrates three alternative alignment options that were considered. They are labeled A, B, and C. These alternatives are presented below. In addition several other interconnection configurations (electrical) were analyzed. The are also discussed below. Other alternatives, not discussed below, were delineated, assessed, and rejected as clearly inferior.

Alternative 1–Alignment A

Alternative 1 would involve a radial connection of the RCEC switchyard to the 230 kV bus at PG&E's Eastshore Substation with an overhead 230 kV transmission line (Alternative Route A in Figure 6.1-2). As a result of the physical layout of the plant and location of the switchyard, routing inside the facility would require the line to run along the east side the entire length of the site. The line would exit the power plant site at the southeast corner and would align along the Union Pacific railroad spur in an easterly direction for approximately 4,650 feet to the Union Pacific mainline tracks. There the line would parallel the mainline tracks in a southeasterly direction for approximately 1,950 feet to where it intersects with the San Mateo-Contra Costa (Eastshore) 230 kV transmission lines. The alignment would then parallel the existing 230 kV lines approximately 1,400 feet to the Eastshore Substation. The total length of the this alternative transmission line will be approximately 8,000 feet.

Implementation of this alternative, among other considerations, would use the corridor established by the existing railroad spur and mainline. The line would parallel the existing railroad right-of-way for approximately 6,600 feet. Placement of a 230 kV transmission line along this corridor would require placement outside (but immediately adjacent) to the railroad right-of-way. This placement may limit the available right-of-way needed to address EMF considerations, prompting the purchase and clearing of adjacent properties or other mitigative measures such as taller structures.

This alternative as with the preferred interconnection will require modifications to the Eastshore Substation to maintain system reliability. One modification would be the movement of the Eastshore-Contra Costa 230 kV line to allow the connection of both circuits of the RCEC interconnection.

This alternative was not selected because of the increased costs associated with the increase in line length and the need to purchase additional right-of-way. Additional costs would be associated with either clearing the new right-of-way or mitigative measures to address EMF concerns and nuisance effects associated with a line parallel to an active railroad.

Alternative 2–Alignment B

Alternative 2 involves looping the existing San Mateo-Pittsburg (Contra Costa) 230-kV transmission line into the RCEC switchyard. This would be accomplished with a new double circuit 230-kV transmission line (Alternative Route B in Figure 6.1-2). The line within the RCEC site would be routed to the southwest corner where it would exit the site in a southern direction. The line would be routed adjacent to the salt marshes and run approximately 3,800 feet south to the intersection of the San Mateo-Contra Costa line at tower 38/164. Figure 6.1-2 shows "B" interconnects at tower 38/164. Tower placement would occur along an existing dike separating the marshes from a saline pond.

This alternative would require securing new right-of-way for the entire length of the alignment and would result at least temporary construction impacts to the extensive saltwater wetlands present along virtually the entire length of the corridor. In addition, looping into the San Mateo-Contra Costa 230-kV line would necessitate reconductoring the entire length of the line between the Pittsburg and San Mateo Substations. Because the RCEC switchyard would be an integral part of the connection between Pittsburg (Contra Costa) and San Mateo, to maintain reliability, it is likely that this configuration would require additional land and result in other impacts associated with a breaker and one-half scheme at the RCEC switchyard. Additionally, new towers would be visible to a large group of bridge users.

This system analysis and anticipated construction impacts indicate that Alternative 2 clearly inferior to the preferred interconnection and the alternative was, therefore, rejected.

Alternative 3–Alignment C

This alternative also involves looping the existing San Mateo-Contra Costa 230 kV line into the RCEC switchyard.

This alternative has the same components and configurations as Alternative 2 with the exception of a different alignment between the RCEC switchyard and the existing San Mateo-Contra Costa transmission line. Alignment for the double circuit interconnection would be directly south out of the RCEC. As a result of the plant layout and switchyard location the interconnecting line would be routed west and then south within the plant site. Alternative 3 route alignment (see Alignment C on Figure 6.1-2) would then follow the extreme western edge of several parking lots where they adjoin the marshes approximately 3,700 feet to where it would intersect with the San Mateo-Contra Costa transmission line. Tower placement would be immediately off the paved areas in previously disturbed high ground between the parking lots and the marshes. The interconnection would be at tower 37/162 of the existing San Mateo-Eastshore 230-kV line.

This alternative would also require securing new right-of-way for the entire length of the alignment. Temporary construction impacts to the extensive wetlands along the route may occur as the right-of-way is surveyed and graded (at tower locations). However, the impacts are anticipated to be less than those anticipated in Alternative 2. In addition, looping into the San Mateo-Pittsburg (Contra Costa) 230-kV line would also necessitate reconductoring the entire length of the line between the San Mateo and Eastshore Substation to ensure system reliability.

Following the system analysis and right-of-way evaluation, Alternative 3 was found to have environmental impacts that the preferred alignment did not. As a minimum, new towers would be visible to a large group of bridge users. Because the RCEC switchyard would be an integral part of the connection between Pittsburg (Contra Costa) and San Mateo, to maintain reliability, it is likely that this configuration would require additional land and have other impacts associated with a breaker and one-half scheme at the RCEC switchyard.

Alternative 4–Interconnection at 115 kV using the existing Eastshore-Grant 115-kV Transmission line

This alternative would loop both circuits of the existing 115-kV Grant to Eastshore line into a 115-kV RCEC switchyard. This alternative presumes that PG&E's project 667 to split this line into separate circuits has been completed. The major components of these alternatives would be:

- Rebuilding the 115-kV line between the RCEC and the Eastshore Substation. Depending on the approach chosen, the lines from Eastshore to Grant might also need to be rebuilt
- A 115-kV switchyard at the RCEC with at least seven breakers. Depending on the desired reliability, a larger switchyard might be required.
- Additional 115/230-kV transformer capability in the Eastshore substation. The existing two transformers are rated at 120 MVA each. To evacuate all the power from the RCEC during low load conditions, additional transformation capability would be required.
- Modifications to the Eastshore Substation

This alternative was rejected because the maximum continuous rating of 115-kV breakers is 3000 Amps, which is less than the 600-MW maximum nominal output of the RCEC (3662 Amps at a 0.85 power factor). If a solution to the breaker limitation could be found, the output of the RCEC would either require the reconductoring of all the 115-kV lines from Eastshore to Newark or a new Eastshore 230/115-kV transformer, or both. Even so, further upgrades to the 230-kV switchyard or the 230-kV lines at Eastshore might be required.

9.5.3 Water Supply Alternatives

The City of Hayward's wastewater treatment plant will supply water for the proposed project as described in Section 7.0. Other sources of water might include using municipal water from the City of Hayward. Due to the high quality of this water (very pure water from the City of San Francisco's Hetch Hetchy Reservoir in the Sierra Nevada Mountains) and its resulting suitability for other uses, and the availability of treated wastewater at a reasonable price, this alternative was not chosen. Well water would be another possible source of cooling water. Treated wastewater is clearly the better alternative, however, due to the expense of drilling wells, and the low quality of groundwater in the East Bay margins, particularly near the Bay itself, where saltwater intrusion is frequently a problem.

9.5.4 Wastewater Disposal Alternatives

Wastewater produced by the RCEC will be disposed of at City of Hayward's treatment plant through a 12-inch return line that will parallel the supply line from the treatment plant. Since the wastewater is being returned to its original source and both supply and return water pipelines would be placed in the same trench, no wastewater disposal alternatives were evaluated.

In addition to alternatives that would use water for cooling, zero discharge was considered. A zero discharge alternative has the potential for significant impacts that may or may not be reduced to a level of insignificance. These different impacts result, in part, from the fact that a zero discharge system would require the addition of several plant design features:

- Raw water pretreatment to soften the water and allow operation of the cooling tower at higher cycles of concentration, thereby reducing the volume of cooling tower blowdown produced.
- Process equipment employing evaporation and crystallization technology to reduce the volume of wastewater and produce reusable water.
- Additional water reuse loops in the plant water management design.
- Sludge dewatering equipment and off-site sludge disposal.

Addition of the necessary processes and equipment to implement the zero discharge alternative would result in increased capital cost, increased operating and maintenance cost, additional auxiliary power consumption, and additional site space requirements. This alternative also significantly increases on-site chemical handling and storage requirements and produces large quantities of sludge that must be properly disposed of off-site. These disadvantages were found to outweigh the water saving advantage of the zero discharge alternative.

9.6 TECHNOLOGY ALTERNATIVES

The configuration of the RCEC was selected from a wide array of technology alternatives. These include generation technology alternatives, fuel technology alternatives, combustion turbine alternatives, NO_x control alternatives, inlet air cooling alternatives, and heat rejection alternatives.

9.6.1 Generation Technology Alternatives

Selection of the power generation technology focused on those technologies that can utilize the natural gas readily available from the existing transmission system. The following provides a discussion of the suitability of such technologies for application to the RCEC.

9.6.1.1 Conventional Boiler and Steam Turbine

This technology burns fuel in the furnace of a conventional boiler to create steam. The steam is used to drive a steam turbine-generator, and the steam is then condensed and returned to the boiler. This is an outdated technology that is able to achieve thermal efficiencies up to approximately 36 percent when utilizing natural gas, although efficiencies are somewhat higher when utilizing oil or coal. Due to this low efficiency, the conventional boiler and steam turbine technology was eliminated from consideration.

9.6.1.2 Simple Cycle Combustion Turbine

This technology uses a combustion turbine to drive a generator. Combustion turbines have relatively low capital cost, and aeroderivative units are able to achieve thermal efficiencies up to approximately 38 percent. Due to its quick startup capability and relatively low capital cost, this technology is used primarily in peaking application (less than 1,000 hours per year), where relatively low efficiency is not an overriding concern. Due to its relatively low efficiency, this technology tends to emit more air pollutants per kilowatt-hour generated than more efficient technologies. Due to less than optimal environmental performance and relatively low efficiency, the simple-cycle combustion turbine technology was eliminated from consideration.

9.6.1.3 Conventional Combined Cycle

This technology integrates combustion turbines and steam turbines to achieve higher efficiencies. The combustion turbine's hot exhaust is passed through an HRSG to create steam used to drive a steam turbine-generator. This technology is able to achieve thermal efficiencies up to approximately 52 percent, considerably higher than most other alternatives. This high efficiency also results in relatively low air emissions per kilowatt-hour generated. For these reasons, the conventional combined cycle is considered the benchmark against which all other base load and intermediate load technologies are compared. Due to its high efficiency and superior environmental performance, this technology was selected for the RCEC as well as for most other new base load and intermediate load power plants being developed in the United States.

9.6.1.4 Kalina Combined Cycle

This technology is similar to the conventional combined cycle, except a mixture of ammonia and water is used in place of pure water in the steam cycle. The Kalina cycle could potentially increase combined cycle thermal efficiencies by several percentage points. However, because this technology is still in the development phase and has not been commercially demonstrated, it was eliminated from consideration.

9.6.1.5 Advanced Combustion Turbine Engines

There are a number of efforts to enhance the thermal efficiency of combustion turbines by injecting steam, intercooling, and staged firing. These include the steam injected gas turbine (STIG), the intercooled steam recuperated gas turbine (ISRGT), the chemically recuperated gas turbine (CRGT), and the humid air turbine (HAT) cycle. The STIG it less efficient than conventional combined cycle technology and is only able to achieve thermal efficiencies up to approximately 40 percent. None of the remaining technologies, ISRGT, CRGT or HAT, is commercially available. Consequently, all of these technologies were eliminated from consideration.

9.6.2 Fuel Technology Alternatives

Technologies based on fuels other than natural gas were eliminated from consideration because they do not meet the project objective of utilizing natural gas available from the existing transmission system. Additional factors rendering alternative fuel technologies unsuitable for the proposed project are as follows:

- No geothermal or hydroelectric resources exist in Alameda County.
- Biomass fuels such as wood waste are not locally available in sufficient quantities to make them a practical alternative fuel.
- Solar and wind technologies are generally not dispatchable and are therefore not capable of producing ancillary services other than reactive power.
- Coal and oil technologies emit more air pollutants than technologies utilizing natural gas.
- The availability of the natural gas resource provided by PG&E, as well as the environmental and operational advantages of natural gas technologies, make natural gas the logical choice for the proposed project.

9.6.3 Combustion Turbine Alternatives

The latest generation of commercially demonstrated combustion turbine generator (CTG) technology, commonly referred to as "F" technology, was selected for the RCEC. Selection of this class of combustion turbines was based on economies of scale, thermal efficiency, operational flexibility, and status of commercial demonstration.

For an overall combined cycle output of 600 MW, total combustion turbine output should be in the range of 400 MW. With this target in view, combustion turbine selection focused on models larger than 80 MW in order to take advantage of economies of scale. In addition, many of such larger combustion turbine models offer thermal efficiencies that are equivalent or superior to the efficiencies of smaller models.

Currently available, large combustion turbine models can be grouped into three classes: conventional, advanced, and next generation. Conventional combustion turbines operate at firing temperatures in the range of 2000°F to 2100°F and are available in sizes up to about 110 MW. Advanced combustion turbines operate at firing temperatures above 2300°F and are available in sizes up to about 160 MW. Next generation combustion turbines have higher firing temperatures than the advanced turbines and have additional features that provide greater output and higher efficiencies. Next generation turbines represent models that has been announced by the manufacturers as commercially available, with advertised outputs in the range of 230 to 240 MW.

Examples of commercially available combustion turbines in each class are shown in Table 9-3.

Table 9-3. Combustion turbines.

Manufacturer	Conventional	Advanced	Next Generation
ABB	GT 11N2	GT 24	None
GE	7EA	7FA	7H
Siemens-Westinghouse	W501.F	W501.F Phase 2	W501.G

Advanced combustion turbines offer significant advantages for the proposed project. Their higher firing temperatures offer higher efficiencies than conventional combustion turbines. They offer proven technology with numerous installations and extensive run time in commercial operation. Emission levels are also proven, and guaranteed emission levels have been reduced based on operational experience and design optimization by the manufacturers. In comparison, environmental performance and thermal efficiencies of next generation turbines have not been demonstrated in commercial operation. Furthermore, next generation turbines may not be suitable for the frequent startups and periods of low load operation anticipated for the RCEC. The CTG's selected for the RCEC are the Siemens-Westinghouse "F" technology CTG's.

9.6.4 NO_x Control Alternatives

To minimize NO_x emissions from the RCEC, the CTGs will be equipped with dry low NO_x combustors and the HRSGs will be equipped with post-combustion selective catalytic reduction (SCR) using aqueous ammonia as the reducing agent. The following combustion turbine NO_x control alternatives were considered:

- Steam injection (capable of 25 to 42 ppm NOx).

- Water injection (capable of 25 to 42 ppm NOx).
- Dry low NOx combustors (capable of 9 to 25 ppm NOx).

Dry low NO_x combustors were selected because they provide for lower NO_x emissions and lower HRSG makeup water requirements.

Two post-combustion NO_x control alternatives were considered:

- SCR.
- SCONOx

SCR is a proven technology and is used frequently in combined cycle applications. Ammonia is injected into the exhaust gas upstream of a catalyst. The ammonia reacts with NO_x in the presence of the catalyst to form nitrogen and water.

$SCONO_x$™ is a new technology and has been installed on a 25 MW combined cycle plant since December 1996. $SCONO_x$™ consists of an oxidation catalyst, which oxidizes CO to CO_2 and NO to NO_2. The NO_2 is adsorbed onto the catalyst, and the catalyst is periodically regenerated. Although a potentially promising technology, $SCONO_x$™ has not been commercially demonstrated on a large power plant. There are several technological and commercial issues remaining to be resolved prior to application of this new technology to the class of large combustion turbines selected for the proposed project.

The following reducing agent alternatives were considered for use with the SCR system:

- Anhydrous ammonia
- Aqueous ammonia
- Urea

Anhydrous ammonia is used in many combined cycle facilities for NO_x control, but is more hazardous than other diluted forms of ammonia. Aqueous ammonia (a 28 percent ammonia, 72 percent water solution) is proposed for the RCEC because of its safety characteristics. Urea has not been commercially demonstrated for long-term use with SCR and was therefore eliminated from consideration.

9.6.5 Inlet Air Cooling Alternatives

Combustion turbine output and efficiency both increase as inlet air temperature decreases. Ambient air temperatures for the proposed project are sufficiently high for a large portion of the year to warrant some form of inlet air cooling. Two common forms of combustion turbine inlet air cooling are evaporative cooling and air chilling.

Evaporative cooling is capable of cooling to temperatures near the ambient wet-bulb temperature. Air chilling is capable of cooling to temperatures far below the ambient wet-bulb temperature, and it is able to maintain a low temperature over a wide range of ambient conditions. Air chilling uses mechanical or absorption refrigeration to produce a cold fluid for cooling of the inlet air, and its capital cost greatly exceeds the cost of evaporative cooling. Air chilling systems may be designed to operate continuously or they may be designed to produce ice or cold water during off peak periods for cooling of the inlet air during peak periods.

Based on temperature profiles at the proposed site, evaporative cooling via an inlet air fogging system was selected for the RCEC to optimize output and efficiency versus capital cost. If warranted by market conditions, the more expensive air chilling alternative may be retrofitted in the future.

9.6.6 Heat Rejection Alternatives

The RCEC will employ a surface condenser cooled by circulating water, with heat rejection provided by a mechanical draft, wet cooling tower. An air-cooled condenser was considered as an alternative. The wet cooling tower was found to be the most cost-effective heat rejection system and produces the highest plant efficiency.

The advantages of an air-cooled condenser are reductions in makeup water requirements, water vapor plume, and cooling tower drift. Plume and drift are not completely eliminated because, even if an air-cooled condenser is used, a wet cooling tower is still required to provide cooling water for plant auxiliaries such as generator coolers and lubrication oil coolers.

Condenser performance is inversely related to the temperature of the cooling medium. The local climate in the project area is characterized by high dry-bulb temperatures and low wet-bulb temperatures (i.e., low relative humidity). Consequently, the performance of an air-cooled condenser (which is inversely related to dry-bulb temperature) is poor compared to the performance of a surface condenser cooled by circulating water (which is inversely related to wet-bulb temperature). The air-cooled condenser's relatively poor performance results in relatively high steam turbine backpressure, which negatively impacts steam turbine output and efficiency. This negative impact causes a decrease in overall plant output and efficiency. The air-cooled condenser also uses more auxiliary power due to the greater number and horsepower of its fans as compared to the wet cooling tower. As a result, net plant output and efficiency are further reduced. In addition, the capital cost of an air-cooled condenser greatly exceeds the cost of a surface condenser, circulating water system, and wet cooling s.

The air-cooled condenser's disadvantages of reduced plant output, reduced plant efficiency, and higher capital costs were found to outweigh the advantage of reduced water consumption.

10. ENGINEERING

In accordance with CEC regulations, this section and its related appendices and Sections 2, 5, 6, and 7 present information concerning the design and engineering of the RCEC and the AWT plant. Section 10.1 describes the design of these project facilities with reference to Section 2, the Project Description. Section 10.2 discusses the reliability of the RCEC, and Section 10.3 presents the estimated thermal efficiency of the facility. Section 10.4 describes the LORS applicable to the RCEC engineering, and Section 10.5 identifies agencies that have jurisdiction, and provides the contact persons within those agencies.

10.1 FACILITY DESIGN

Detailed descriptions of the RCEC and the AWT plant are provided in Sections 2.2, and 2.3 respectively. Design for safety is provided in Section 2.2.17, Facility Safety Design.

A preliminary geotechnical assessment of the proposed site, including core borings, is in progress. Copies of the Preliminary Geotechnical Report will be provided to the CEC when it becomes available.

Summary descriptions of the design criteria are included in: Appendix 10-A, Civil Engineering Design Criteria; Appendix 10-B, Structural Engineering Design Criteria; Appendix 10-C, Mechanical Engineering Design Criteria; Appendix 10-D, Electrical Engineering Design Criteria; Appendix 10-E, Control Engineering Design Criteria; and Appendix 10-F, Chemical Engineering Design Criteria.

Design and engineering information and data for the following systems are found in the following parts of the AFC:

- **Power Generation**—See Section 2.2.4 regarding the CTG, HRSG, and STG. Also see Appendix 10-C and Sections 2.2.5 through 2.2.13, which describe the various plant auxiliaries.
- **Heat Dissipation**—See Section 2.2.8, Plant Cooling System, and Appendix 10-C.
- **Cooling Water Supply System**—See Section 2.2.7, Water Supply, Section 2.2.8, Plant Cooling System, and Appendix 10-F.
- **Air Emission Control System**—See Section 2.2.11 Emission Control and Monitoring, and Section 8.1, Air Quality.
- **Waste Disposal System**—See Section 2.2.9 and 8.14, Waste Management.
- **Noise Abatement System**—See Section 8.7, Noise, and Appendix 10-C.
- **Switchyards/Transformer Systems**—See Section 2.2.5, Major Electrical Equipment and Systems; 2.2.13.2, Grounding; Section 2.2.5.1, AC Power-Transmission; Section 2.2.14, Interconnect to Transmission Line; Section 6, Electrical Transmission; and Appendix 10-D, Electrical Engineering Design Criteria.

10.2 RELIABILITY

This section discusses the availability of fuel, the expected service life of the plant, and the degree of reliability to be achieved by the RCEC and the AWT plant.

10.2.1 Fuel Availability

The new dedicated gas supply pipeline to the RCEC will be connected to PG&E's line 153, about 1.1 miles east of the RCEC SITE. Line 153 is capable of delivering the required quantity of gas to the RCEC. It is conceivable that PG&E's transmission line or the new branch pipeline from the Line 153 to the RCEC could become temporarily inoperable if there is a breach in one of the lines or from other causes, resulting in fuel being unavailable at the RCEC. The RCEC facility has no backup fuel supply and would, therefore, have to be shut down until the situation was corrected.

10.2.2 Plant Availability

The RCEC will be a merchant facility and will therefore operate as dictated by contractual power supply obligations and the relative cost of power generation from the facility, rather than current market pricing for power. Due to the relatively high efficiency of the RCEC, it is anticipated that the facility will normally operate at a high average annual capacity. The RCEC will be designed to operate between approximately 50 and 100 percent of baseload to support sales to the power market. The RCEC will be designed for an operating life of 30 years. Reliability and availability projections are based on this operating life. O&M procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

The RCEC combined-cycle power block will consist of two natural gas-fired CTGs, two HRSGs with natural gas-fired duct burners, and one STG.

The combined-cycle power block is projected to operate between 50 and 100 percent of each year during each of the 30 years. The percentage of time that the combined-cycle power block is projected to operate is defined as the "service factor." The service factor considers the amount of time that a unit is operating and generating power, whether at full or partial load. The projected service factor for the combined-cycle power block, which considers projected percentage of time of operation, differs from the "equivalent availability factor" (EAF), which considers the projected percentage of energy production capacity achievable. EAF is defined as a weighted average of the percentage of full energy production capacity achievable. The projected EAF for the RCEC is estimated to be in the range of 92 to 98 percent. The EAF differs from the "availability of a unit," which is the percentage of time that a unit is available for operation, whether at full load or partial load or on standby.

There are no known geologic hazards other than the remote possibility of a major earthquake (see Section 8.4).

The RCEC and the AWT plant will be designed to ensure high reliability, including the redundancy of critical components (see Section 2.2.18.2, Redundancy of Critical Components).

Deterioration of output capacity and efficiency of the RCEC over time, called maturation, is expected to be on the order of 2 to 3 percent over a 3-year period. Cleaning, maintenance, or overhaul will recapture most of the loss. Over the expected 30-year life of the facility, the estimated total, nonrecovered loss in output and efficiency will be on the order of 1 to 2 percent.

10.3 EFFICIENCY

The maximum thermal efficiency that can be expected from a large natural gas-fired combined-cycle plant is approximately 55 percent. This level of efficiency is achieved when a facility is base-loaded. Other types of operations, particularly those at less than full gas turbine output, will result in lower efficiencies. Potential operating scenarios for the plant vary virtually continuous base-load operation during its early life to a very low facility capacity factor near the end of its operating life as new technologies displace today's best. The number of plant startup and shutdown cycles is expected to range between zero and over 300 per year per CTG. The actual number of hot startups and cold startups cannot be predicted at this time.

The RCEC's net annual electrical production cannot be forecast accurately at the present time because the plant will operate in a deregulated environment. The maximum annual generation possible from the facility is estimated to be between 4,500 and 4,850 gigawatt hours (GWh). The amount of power generated during plant startups and shutdowns can also only be estimated roughly. The range of startup/shutdown generation possible begins near zero megawatt hours (MWh) per year and increases to a maximum of 250 to 300 GWh per year.

10.4 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The LORS that are applicable to the design of the RCEC and AWT plant are referenced in Table 10.4-1 below. LORS applicable to the environmental areas of the AFC (sections 8.1 through 8.16) are contained within each of the environmental sections. The project will conform to all of these LORS.

The Appendices to Chapter 10 contain the discipline design criteria that will be used in design. Appendix 10-A and Appendix 10-B address the physical design criteria for the site-related features, structures, and foundations of the RCEC.

Table 10.4-1. Applicable laws, ordinances, regulations, and standards.

LORS	Location in AFC for Facility Design Compliance	Conformance
Federal:		
Occupational Safety and Health Act (OSHA)—29CFR1910 and 29CFR126	Section 10	Meet Requirements
Environmental Protection Agency (EPA)—40CFR60, 40CFR75, 40CFR112, 40CFR302, 40CFR423, 40CFR50, 40CFR100, 40CFR260, 40CFR300, and 40CFR400	Section 8 & 10	Meet Requirements
Federal Aviation Agency (FAA)—Obstruction Marking and Lighting AC No. 70/74601H	Section 5 & 10	Meet Requirements
California:		
California Code of Regulations (CCR)— Title 8, Sections 450 and 750 and Title 24, 1995, Titles 14, 17, 19, 20, 22, 23, and 26.	Section 10	Meet Requirements
California Department of Transportation (Cal-DOT)—Standard Specifications	Section 10	Meet Requirements

Table 10.4-1. (continued)

LORS	Location in AFC for Facility Design Compliance	Conformance
California Occupational Safety and Health Administration (Cal-OSHA)—Regulations and Standards	Section 10	Meet Requirement
California Business and Professions Code—Sections 6704, 5730, and 6736	Section 10	Meet Requirements
California Vehicle Code—Section 35780	Section 10	Meet Requirements
California Labor Code—Section 6500	Section 10	Meet Requirements
Local:		
City of Hayward—Regulations and Ordinances	Section 10	Meet Requirements
County of Alameda—Regulations and Ordinances	Section 10	Meet Requirements
Industrial:		
Civil Engineering Design Criteria	Appendix 10-A	Meet Design Criteria
Structural Engineering Design Criteria	Appendix 10-B	Meet Design Criteria
Mechanical Engineering Design Criteria	Appendix 10-C	Meet Design Criteria
Control Engineering Design Criteria	Appendix 10-E	Meet Design Criteria
Chemical Engineering Design Criteria	Appendix 10-F	Meet Design Criteria
Geologic and Foundation Design Criteria	Appendix 10-G	Meet Design Criteria

Appendices 10-C through 10-F provide the design criteria for the RCEC and AWT plant systems and equipment, including the codes and standards that apply to the design, materials, fabrication and erection of the systems and equipment. The project will also comply fully with these codes and standards.

Appendix 10-G, Geologic and Foundation Criteria, will be provided later and will include the results of the subsurface investigation, laboratory testing program, and preliminary geotechnical assessment of the RCEC. The preliminary foundation design considerations and criteria will be provided for the RCEC structures in Appendix 10-G when available.

10.5 INVOLVED AGENCIES AND AGENCY CONTACTS

Building Permits for the RCEC and the AWT plant would be issued by the Hayward Department of Community and Economic Development acting as a delegate CBO for CEC Compliance. A point of contact is provided in Table 10.4-2.

Table 10.4-2. Agency Contacts

Agency	Contact	Telephone
City of Hayward Department of Community and Economic Development	Dyana Anderly Planning Manager	(510) 583-4214

10.6 PERMITS AND PERMITTING SCHEDULE

A detailed schedule for submittal of all plans and specifications that require review by the local Chief Building Official (CBO) will be prepared well in advance of the start of construction of either the RCEC or the AWT plant.

Russell City Energy Center AFC

May 2001