Draft Environmental Impact Report for the Bay Area Air Quality Management District's Proposed Regulation 6, Rule 3 Wood-Burning Devices

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BAY AREA AIR QUALITY MANAGEMENT DISTRICT

DRAFT ENVIRONMENT IMPACT REPORT

PROPOSED REGULATION 6, RULE 3: WOOD-BURNING DEVICES

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The Bay Area Air Quality Management District (BAAQMD or District) was established in 1955 by the California Legislature to control air pollution in the counties around the San Francisco Bay and to attain federal air quality standards by the dates specified in federal law. There have been significant improvements in air quality in the Bay Area over the last several decades. The BAAQMD is also required to meet state standards by the earliest date achievable.

For the last several years the District has been refining the emission inventory for emissions from wood-burning devices, which are a significant source of particulate emissions, and attempting to reduce fine particulates from these devices. Considerable further reductions in emissions from wood-burning devices are available through the implementation of Regulation 6, Rule 3 (Reg 6-3): Particulate Matter and Visible Emissions from Woodburning Devices. The District is proposing to adopt this new rule to ensure these reductions are realized, and to encourage residences and businesses to operate wood-burning devices appropriately to ensure reductions in emissions.

This Environmental Impact Report (EIR) addresses the impacts due to implementation of the Bay Area Air Quality Management District Regulation 6, Rule 3, Woodburning Devices. The District is also proposing to amend District Regulation 1: General Provisions and Definitions, to remove the existing exclusion of residential fires from regulation; and Regulation 5: Open Burning, to require a provision for outdoor recreational fires similar to that proposed in Reg 6-3.

1.1.1 CALIFORNIA ENVIRONMENTAL QUALITY ACT

The California Environmental Quality Act (CEQA), Public Resources Code Section 21000 et seq., requires that the potential environmental impacts of proposed projects be evaluated and that feasible methods to reduce or avoid identified significant adverse environmental impacts of these projects be identified.

To fulfill the purpose and intent of CEQA, the BAAQMD has prepared this EIR under the requirements of CEQA Guidelines §15187 to address the potential environmental impacts associated with the proposed Regulation 6, Rule 3. Amendments to several other District rules are also proposed in order to allow regulation of this type of source and to maintain consistency with Regulation 6, Rule 3 for similar types of sources. Prior to making a decision on the adoption of the new wood-burning device rule, the BAAQMD Governing Board must review and certify the EIR as providing adequate information on the potential adverse environmental impacts of implementing the proposed Rule.

1.1.2 NOTICE OF PREPARATION AND INITIAL STUDY

A Notice of Preparation and Initial Study (NOP/IS) for the adoption of District Regulation 6, Rule 3 (included as Appendix A of this EIR) was distributed to responsible

agencies and interested parties for a 30-day review on March 10, 2008. A notice of the availability of this document was distributed to other agencies and organizations and was placed on the BAAQMD's web site, and was also published in newspapers throughout the area of the BAAQMD's jurisdiction.

The NOP/IS identified the following environmental resources as being potentially significant, requiring further analysis in the EIR: air quality. The following environmental resources were considered to be less than significant in the NOP/IS: aesthetics, agricultural resources, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and traffic, and utilities service systems (see Appendix A).

1.1.3 TYPE OF EIR

In accordance with §15121(a) of the State CEQA Guidelines (California Administrative Code, Title 14, Division 6, Chapter 3), the purpose of an EIR is to serve as an informational document that: "will inform public agency decision-makers and the public generally of the significant environmental effect of a project, identify possible ways to minimize the significant effects, and describe reasonable alternatives to the project."

The EIR is an informational document for use by decision-makers, public agencies and the general public. The proposed project requires discretionary approval and, therefore, it is subject to the requirements of CEQA (Public Resources Code, §21000 et seq.).

The focus of this EIR is to address the environmental impacts of the proposed project as identified in the NOP and Initial Study (included as Appendix A of this EIR). The degree of specificity required in an EIR corresponds to the degree of specificity involved in the underlying activity described in the EIR (CEQA Guidelines §15146). Because the level of information regarding potential impacts from the adoption of Regulation 6, Rule 3, is relatively general at this time, the environmental impact forecasts are also general or qualitative in nature.

1.1.4 INTENDED USES OF THIS DOCUMENT

In general, a CEQA document is an informational document that informs a public agency's decision-makers, and the public generally, of potentially significant adverse environmental effects of a project, identifies possible ways to avoid or minimize the significant effects, and describes reasonable alternatives to the project (CEQA Guidelines §15121). A public agency's decision-makers must consider the information in a CEQA document prior to making a decision on the project. Accordingly, this EIR is intended to: (a) provide the BAAQMD Governing Board and the public with information on the environmental effects of the proposed project; and, (b) be used as a tool by the BAAQMD Governing Board to facilitate decision making on the proposed project.

Additionally, CEQA Guidelines §15124(d)(1) require a public agency to identify the following specific types of intended uses of a CEQA document:

1. A list of the agencies that are expected to use the EIR in their decision-making;

2. A list of permits and other approvals required to implement the project; and

3. A list of related environmental review and consultation requirements required by federal, state, or local laws, regulations, or policies.

Other local public agencies, such as cities, county planning commissions, etc., may use the EIR for the purpose of developing projects consistent with Regulation 6, Rule 3 if local building permits are required. No other permits will be required by single purpose public agencies.

1.1.5 AREAS OF CONTROVERSY

In accordance to CEQA Guidelines §15123(b)(2), the areas of controversy known to the lead agency including issues raised by agencies and the public shall be identified in the EIR. Several areas of controversy have been expressed during public workshops or in the letter received on the NOP.

Concerns that the rule could create extra fuel load for wildland fires were raised during public meetings. No increase in hazards related to wildfires is anticipated from the proposed rule which would apply to existing structures utilizing compliant wood-burning devices. The proposed rule will not create new residential or commercial land use projects. Any new development that might occur in the District would occur for reasons other than the proposed rule. New land use projects would require a CEQA analysis that would evaluate wildfire risks. Mitigation measures would be required to reduce impacts to the maximum extent feasible if the analysis determined such risks to be significant. Proposed Rule 6-3 is not expected to reduce the amount of brush cleared in wildfire hazard areas as the brush clearing is generally required for compliance with fire codes. The burning of brush in wood burning devices under proposed Rule 6-3 could still be accomplished, as long as the brush is seasoned and not burned on curtailment days. The proposed rule does not prevent the California Department of Forestry and Fire Protection (CAL FIRE) or fire districts from conducting controlled burns on non-curtailment days. CAL FIRE is subject to the limitations in Regulation 5: Open Burning. The only change to Regulation 5 would limit recreational fires on curtailment days. Curtailment days only occur about 20 days a year so burning would be allowed on most days (about 345) of the year. In addition, wood can be disposed of in other manners other than burning, such as mulching or chipping. Most wood brush from private property that would be burned is seasoned before burning to produce a desirable (hot) fire. As Rule 6-3 would only provide minor and sporadic delays in burning, no significant impacts are expected.

There is some uncertainty in the appropriate analysis of greenhouse gas emissions from the burning of wood and the comparison to the combustion of natural gas. To respond to this uncertainty, emission estimates for greenhouse gases are evaluated using several different methodologies.

1.1.6 PROJECT OBJECTIVES

CEQA Guidelines §15124(b) requires an EIR to include a statement of objectives, which describes the underlying purpose of the proposed project. The purpose of the statement of objectives is to aid the lead agency in identifying alternatives and the decision-makers in preparing a statement of findings and a statement of overriding considerations, if necessary. The objectives of the proposed Regulation 6, Rule 3 are summarized in the following bullet points.

- reduce particulate matter and visible emissions from wood-burning devices in order to reduce ambient levels of particulate matter in the Bay Area;
- reduce wintertime peak concentrations to attain the federal particulate matter less than 2.5 microns in diameter (PM2.5) standard; and
- further reduce emissions of particulate matter to comply with the State particulate matter less than 10 microns in diameter (PM10) and PM2.5 standards.

1.1.7 DOCUMENT FORMAT

State CEQA Guidelines outline the information required in an EIR, but allow the format of the document to vary [CEQA Guidelines §15120(a)]. The information in the EIR complies with CEQA Guidelines §15122 through §15131 and consists of the following:

Chapter 1: Introduction

Chapter 2: Project Description

Chapter 3: Environmental Setting, Impacts and Mitigation Measures

Chapter 4: Alternatives

Chapter 5: Other CEQA Topics

Chapter 6: References

Chapter 7: Acronyms

Appendix A: Notice of Preparation/Initial Study

1.2 EXECUTIVE SUMMARY OF DRAFT EIR

1.2.1 EXECUTIVE SUMMARY – CHAPTER 2: PROJECT DESCRIPTION

Regulation 6, Particulate Matter and Visible Emissions, Rule 3, Wood-Burning Devices is a proposed new rule initiated by the District's Particulate Matter Implementation Schedule. It is intended to reduce emissions from wood-burning devices in residences and businesses by curtailing burning during specific periods and regulating fuels and materials to be used in wood-burning devices.

A wood-burning device is any indoor wood-burning stove or insert, pellet-fueled device, conventional fireplace and/or any indoor permanently-installed device burning solid-fuel for aesthetic or space-heating purposes in structures for residential or commercial use. Proposed Rule 6-3 for control of wood-burning devices would:

- Curtail operation of any wood-burning device during periods forecast to negatively impact public heath due to PM2.5 levels.
- Establish limitations on visible emissions from wood burning.
- Establish criteria for the sale, transfer or installation of wood-burning devices.
- Establish criteria for the installation of wood-burning devices in new building construction.
- Prohibit the burning of garbage and certain types of materials.
- Establish requirements for the sale of wood products for use in wood burning devices.
- The proposal to amend Regulation 5, Open Burning, would create only a limited exemption for outdoor fires set for recreational purposes which would require curtailment during periods forecast to negatively impact public heath due to PM2.5 levels.
- The proposal to amend Regulation 1, General Provisions and Definitions, would remove the language "residential heating" to allow for the regulation of indoor wood-burning devices.

1.2.2 EXECUTIVE SUMMARY – CHAPTER 3: ENVIRONMENTAL SETTINGS, IMPACTS AND MITIGATION MEASURES

1.2.2.1 Air Quality

Environmental Setting

It is the responsibility of the BAAQMD to ensure that state and federal ambient air quality standards are achieved and maintained in its geographical jurisdiction. Health-based air quality standards have been established by California and the federal

government for the following criteria air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter less than 10 microns in diameter (PM10), particulate matter less than 2.5 microns in diameter (PM2.5), sulfur dioxide (SO_2) and lead. These standards were established to protect sensitive receptors with a margin of safety from adverse health impacts due to exposure to air pollution.

Air quality conditions in the San Francisco Bay Area have improved since the Air District was created in 1955. Ambient concentrations of air pollutants and the number of days on which the region exceeds air quality standards have fallen dramatically. The Air District is in attainment of the State and federal ambient air quality standards for CO, nitrogen oxides (NOx), and sulfur dioxides (SO_2). The Air District is not considered to be in attainment with the State PM10 and PM2.5 standards. The Bay Area is designated as a marginal non-attainment area for the federal 8-hour ozone standard and as a serious non-attainment area for the California 1-hour ozone standard. The District has been designated as non-attainment for the new State 8-hour standard.

Wood-burning devices generate particulate matter. Combustion of wood also creates carbon dioxide, water vapor, carbon monoxide and volatile organic compounds, including toxic compounds. Partial or incomplete combustion, or burning wood that is not seasoned and dry, or burning garbage or other materials, generates more particulate matter, carbon monoxide, and increases toxic compounds. Residential wood combustion is an important contributor to ambient fine particle levels in the United States.

To estimate the amount of particulate matter coming from wood-burning devices, including fireplaces, District staff used data from survey sample results from Bay Area residents. These results were then correlated with projected demographic trends from the Association of Bay Area Governments (ABAG), which were based on U.S. Census data, and used to arrive at the estimated number of devices. The total annual emissions from both wood stoves (1,657 tons per year (tpy)) and fireplaces (5,037 tpy) is estimated to be 6,694 tpy of PM10. The total annual emissions from both wood stoves (1,591 tpy) and fireplaces (4,836 tpy) is estimated to be 6,427 tpy of PM2.5.

Environmental Impacts

Proposed Rule 6-3 would not generate any new construction. Rule 6-3 proposes that new or used wood stoves sold or installed in the Bay Area would be required to meet EPA Phase II standards for wood burning devices. In addition, new commercial and residential buildings would not be allowed to be constructed with wood burning devices that are not Phase II, pellet or equivalent devices. Natural gas-burning fireplaces or conventional fireplaces with natural gas inserts would be allowed. Therefore, Rule 6-3 is not expected to require or generate additional construction activities or additional construction emissions.

Operational Emission Impacts: The overall objective of the proposed project is to reduce PM10 and PM2.5 emissions from wood burning devices. The operational PM10 and PM2.5 emission reductions were estimated according to the methodology developed

in the Staff Report (BAAQMD, 2007). The overall emission reductions are expected to be in the range of 263 to 917 tpy of PM10 and 254 to 887 tpy of PM2.5, providing an overall beneficial impact on air quality.

Since Rule 6-3 compliant wood burning devices are more efficient, requiring the sale, transfer and installation of only EPA Phase II certified, pellet or equivalent devices would reduce the amount of air toxics emitted. Natural gas is a cleaner burning fuel than wood; therefore, the installation or replacement of pre-EPA approved devices with natural gas appliances would reduce toxic emissions. Therefore, Rule 6-3 is expected to provide beneficial impacts on toxic air contaminants and related beneficial health impacts.

Cumulative Impacts

Criteria and Toxic Air Contaminants: Cumulative air quality impacts on criteria and toxic air contaminants due to implementation of proposed Rule 6-3 and all air pollution control rules currently being developed, considered together, are not expected to be significant because implementation of all control measures is expected to result in net emission reductions and overall air quality improvement. Implementation of Rule 6-3 will result in reductions in emissions of PM10, PM2.5, and toxic air contaminants, providing a cumulative air quality and public health benefit. Therefore, no significant adverse cumulative air quality impacts related to criteria and toxic air contaminants are expected.

Greenhouse Gases: Global climate change refers to changes in average climatic conditions on the earth as a whole, including temperature, wind patterns, precipitation and storms. Global warming, a related concept, is the observed increase in average temperature of the earth's surface and atmosphere. One identified cause of global warming is an increase of Greenhouse Gases (GHG) in the atmosphere.

Events and activities, such as the industrial revolution and the increased combustion of fossil fuels (e.g., gasoline, diesel, coal, etc.), have heavily contributed to the increase in atmospheric levels of GHG. As reported by the CEC, California contributes 1.4 percent of the global and 6.2 percent of the national GHG emissions. Approximately 80 percent of GHG in California are from fossil fuel combustion and over 70 percent of GHG emissions are carbon dioxide emissions.

Depending on the assumptions used and whether or not direct emissions or life cycle emissions are estimated, there is a wide variability in terms of the potential GHG emissions resulting from implementing Rule 6-3. Based on the best available studies and available information about firewood used in the Bay Area, the imposition of a curtailment requirement on some days during the winter season is not expected to result in an increase in GHG emissions.

1.2.3 EXECUTIVE SUMMARY – CHAPTER 4: ALTERNATIVES

An EIR is required to describe a reasonable range of feasible alternatives to the proposed project that could feasibly attain most of the basic project objectives and would avoid or substantially lessen any of the significant environmental impacts of the proposed project (CEQA Guidelines §15126.6(a)). As discussed in Chapter 3 of this EIR and the Initial Study (see Appendix A), the proposed new rule is not expected to result in significant impacts to any environmental resources including aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and traffic, and utilities service systems. Because no significant impacts have been identified for the proposed project, alternatives are not required to be analyzed in this EIR. The requirement to develop alternatives under CEQA Guidelines §15126.6 has been satisfied because no significant adverse impacts were identified for the proposed project. No further discussion of alternatives is required for this EIR.

1.2.4 EXECUTIVE SUMMARY – CHAPTER 5: OTHER CEQA TOPICS

1.2.4.1 Relationship Between Short-term Uses and Long-Term Productivity

Implementing Rule 6-3 is not expected to achieve short-term goals at the expense of long-term environmental productivity or goal achievement. Of the potential environmental impacts discussed in Chapter 3, no significant adverse impacts were identified. The purpose of the proposed rule is to reduce emissions of particulate matter and visible emissions (as well as toxic air contaminants and other criteria pollutants), particularly on winter nights when particulate matter concentrations could exceed the national health-based air quality standard for PM10 and PM2.5. By reducing particulate matter and visible emissions, human exposure to air pollutants would also be reduced, providing long-term health benefits. Therefore, no short-term benefits at the expense of long-term impacts have been identified due to implementation of the proposed rule.

Because no short-term environmental benefits are expected at the expense of long-term environmental goals being achieved, there is no justification for delaying the proposed action. The proposed project should be implemented now as the District is required to make progress toward attaining state and federal particulate matter standards, and has identified it as a control measure in accordance with requirements of Senate Bill 656 (SB 656, Sher).

1.2.4.2 Significant Irreversible Environmental Changes

Implementation of the proposed rule is not expected to result in significant irreversible adverse environmental changes. Of the potential environmental impacts discussed in Chapter 3, no significant impacts to any environmental resource are expected. Cumulative air quality impacts are expected to be less than significant as implementation of the proposed rule will result in overall emission reductions of PM10 and PM2.5, as

well as TACs, other criteria pollutants, and GHG. Proposed Rule 6-3 is expected to result in long-term benefits associated with improved air quality even though the use of natural gas in the Bay Area may increase. The project would result in reduced emissions, thereby improving air quality and related public health.

1.2.4.3 Growth-Inducing Impacts

Growth-inducing impacts can generally be characterized in three ways: (1) a project includes sufficient urban infrastructure to result in development pressure being placed on less developed adjacent areas; (2) a large project affects the surrounding community by producing a "multiplier effect," which results in additional community growth; and (3) a new type of development is allowed in an area, which subsequently establishes a precedent for additional development of a similar character. None of the above scenarios characterize the project evaluated in the EIR since it will control emissions from wood-burning devices.

1.2.5 EXECUTIVE SUMMARY – CHAPTERS 6 AND 7: REFERENCES AND ACRONYMS

Information on references cited (including organizations and persons consulted) and the acronyms are presented in Chapters 6 and 7, respectively.

CHAPTER 2

PROJECT DESCRIPTION

Introduction
Project Location
Background
Project Objective
Proposed Project

2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION

Regulation 6, Particulate Matter and Visible Emissions, Rule 3, Wood-Burning Devices is a proposed new rule initiated by the Bay Area Air Quality Management District (BAAQMD) and is included as part of the District's Particulate Matter Implementation Schedule. The purpose of the rule is to limit emissions of particulate matter and visible emissions from wood-burning devices as part of an overall wood smoke reduction program within the jurisdiction of the BAAQMD. Minor changes in current Regulation 1 and Regulation 5 are required as they are necessary to accomplish the associated reductions.

Particulate matter consists of very small liquid and solid particles suspended in the air, and includes particulate matter less than 10 microns equivalent aerodynamic diameter (PM10) as well as finer particulate matter less than 2.5 microns equivalent aerodynamic diameter (PM2.5). Particulate matter is of concern because it can cause serious health effects. People with respiratory illnesses, children, and the elderly are more sensitive to the effects of particulate matter, but it can affect everyone.

The Bay Area experiences its highest particulate matter concentrations in the winter, especially during the evening and night time hours. Wood-burning is the single greatest source contributing to the particulate matter concentrations, based on chemical composition analysis of deposited airborne particulate matter. Emissions calculations indicate wood smoke contributes only about 10 percent of total particulate matter emissions on an annual basis, but approximately 30 percent of total wintertime PM2.5.

During recent winters, the Bay Area Air District exceeded the 24-hour PM2.5 National Ambient Air Quality Standard (NAAQS) 20 to 30 days. The BAAQMD staff anticipates a non-attainment designation for this newly revised standard. The emission limitations in this proposed rule are intended to address this expected non-attainment status and reduce the health impacts of particulate matter in the Bay Area. Reductions in wood smoke emissions will be necessary to achieve clean air on a district-wide basis.

The proposed rule would reduce wintertime PM2.5 levels by curtailing wintertime wood-burning emissions from wood-burning devices, including fireplaces, and achieve additional reductions by requiring cleaner burning technologies in new construction. In addition, non-wintertime burning will be improved by requiring appropriate fuel with low-moisture content be used throughout the year in wood-burning devices. Currently, there is no Air District rule which directly limits emissions from wood-burning devices. Air District Regulation 1 has historically excluded regulation of any fires associated with residential heating and will be amended to remove this exclusion. An amendment to existing Regulation 5, Open Burning, will remove an exemption for outdoor fires set for recreational purposes and create a similar requirement to curtail wintertime wood burning outdoors as well as indoors when air quality conditions dictate.

A wood-burning device is any indoor wood-burning stove or insert, pellet-fueled device, conventional fireplace and/or any indoor permanently-installed device burning solid-fuel for aesthetic or space-heating purposes in structures for residential or commercial use. The proposal for wood-burning devices would:

- Curtail operation of any wood-burning device during periods forecast to negatively impact public heath due to PM2.5 levels;
- Establish limitations on visible emissions from wood burning;
- Establish criteria for the sale, transfer or installation of wood-burning devices;
- Establish criteria for the installation of wood-burning devices in new building construction;
- Prohibit the burning of garbage and certain types of materials;
- Establish requirements for the sale of wood products for use in wood burning devices.
- The proposal to amend Regulation 5, Open Burning, would create only a limited exemption for outdoor fires set for recreational purposes which would require curtailment during periods forecast to negatively impact public heath due to PM2.5 levels in ambient air.
- The proposal to amend Regulation 1, General Provisions and Definitions, would remove the language “residential heating” to allow for the regulation of indoor wood-burning devices.

2.2 PROJECT LOCATION

The BAAQMD has jurisdiction of an area encompassing 5,600 square miles. The Air District includes all of Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, and Napa Counties, and portions of southwestern Solano and southern Sonoma counties. The San Francisco Bay Area is characterized by a large, shallow basin surrounded by coastal mountain ranges tapering into sheltered inland valleys. The combined climatic and topographic factors result in increased potential for the accumulation of air pollutants in the inland valleys and reduced potential for buildup of air pollutants along the coast. The Basin is bounded by the Pacific Ocean to the west and includes complex terrain consisting of coastal mountain ranges, inland valleys and bays (see Figure 2-1).

2.3 BACKGROUND

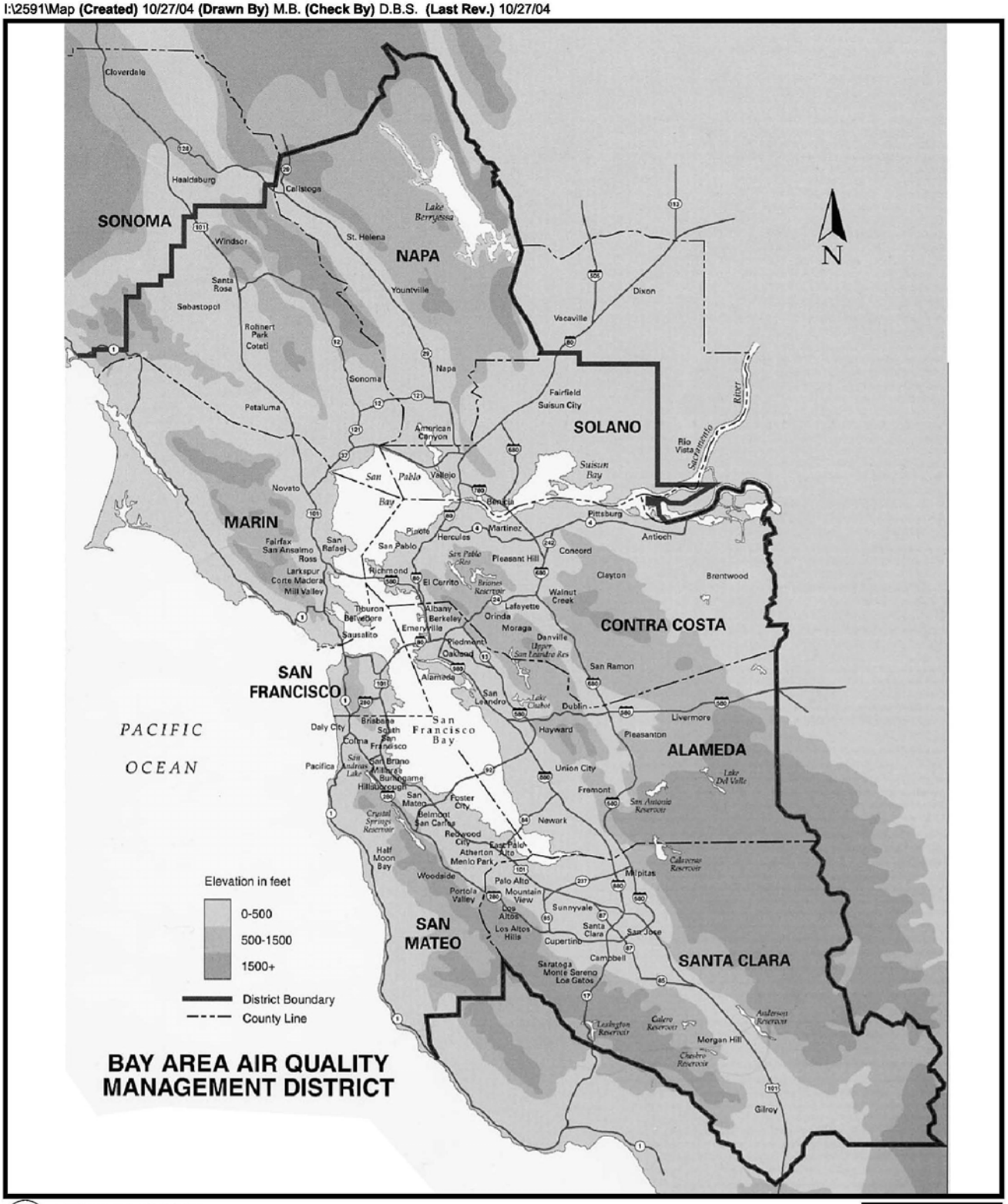
The Bay Area Air Quality Management District (BAAQMD) is proposing adoption of Regulation 6, Particulate Matter and Visible Emissions, Rule 3 Wood-Burning Devices (Rule 6-3). This proposed rule would control air pollution from wood-burning stoves, fireplaces and heaters, including wood pellet stoves. The BAAQMD proposes adoption of Rule 6-3 to reduce emissions of particulate matter and visible emissions, particularly on winter nights when particulate matter concentrations could exceed the national health-based air quality standard for fine particulate matter, or particulate matter of 2.5 microns diameter or less (PM2.5). The national 24-hour standard for fine particulate matter in ambient air was lowered from 65 micrograms/cubic meter ($\mu g/m^3$), to 35 $\mu g/m^3$, in December 2006.

Currently, fireplaces and wood stoves used to heat residences are exempt from District rules by Regulation 1, Section 110.4. However, from time to time the District receives complaints about residential wood-burning devices, such as excessive smoke and odor. The District's regulations of general applicability, such as Regulation 6 - Particulate Matter and Visible Emissions, and Regulation 7 - Odorous Substances, and the public nuisance standard in Regulation 1 do not apply. District inspectors respond to such complaints with informational literature advising residents of the dangers of particulate matter and how to burn with a minimum of smoke.

The District also has a voluntary program to minimize particulate matter emissions from wood-burning devices, called Spare the Air Tonight (STAT). The STAT program asks residents, via e-mail, the District website and press releases to radio and TV, not to burn during predicted excesses of the 35 $\mu g/m^3$ standard for PM2.5 in ambient air. The STAT season runs from mid-November through mid-February, and has been active since 1991. Typically, there are between 20 and 30 STAT nights, however, during the 2007-2008 season, there were only six. The District has averaged 17 STAT nights in the past five years. During the STAT season, the District follows up with surveys to determine the amount of success of the voluntary program and public attitudes and behaviors associated with wood burning.

In addition, the District has promoted a model ordinance to cities and counties that contains various elements that can reduce particulate matter from wood smoke. The ordinance serves as a template or guidance document for cities and counties that wish to regulate sources of particulate matter in their communities. The model ordinance does not ban wood burning in fireplaces but seeks to take advantage of new, cleaner technologies that have been developed to effectively reduce wood smoke pollution. The model ordinance includes options for mandatory burning curtailments on STAT nights, a requirement that new or re-modeled homes contain only EPA Phase II certified devices, a prohibition on gas to wood heating conversion and limitations on fuel that can be burned.

I:\2591\Map **(Created)** 10/27/04 **(Drawn By)** M.B. **(Check By)** D.B.S. **(Last Rev.)** 10/27/04



Environmental Audit, Inc.

NOT TO SCALE

LOCATION OF BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Figure 2-1

When a city or a county adopts all or only parts of the model wood smoke ordinance, enforcement typically takes place through the permit process at local building departments. The ordinance requires residents to provide documentation that the device to be installed is allowed by the ordinance. To date, 41 Bay Area cities and eight counties have adopted aspects of this model ordinance, including a mix of voluntary and mandatory standards.

Finally, the District co-sponsored and managed a financial incentive, or "wood stove change-out", program in Santa Clara County as part of an air quality mitigation program required by the California Energy Commission. Rebates were offered to residents to upgrade to cleaner burning wood-burning devices. The District's Cleaner Burning Technology Incentives Program offered a similar District-wide incentive program in 2008.

Wood stoves are wood-burning devices that are enclosed to control combustion. EPA-certified stoves employ either a catalytic or non-catalytic system to increase combustion of the exhaust stream. These units are either stand alone or installed into a building's walls. A wood-burning insert can be placed in either a new or an existing fireplace.

Some EPA-certified stoves utilize a catalyst to reduce the ignition temperature of volatile gases resulting from wood combustion. A catalyst in a stove is a ceramic honey-combed combustor that is coated with a noble metal, such as platinum or palladium. These types of stoves require maintenance and eventually catalyst replacement during the lifetime of the stove in order to operate properly. The EPA Phase II certification emission limit for catalytic stoves is 4.1 grams per hour (g/hr).

Non-catalytic stoves, on the other hand, achieve low-emission, cleaner burning by decreasing the firebox size, increasing turbulence (mixing) within the firebox, and adding baffles as well as secondary burn tubes to combust emission gases. These stoves still require maintenance to operate effectively, but do not have a catalyst to replace. The EPA certification emission limit for non-catalytic stoves is 7.5 g/hr.

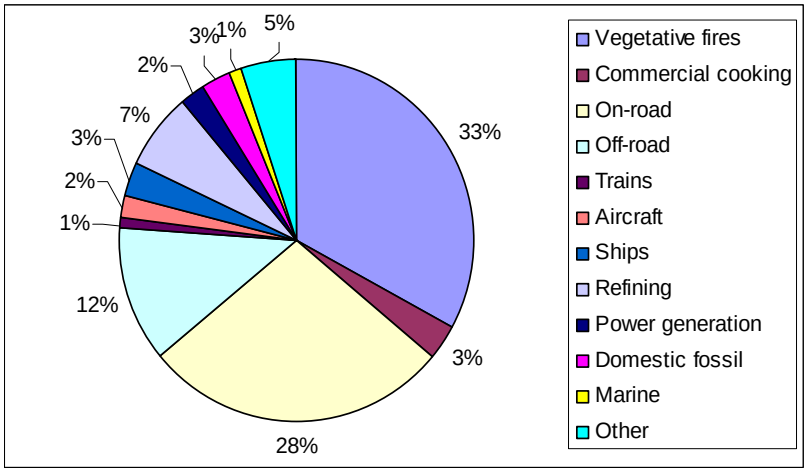
Pellet stoves were developed during the 1970's to develop alternatives to fossil fuel. These devices burn pellets very cleanly and do not require EPA certification, although many manufacturers have the devices certified by the EPA. Pellet stoves burn wood that has been compressed into pellet form for combustion and easy storage. Some pellet stoves burn products other than wood, such as wheat or corn. In addition to the need to be vented to the outside of the structure, pellet stoves require electricity to operate in order to utilize active air and fuel management systems to control combustion efficiency. Some pellet stoves cannot meet the EPA certification requirements due to excessive air-to-fuel ratios. These stoves, however, are efficient and clean burning.

A masonry heater is a site-built, or site-assembled, solid-fueled heating device consisting of a firebox, a large masonry mass, and a maze of heat exchange channels. While a masonry heater may look like a fireplace, it operates differently. It stores heat from a rapidly burning fire within its masonry structure, and slowly releases the heat over time.

These devices currently do not require EPA-certification.

Wood-burning devices generate particulate matter. Combustion of wood also creates carbon dioxide, water vapor, carbon monoxide and volatile organic compounds, including toxic compounds. Partial or incomplete combustion, or burning wood that is not seasoned and dry, or burning garbage or other materials generates more particulate matter, carbon monoxide, and increases toxic compounds.

Residential wood combustion is an important contributor to ambient fine particle levels in the United States. District staff has identified wood smoke as the single greatest contributor on wintertime peak days (33 percent) to PM2.5 in the Bay Area, as shown in Figure 2-2.



Note: Smoke from residential wood burning constitutes nearly all of the vegetative fires category during peak periods. The other major contributors, agricultural and wildland management burns, are prohibited under District Regulation 5 during "no-burn" days, when peak concentrations occur.

FIGURE 2-2: PM2.5 Concentration on Peak Days by Constituent in the Bay Area.

Other studies find results and trends that support emission inventory estimates derived from the District data. The California Air Resources Board (CARB) found (Magliano, 1999) that residential wood combustion makes up 20 percent to 35 percent of wintertime particulate matter.

To estimate the amount of particulate matter coming from wood-burning devices, including fireplaces, District staff used data from survey sample results from Bay Area residents. These results were then correlated with projected demographic trends from the Association of Bay Area Governments (ABAG), which were based on U.S. Census data, and used to arrive at the estimated number of devices. These data, along with an annual through-put (fuel load), also derived from survey results, and an emission factor were then used to generate a particulate matter 10 microns and below in diameter (PM10) estimate for each county in the Bay Area. Wood stoves and fireplaces are expected to generate 1,657 tons per year (tpy) and 5,037 tpy of PM10 emissions, respectively. Wood stoves and fireplaces are expected to generate 1,591 tpy and 4,836 tpy of PM2.5 emissions, respectively (see Chapter 3 for further details). Because the category of

PM10 also includes PM2.5, a large portion of PM10 particles are also PM2.5 particles. Therefore, the majority of particulate matter from wood smoke are fine particles. It is these fine particles that are of greatest concern to public health.

2.4 PROJECT OBJECTIVES

The objective of Rule 6-3 is to reduce particulate matter and visible emissions from wood-burning devices in order to reduce ambient levels of particulate matter in the Bay Area, and to reduce wintertime peak concentrations to attain the federal PM2.5 standard. The Bay Area is also not in attainment with the State particulate matter standards, so further reductions in emissions of particulate matter are needed.

The Bay Area attains the federal annual PM10 standard, but is not in attainment of the California annual PM10 or PM2.5 or the California 24-hour PM10 standard. The Bay Area is unclassified for the federal 24-hour PM10 and new 24-hour PM2.5 standard.

2.5 PROPOSED PROJECT

This section presents the proposed Regulation 6, Rule 3 components to reduce particulate matter and visible emissions from wood-burning devices in order to reduce ambient levels of particulate matter in the Bay Area, and to reduce wintertime peak concentrations to attain the federal PM2.5 standard.

Visible Emissions: Rule 6-3 proposes to limit visible emissions from wood-burning devices, except six minutes during any one-hour period, to 20 percent visible emissions (equivalent to 1 on a Ringelmann Scale). This opacity limit would not apply during a 20-minute start-up period for any wood fire. This opacity standard is similar to that required of other District operations from stationary sources, including dust from construction sites and any other regulated sources (20 percent visible emissions except for three minutes in any one-hour period). Failure to meet a visible emissions standard is indicative of poor ventilation to a fire, or poorly seasoned or wet wood. Based on District inspection staff observations, this standard is not difficult to meet for properly maintained and operated wood burning devices.

Prohibit Burning of Garbage: Rule 6-3 proposes to prohibit the burning of garbage, treated wood, non-seasoned wood, used or contaminated wood pallets, plastic products, rubber products, waste petroleum products, paints and paint solvents, coal, animal carcasses, glossy and/or colored paper, salt water driftwood, particle board, and any material not intended by a manufacturer for use as a fuel in a wood-burning device at any time. These materials produce volatile organic compounds (VOCs), particulate matter and toxic compounds.

Labeling: Rule 6-3 proposes to require a label be placed on firewood for sale, including manufactured wood products such as artificial logs and wood pellets. The label would warn consumers about the health impacts from burning wood and where to find out if burning is prohibited. Unseasoned wood (moisture content of greater than 20 percent)

would be required to be labeled as such and contain a notification that burning unseasoned wood is not allowed and provide instructions for seasoning.

Seasoned wood: Rule 6-3 proposes to require that seasoned firewood must have a moisture content of 20 percent or less. Only seasoned wood can be burned in a wood-burning device. Unseasoned firewood may be sold, but must include a warning that it is not legal to burn before seasoning and instructions must be provided for seasoning.

Sale, transfer or installation: Federal law already requires newly manufactured wood stoves to meet EPA Phase II certification standards. Rule 6-3 proposes to require that wood stoves sold, transferred or installed in the District to meet these standards. Stoves sold as part of a house or other real estate transaction would not be affected by this prohibition.

New Construction: Rule 6-3 proposes to allow only EPA certified wood-burning devices or pellet stoves or equivalent devices in new construction. This would prohibit conventional wood-burning fireplaces in new housing developments.

Burning Curtailment: Rule 6-3 proposes to limit the ability to burn on STAT nights, defined as a night when the particulate matter is forecast to exceed the 24-hour National Ambient Air Quality Standard of 35 $\mu g/m^3$. An exemption would be provided if wood burning was the sole source of heat for a home.

CHAPTER 3

ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

Introduction
Air Quality

3.0 ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

3.1 INTRODUCTION

A NOP/IS was prepared for Regulation 6: Particulate Matter and Visible Emissions, Rule 3: Wood-Burning Devices and Amendment of Regulation 5: Open Burning and Regulation 1: General Provisions and Definitions on March 10, 2008 (see Appendix A). The NOP/IS identified air quality as the environmental resource to be potentially significant, requiring further analysis in the EIR. The following environmental resources were considered to be less than significant and will not be further evaluated: aesthetics, agricultural resources, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and traffic, and utilities service systems.

The environmental resource section is organized into the following subsections: (1) Environmental Setting; (2) Thresholds of Significance; (3) Environmental Impacts; and (4) Mitigation Measures. A description of each subsection follows.

3.1.1 Environmental Setting

CEQA Guidelines §15125 requires that an EIR include a description of the physical environmental conditions in the vicinity of the proposed project as they exist at the time the NOP/IS is published, or if no NOP/IS is published, at the time the environmental analysis is commenced, from both a local and regional perspective. This Chapter describes the existing environment in the Bay Area as they exist at the time the NOP/IS was prepared (March 2008). The environmental topics identified in this Chapter include both a regional and local setting. The analysis included in this chapter focus on those aspects of the environmental resource areas that could be adversely affected by the implementation of the proposed project (implementation of Regulation 6, Rule 3 and amendment of Regulations 5 and 1) as determined in the NOP/IS (see Appendix A), and not those environmental resource areas determined to have no potential adverse impact from the proposed project.

3.1.2 Thresholds of Significance

This section identifies the criteria used to determine when physical changes to the environment created as a result of the project approval would be considered significant. The levels of significance for each environmental resource were established by identifying significance criteria. These criteria are based upon those presented in the California Environmental Quality Act (CEQA) environmental checklist and the BAAQMD's CEQA Guidelines (BAAQMD, 1999).

The significance determination under each impact analysis is made by comparing the proposed project impacts with the conditions in the environmental setting and comparing the difference to the significance criteria.

3.1.3 Environmental Impacts

The potential impacts associated with each discipline are either quantitatively analyzed where possible or qualitatively analyzed where data were insufficient to quantify impacts. The impacts are compared to the significance criteria to determine the level of significance.

The impact sections of this chapter focus on those impacts that are considered potentially significant per the requirements of the California Environmental Quality Act. An impact is considered significant if it leads to a "substantial, or potentially substantial, adverse change in the environment." Impacts from the project fall within one of the following categories:

Beneficial – Impacts will have a positive effect on the resource.

No Impact: There would be no impact to the identified resource as a result of the project.

Less Than Significant: Some impacts may result from the project; however, they are judged to be less than significant. Impacts are frequently considered less than significant when the changes are minor relative to the size of the available resource base or would not change an existing resource. A “less than significant impact” applies where the environmental impact does not exceed the significance threshold.

Potentially Significant But Mitigation Measures Can Reduce Impacts to Less Than Significant: Significant adverse impacts may occur; however, with proper mitigation, the impacts can be reduced to less than significant.

Potentially Significant or Significant Impacts: Adverse impacts may occur that would be significant even after mitigation measures have been applied to minimize their severity. A “potentially significant or significant impacts” applies where the environmental impact exceeds the significance threshold, or information was lacking to make a finding of insignificance.

3.1.4 Mitigation Measures

This section describes feasible mitigation measures that could minimize potentially significant or significant impacts that may result from project approval. CEQA Guidelines (§15370) defines mitigation to include:

- Avoiding the impact altogether by not taking a certain action or parts of an action.

- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating or restoring the impacted environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

In accordance with CEQA statutes (§21081.6), a mitigation and monitoring program would be required to be adopted to demonstrate and monitor compliance with any mitigation measures identified in this EIR. The program would identify specific mitigation measures to be undertaken, when the measure would be implemented, and the agency responsible for oversight, implementation and enforcement.

3.2 AIR QUALITY

3.2.1 ENVIRONMENTAL SETTING

The NOP/IS (see Appendix A) determined the air quality impacts of proposed Rule 6-3 as having the potential for significant adverse impacts. Project-specific and cumulative adverse air quality impacts associated with increased emissions of air contaminants (criteria air pollutants; toxic air contaminants, TACs; and greenhouse gas emissions, GHG) have been evaluated in this EIR.

3.2.1.1 Criteria Air Pollutants

Ambient Air Quality Standards

It is the responsibility of the BAAQMD to ensure that state and federal ambient air quality standards are achieved and maintained in its geographical jurisdiction. Health-based air quality standards have been established by California and the federal government for the following criteria air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter less than 10 microns in diameter (PM10), particulate matter less than 2.5 microns in diameter (PM2.5), sulfur dioxide (SO_2) and lead. These standards were established to protect sensitive receptors with a margin of safety from adverse health impacts due to exposure to air pollution. The California standards are more stringent than the federal standards, and in the cases of PM10 and SO_2, far more stringent. California has also established standards for sulfate, visibility, hydrogen sulfide, and vinyl chloride.

The state and National Ambient Air Quality Standards (NAAQS) for each of these pollutants and their effects on health are summarized in Table 3-1. CO, NO_2, PM10, PM2.5 and SO_2 are directly emitted from stationary and mobile sources. Ozone is not

emitted directly from pollution sources. Instead ozone is formed in the atmosphere through complex chemical reactions between hydrocarbons or reactive organic hydrocarbons (ROG, also commonly referred to as volatile organic compounds or VOCs).

U.S. EPA requires CARB and BAAQMD to measure the ambient levels of air pollution to determine compliance with the NAAQS. To comply with this mandate, the BAAQMD monitors levels of various criteria pollutants at 26 monitoring stations. The 2006 air quality data from the BAAQMD monitoring stations are presented in Table 3-2.

Air quality conditions in the San Francisco Bay Area have improved since the Air District was created in 1955. Ambient concentrations of air pollutants and the number of days on which the region exceeds air quality standards have fallen dramatically (see Table 3-3). The Air District is in attainment of the State and federal ambient air quality standards for CO, nitrogen oxides (NOx), and sulfur dioxides (SO_2). The Air District is not considered to be in attainment with the State PM10 and PM2.5 standards.

The 2006 air quality data from the BAAQMD monitoring stations are presented in Table 3-2. All monitoring stations were below the state standard and federal ambient air quality standards for CO, NO_2, and SO_2. The federal 8-hour ozone standard was exceeded 12 days in the District in 2006, while the state 1-hour standard was exceeded on 22 days. The Bay Area is designated as a marginal non-attainment area for the federal 8-hour ozone standard and as a serious non-attainment area for the California 1-hour ozone standard. The State 1-hour ozone standard was exceeded on 18 days in 2006 in the District, most frequently in the Eastern District (Livermore) (see Table 3-2). The District has been designated as non-attainment for the new State 8-hour standard.

TABLE 3-1: Federal and State Ambient Air Quality Standards

	STATE STANDARD	FEDERAL PRIMARY STANDARD	MOST RELEVANT EFFECTS
AIR POLLUTANT	CONCENTRATION/ AVERAGING TIME	CONCENTRATION/ AVERAGING TIME	
Ozone	0.09 ppm, 1-hr. avg. > 0.070 ppm, 8-hr	0.08 ppm, 8-hr avg. >	(a) Short-term exposures: (1) Pulmonary function decrements and localized lung edema in humans and animals (2) Risk to public health implied by alterations in pulmonary morphology and host defense in animals; (b) Long-term exposures: Risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (c) Vegetation damage; (d) Property damage
Carbon Monoxide	9.0 ppm, 8-hr avg. > 20 ppm, 1-hr avg. >	9 ppm, 8-hr avg.> 35 ppm, 1-hr avg.>	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Impairment of central nervous system functions; (d) Possible increased risk to fetuses
Nitrogen Dioxide	0.25 ppm, 1-hr avg. >	0.053 ppm, ann. avg.>	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) Risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; (c) Contribution to atmospheric discoloration
Sulfur Dioxide	0.04 ppm, 24-hr avg.> 0.25 ppm, 1-hr. avg. >	0.03 ppm, ann. avg.> 0.14 ppm, 24-hr avg.>	(a) Bronchoconstriction accompanied by symptoms which may include wheezing, shortness of breath and chest tightness, during exercise or physical activity in persons with asthma
Suspended Particulate Matter (PM10)	20 µg/m^3, annual arithmetic mean > 50 µg/m^3, 24-hr average>	50 µg/m^3, annual arithmetic mean > 150 µg/m^3, 24-hr avg.>	(a) Excess deaths from short-term exposures and exacerbation of symptoms in sensitive patients with respiratory disease; (b) Excess seasonal declines in pulmonary function, especially in children
Suspended Particulate Matter (PM2.5)	12 µg/m^3, annual arithmetic mean>	15 µg/m^3, annual arithmetic mean> 35 µg/m^3, 24-hour average>	Decreased lung function from exposures and exacerbation of symptoms in sensitive patients with respiratory disease; elderly; children.
Sulfates	25 µg/m^3, 24-hr avg. >=		(a) Decrease in ventilatory function; (b) Aggravation of asthmatic symptoms; (c) Aggravation of cardio-pulmonary disease; (d) Vegetation damage; (e) Degradation of visibility; (f) Property damage
Lead	1.5 µg/m^3, 30-day avg. >=	1.5 µg/m^3, calendar quarter>	(a) Increased body burden; (b) Impairment of blood formation and nerve conduction
Visibility-Reducing Particles	In sufficient amount to give an extinction coefficient >0.23 inverse kilometers (visual range to less than 10 miles) with relative humidity less than 70%, 8-hour average (10am – 6pm PST)		Nephelometry and AISI Tape Sampler; instrumental measurement on days when relative humidity is less than 70 percent

TABLE 3-2
Bay Area Air Pollution Summary – 2006

MONITORING STATIONS	OZONE						CARBON MONOXIDE			NITROGEN DIOXIDE			SULFUR DIOXIDE			PM 10				PM 2.5				
	Max 1-hr	Cal Days	Max 8-hr	Nat Days	Cal Days	3-Yr Avg	Max 1-hr	Max 8-hr	Nat/ Cal Days	Max 24-hr	Ann Avg	Nat/ Cal Days	Max 24-hr	Ann Avg	Nat/ Cal Days	Ann Avg	Max 24-hr	Nat Days	Cal Days	Max 24-hr	Nat Days	3-Yr Avg	Ann Avg	3-Yr Avg
North Counties	(ppb)						(ppm)			(ppb)			(ppb)			(μm^3)				(μm^3)				
Napa	96	1	72	0	2	60	3.5	2.8	0	3.5	11	0	-	-	-	21.9	52	0	1	-	-	-	-	-
San Rafael	89	0	58	0	0	50	2.6	1.5	0	2.6	14	0	-	-	-	18.1	68	0	1	-	-	-	-	-
Santa Rosa	77	0	58	0	0	47	2.4	1.7	0	2.4	11	0	-	-	-	18.8	90	0	2	59.0	1	28.7	9.2	8.3
Vallejo	80	0	69	0	0	57	3.7	2.9	0	3.7	12	0	4	1.0	0	19.8	50	0	0	42.2	1	35.6	9.8	10.2
Coast/Central Bay																								
Richmond	-	-	-	-	-	-	-	-	-	-	-	-	6	1.6	0	-	-	-	-	-	-	-	-	-
San Francisco	53	0	46	0	0	45	2.7	2.1	0	107	16	0	6	1.3	0	22.9	61	0	3	54.3	3	30.9	9.7	9.7
San Pablo	61	0	50	0	0	48	2.5	1.4	0	55	13	0	5	1.6	0	21.3	62	0	2	-	-	-	-	-
Eastern District																								
Bethel Island	116	9	90	1	14	73	1.3	1.0	0	44	8	0	7	2.1	0	19.4	84	0	1	-	-	-	-	-
Concord	117	8	92	4	14	74	1.7	1.3	0	47	11	0	7	0.8	0	18.5	81	0	3	62.1	5	35.0	9.3	9.7
Crockett	-	-	-	-	-	-	-	-	-	-	-	-	8	1.8	0	-	-	-	-	-	-	-	-	-
Fairfield	106	3	87	1	8	69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Livermore	127	13	101	5	15	80	3.3	1.8	0	64	14	0	-	-	-	21.8	69	0	3	50.8	3	33.5	9.8	9.7
Martinez	-	-	-	-	-	-	-	-	-	-	-	-	7	1.9	0	-	-	-	-	-	-	-	-	-
Pittsburg	105	3	93	1	10	70	3.3	1.9	0	52	11	0	9	2.4	0	19.9	59	0	2	-	-	-	-	-
South Central Bay																								
Fremont	102	4	74	0	3	60	2.9	1.8	0	63	15	0	-	-	-	20.0	57	0	1	43.9	2	30.3	10.3	9.6
Hayward	101	2	71	0	1	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Redwood City	85	0	63	0	0	53	5.5	2.4	0	69	14	0	-	-	-	19.8	70	0	2	75.3	1	29.4	9.6	9.2
San Leandro	88	0	66	0	0	53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Santa Clara Valley																								
Gilroy	120	4	101	2	8	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Los Gatos	116	7	87	4	11	73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
San Jose Central	118	5	87	1	5	63	4.1	2.9	0	74	18	0	-	-	-	21.0	73	0	2	64.4	6	38.5	10.8	11.4
San Jose, Tully Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.0	106	0	13	30.6	0	-	-	-
San Martin	123	7	105	5	11	76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sunnyvale	106	3	78	0	1	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Days over Standard		**18**		**12**	**22**				**0**			**0**			**0**			**0**	**15**		**10**			

(ppm) = parts per million, (pphm) = parts per hundred million, (ppb) = parts per billion

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All monitoring stations were in compliance with the federal PM10 standards. The California PM10 standards were exceeded on 15 days in 2006, most frequently in San Jose. The Air District exceeded the federal PM2.5 standard on ten days, most frequently in San Jose, in 2006 (see Table 3-2).

3.2.1.2 Non-Criteria Pollutants

Although the primary mandate of the BAAQMD is attaining and maintaining the national and state Ambient Air Quality Standards for criteria pollutants within the BAAQMD jurisdiction, the BAAQMD also has a general responsibility to control, and where possible, reduce public exposure to airborne toxic compounds. The state and federal governments have set health-based ambient air quality standards for criteria pollutants. The air toxics program was established as a separate and complementary program designed to evaluate and reduce adverse health effects resulting from exposure to TACs.

The major elements of the District's air toxics program are outlined below.

- Preconstruction review of new and modified sources for potential health impacts, and the requirement for new/modified sources with non-trivial TAC emissions to use the Best Available Control Technology.
- The Air Toxics Hot Spots Program, designed to identify industrial and commercial facilities that may result in locally elevated ambient concentrations of TACs, to report significant emissions to the affected public, and to reduce unacceptable health risks.
- Control measures designed to reduce emissions from source categories of TACs, including rules originating from the state Toxic Air Contaminant Act and the federal Clean Air Act.
- The TAC emissions inventory, a database that contains information concerning routine and predictable emissions of TACs from permitted stationary sources.
- Ambient monitoring of TAC concentrations at a number of sites throughout the Bay Area.
- The Community Air Risk Evaluation (CARE) Program evaluates and reduces emissions of TACs in high risk communities.

Historically, the BAAQMD has regulated criteria air pollutants using either a technology-based or an emissions-limit approach. The technology-based approach defines specific control technologies that may be installed to reduce pollutant emissions. The emission limit approach establishes an emission limit, and allows industry to use any emission control equipment, as long as the emission requirements are met. The regulation of TACs requires a different regulatory approach as explained in the following subsections.

Air Toxics New Source Review

New and modified source permit applications have been reviewed for air toxics concerns since 1987, in accordance with the Risk Management Policy (RMP) established at the

request of the District's Board of Directors. A large increase in risk screening analyses has occurred in recent years due primarily to the removal of permit exemptions in District regulations for standby engines. Prior to 2000, the District completed screening risk analyses for an average of about 175 permit applications per year. This number increased to 255 in 2000, to 440 in 2001, reached a peak of 602 in 2002, and declined to 430 in 2003. The District has replaced the RMP with Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants, which was adopted by the District Board of Directors on June 15, 2005.

Regulation 2, Rule 5 changed the Air Toxics NSR Program by:

(1) adding a project risk limit for acute health risks (HI = 1.0);

(2) requiring TBACT for chronic non-cancer health risks (at HI > 0.20);

(3) using updated toxicity values and exposure assessment procedures (primarily from OEHHA Air Toxic Hot Spots Program Guidance Manual for Preparation of Health Risk Assessment);

(4) removing “special” project cancer risk limits for perchloroethylene dry cleaners; and

(5) eliminating discretionary risk authority for the Air Pollution Control Officer; all sources are limited to cancer risk of 10 in a million and non-cancer Hazard Index of 1.0.

Air Toxics Hot Spots Program

The Air Toxics Hot Spots (ATHS) Program involves the evaluation of health risks due to routine and predictable TAC emissions from industrial and commercial facilities. The District has established specific public notification measures for various levels of risk identified under the program (Levels 1, 2, and 3). In 1991, the first year of the risk assessment phase of the program, 30 facilities were identified with Level 1 health risks (cancer risk of 10 in a million or greater) that triggered public notification requirements. The number of facilities requiring public notification had steadily decreased over the first decade of the program as industries reduced toxic emissions and refined estimates of risk. There are currently no major facilities in the Bay Area that require public notification under the ATHS Program. In addition to public notification requirements, the ATHS Program requires facilities to reduce their health risks below levels determined by the air district to be significant within a certain timeframe. The District requires mandatory risk reduction measures for those facilities with health risks of Level 2 or greater (cancer risks of 100 in one million or greater). There are currently no facilities in the Bay Area that have risks identified as Level 2 or greater.

Control Measures for Categories of Sources

The California Air Resources Board (CARB) has adopted seventeen Airborne Toxic Control Measures (ATCMs) for stationary sources which the District implements in the

Bay Area. More recent ATCMs include residential waste burning (2003), stationary diesel engines (2004), portable diesel engines (2004), thermal metal spraying (2005), and formaldehyde from composite wood products (2007). CARB revised existing ATCMs for chrome plating and chromic acid anodizing operations and perchloroethylene dry cleaners (included a phase-out of perchloroethylene by 2023).

National Emission Standards for Hazardous Air Pollutants (NESHAPs) developed by U.S. EPA in accordance with Title III of the 1990 federal Clean Air Act Amendments have also become an important source of air toxics control measures in California. These rules generally focus on larger "major source" facilities, and require that emissions be reduced using the Maximum Achievable Control Technology (MACT). Under State law, the District must implement and enforce all MACT Standards, or rules that are at least as stringent. U.S. EPA has already adopted a significant number of new MACT Standards. The focus of future NESHAP development under Title III has shifted to rules that apply to smaller "area source" facilities, e.g., EPA revised the Perchloroethylene Dry Cleaning MACT in July 2006.

Air Toxics Emission Inventory

The BAAQMD maintains a database that contains information concerning emissions of TACs from permitted stationary sources in the Bay Area. This inventory, and a similar inventory for mobile and area sources compiled by CARB, is used to plan strategies to reduce public exposure to TACs. The detailed emissions inventory is reported in the BAAQMD, Toxic Air Contaminant Control Program, 2003 Annual Report (BAAQMD, 2007). The 2003 emissions inventory continues to show decreasing emissions of many TACs in the Bay Area. The most dramatic emission reductions in recent years have been for certain chlorinated compounds that are used as solvents including 1,1,1-trichloroethane, perchloroethylene, and trichloroethylene. Additionally, in 2003, there were reductions in other organic TACs such as: toluene, xylene, butyl cellosolve, glycol ethers, and methyl ethyl ketone.

Targeted Control of TACs Under the Community Air Risk Evaluation Program:

In 2004, BAAQMD established the Community Air Risk Evaluation (CARE) program to identify locations with high emissions of toxic air contaminants (TAC) and high exposures of sensitive populations to TAC and to use this information to help establish policies to guide mitigation strategies that obtain the greatest health benefit from TAC emission reductions. For example, BAAQMD will use information derived from the CARE program to develop and implement targeted risk reduction programs, including grant and incentive programs, community outreach efforts, collaboration with other governmental agencies, model ordinances, new regulations for stationary sources and indirect sources, and advocacy for additional legislation.

Ambient Monitoring Network

Table 3-3 (BAAQMD, 2007) contains a summary of average ambient concentrations of TACs measured at monitoring stations in the Bay Area by the District in 2003. Table 3-3 show the calculated cancer risks associated with lifetime exposure to average ambient concentrations of these measured TACs. Of the pollutants for which monitoring data are available, 1,3-butadiene and benzene (which are emitted primarily from motor vehicles) account for slightly over one half of the average calculated cancer risk.

Ambient benzene levels declined dramatically in 1996 with the advent of Phase 2 reformulated gasoline, with significant reductions in ambient 1,3-butadiene levels also occurring. Due largely to these observed reductions in ambient benzene and 1,3-butadiene levels, the calculated network average cancer risk has been significantly reduced in recent years. Based on 2003 ambient monitoring data, the calculated inhalation cancer risk is 143 in one million, which is 53 percent less than the 303 in one million risk that was observed in 1995. These figures do not include the risk resulting from exposure to diesel particulate matter or other compounds not monitored. Although not specifically monitored, recent studies indicate that exposure to diesel particulate matter may contribute significantly to a cancer risk (approximately 500-700 in a million) that is greater than all of the other measured TACs combined. CARB began monitoring for acrylonitrile mid-2003; ambient concentration data will be included for 2004 and in later reports.

TABLE 3-3: Summary of 2003 BAAQMD Ambient Air Toxics Monitoring Data

Compound	LOD (ppb)[1]	% of Samples < LOD[2]	Max. Conc. (ppb)[3]	Min. Conc. (ppb)[4]	Mean Conc. (ppb)[5]
Acetone	0.30	0	121.4	0.6	6.80
Benzene	0.10	1.78	2.4	0.5	0.401
1,3-butadiene	0.15	75.7	0.89	0.075	0.12
Carbon tetrachloride	0.01	0	0.16	0.09	0.108
Chloroform	0.02	62.5	1.47	0.01	0.024
Ethylbenzene	0.10	44.2	0.90	0.05	0.135
Ethylene dibromide	0.02	100	0.01	0.01	0.01
Ethylene dichloride	0.10	100	0.05	0.05	0.05
Methylene chloride	0.50	82.9	3.40	0.25	0.356
Methyl ethyl ketone	0.20	7.7	5.80	0.1	0.496
Metyl tert-butyl ether	0.30	32.9	4.80	0.15	0.532
Perchloroethylene	0.01	42.4	0.28	0.005	0.026
Toluene	0.10	0.2	6.0	0.05	1.062
1,1,1-Trichloroethane	0.05	72.3	2.47	0.025	0.084
Trichloroethylene	0.05	93.8	0.33	0.025	0.029
Trichlorofluoromethane	0.01	0	.046	0.18	0.266
1,1,2-trichlorotrifluoroethane	0.01	0	1.16	0.06	0.077
Vinyl chloride	0.30	100	0.15	0.15	0.15
m/p-xylene	0.10	2.8	3.40	0.05	0.535
o-xylene	0.10	27.9	1.30	0.05	0.186

NOTES: Table 4 summarizes the results of the BAAQMD gaseous toxic air contaminant monitoring network for the year 2003. These data represent monitoring results at 19 of the 20 separate sites at which samples were collected. Data from the Fort Cronkhite "clean-air" background site was not included. Data from the Oakland-Davie Stadium site was available from January through March.

(1) "LOD" is the limit of detection of the analytical method used.

(2) "% of samples < LOD" is the percent of the total number of air samples collected in 2003 that had pollutant concentrations less than the LOD.

(3) "Maximum Conc." is the highest daily concentration measured at any of the 19 monitoring sites.

(4) "Minimum Conc." is the lowest daily concentration measured at any of the 19 monitoring sites.

(5) "Mean Conc." is the arithmetic average of the air samples collected in 2003 at the 19 monitoring sites. In calculating the mean, samples with concentrations less than the LOD were assumed to be equal to one half the LOD concentration.

(6) Acrylonitrile data not available for full year and not reported.

3.2.1.3 Greenhouse Gases

Global climate change refers to changes in average climatic conditions on the earth as a whole, including temperature, wind patterns, precipitation and storms. Global warming, a related concept, is the observed increase in average temperature of the earth's surface and atmosphere. Global warming occurs when the amount of heat trapped in the earth's

atmosphere is greater than the amount radiated. Global warming is a natural phenomenon, whereby the sun's heat trapped in the atmosphere maintains a habitable temperature and supports life. The heat is trapped and maintained by the presence of "greenhouse gases" or GHG. The GHG absorb longwave radiant energy reflected by the earth, warming the atmosphere. GHG also radiate longwave radiation both upward to space and back down toward the surface of the earth. The downward part of this longwave radiation absorbed by the atmosphere is known as the "greenhouse effect." Events and activities, such as the industrial revolution and the increased combustion of fossil fuels (e.g., gasoline, diesel, coal, etc.), have heavily contributed to the increase in atmospheric levels of GHG. Consequently, concern over the impacts of global warming relate not to the ability of the atmosphere to hold heat, but to the increase in emissions of GHG as the basis for irreversible change in the climate worldwide. Some studies indicate that the potential effects of global climate change may include rising surface temperatures, loss in snow pack, sea level rise, and more extreme heat days per year. One identified cause of global warming is an increase of GHG in the atmosphere. The six major GHG identified by the Kyoto Protocol are CO_2, methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), haloalkanes (HFCs), and perfluorocarbons (PFCs). In addition, black carbon particles entrained in the atmosphere are implicated in global warming.

Each greenhouse gas differs in its ability to absorb heat in the atmosphere. High global warming potential gases such as HFCs, PFCs, and SF6 are the most heat-absorbent. Methane (CH4) traps over 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 310 times more heat per molecule than carbon dioxide. Often, estimates of greenhouse gas emissions are presented in carbon dioxide equivalents (CO2-eq), which weight each gas relative to the global warming potential of carbon dioxide, which has arbitrarily been assigned a value of 1 for comparison purposes. Table 3-4 shows the global warning potentials for different greenhouse gases for 100 year time horizon.

Table 3-4: Global Warming Potentials (GWPs) for Greenhouse Gases

Carbon dioxide, CO2	1
Methane, CH4	21
Nitrous oxide, N2O	310
Hydrofluoro- and Perfluoro-carbons, HFC/CFC	6,500
Sulfur hexafluoride, SF6	23,900

As reported by the CEC, California contributes 1.4 percent of the global and 6.2 percent of the national GHG emissions (CEC, 2004) in spite of 10 percent of the country's population. The GHG inventory for California is presented in Table 3-8 (CARB, 2007). Approximately 80 percent of GHG in California are from fossil fuel combustion and over 70 percent of GHG emissions are carbon dioxide emissions (see Table 3-5).

In response to growing scientific and political concern regarding global climate change, California has recently adopted a series of laws to reduce both the level of GHG in the atmosphere and to reduce emissions of GHG from commercial and private activities within the state. In September 2002, Governor Gray Davis signed Assembly Bill (AB) 1493, requiring the development and adoption of regulations to achieve "the maximum feasible reduction of greenhouse gases" emitted by noncommercial passenger vehicles, light-duty trucks, and other vehicles used primarily for personal transportation in the State. Setting emission standards on automobiles is normally the responsibility of the U.S. EPA. The Federal Clean Air Act, however, allows California to set a state-specific emission standard on automobiles if it first obtains a waiver from the U.S. EPA. On December 19, 2007 the U.S. EPA denied California's request for a waiver. In response, California sued the U.S. EPA claiming that the denial was not based on the scientific data.

In June 2005, Governor Schwarzenegger signed Executive Order S-3-05, which established GHG emissions reduction targets for the state, as well as a process to ensure that the targets are met. As a result of this executive order, the California Climate Action Team (CAT), led by the Secretary of the California State Environmental Protection Agency (CalEPA), was formed. The CAT published its report in March 2006, in which it laid out several recommendations and strategies for reducing GHG emissions and reaching the targets established in the executive order. The greenhouse gas targets are:

- By 2010, reduce to 2000 emission levels;
- By 2020, reduce to 1990 emission levels; and,
- By 2050, reduce to 80 percent below 1990 levels.

TABLE 3-5: California GHG Emissions and Sinks Summary
(Million metric tons, CO_2-equivalent)

Categories Included in the Inventory	1990	2004
ENERGY	**386.41**	**420.91**
Fuel Combustion Activities	**381.16**	**416.29**
Energy Industries	157.33	166.43
Manufacturing Industries & Construction	24.24	19.45
Transport	150.02	181.95
Other Sectors	48.19	46.29
Non-Specified	1.38	2.16
Fugitive Emissions from Fuels	**5.25**	**4.62**
Oil and Natural Gas	2.94	2.54
Other Emissions from Energy Production	2.31	2.07
INDUSTRIAL PROCESSES & PRODUCT USE	**18.34**	**30.78**
Mineral Industry	4.85	5.90
Chemical Industry	2.34	1.32
Non-Energy Products from Fuels & Solvent Use	2.29	1.37
Electronics Industry	0.59	0.88
Product Uses as Substitutes for Ozone Depleting Substances	0.04	13.97
Other Product Manufacture & Use Other	3.18	1.60
Other	5.05	5.74
AGRICULTURE, FORESTRY, & OTHER LAND USE	**19.11**	**23.28**
Livestock	11.67	13.92
Land	0.19	0.19
Aggregate Sources & Non-CO_2 Emissions Sources on Land	7.26	9.17
WASTE	**9.42**	**9.44**
Solid Waste Disposal	6.26	5.62
Wastewater Treatment & Discharge	3.17	3.82
EMISSION SUMMARY		
Gross California Emissions	**433.29**	**484.4**
Sinks and Sequestrations	**-6.69**	**-4.66**
Net California Emissions	**426.60**	**479.74**

Source: CARB, 2007.

In September 2006, Governor Schwarzenegger signed California's Global Warming Solutions Act of 2006 (AB32). AB32 will require CARB to:

- Establish a statewide GHG emissions cap for 2020, based on 1990 emissions, by January 1, 2008;
- Adopt mandatory reporting rules for significant sources of GHG emissions by January 1, 2008;

- Adopt an emissions reduction plan by January 1, 2009, indicating how emissions reductions will be achieved via regulations, market mechanisms, and other actions; and,
- Adopt regulations to achieve the maximum technologically feasible and cost-effective reductions of GHG by January 1, 2011.

California Senate Bill 97 (SB97), passed in August 2007, is designed to work in conjunction with CEQA and AB32. SB97 requires the California Office of Planning and Research (OPR) to prepare and develop guidelines for the mitigation of GHG emissions or the effects thereof, including but not limited to, effects associated with transportation and energy consumption. These guidelines must be transmitted to the Resources Agency by July 1, 2009, to be certified and adopted by January 1, 2010. The OPR and the Resources Agency shall periodically update these guidelines to incorporate new information or criteria established by CARB pursuant to AB32. SB97 will apply to any EIR, negative declaration, mitigated negative declaration, or other document required by CEQA, prepared for a limited number of types of projects, which has not been finalized. SB 97 will be automatically repealed January 1, 2010.

The BAAQMD has also initiated a Climate Protection Program. On June 1, 2005 the Air District Board of Directors adopted a resolution establishing a Climate Protection Program and acknowledging the link between climate protection and programs to reduce air pollution in the Bay Area. A central element of the District's climate protection program is the integration of climate protection activities into existing District programs. The District is seeking ways to integrate climate protection into current District functions, including grant programs, CEQA commenting, regulations, inventory development, and outreach. In addition, the District's climate protection program emphasizes collaboration with ongoing climate protection efforts at the local and State level, public education and outreach and technical assistance to cities and counties.

The District has contracted two reports on potential mitigation of greenhouse gas emissions from Bay Area stationary sources. The reports were titled "Opportunities for Further Greenhouse Gas Emission Reductions for the BAAQMD Stationary Sources" and "Greenhouse Gas Mitigation: Landfill Gas and Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters." The first gave an overview of the potential areas for regulatory activity to reduce greenhouse gas emissions at Bay Area sources, and the second focused on two of the most promising categories, landfills and boilers.

The Climate Protection Grant Program is another aspect of the District's efforts to reduce greenhouse gas emissions. In 2007, the District awarded $3 million to fund 53 local projects to reduce the Bay Area's carbon footprint. This $3 million represents the largest single source of funding available for climate protection projects in the Bay Area. Grants were made to Bay Area local governments and non-profit organizations for implementation of innovative projects to reduce greenhouse gas emissions.

The District has developed a Source Inventory of Bay Area Greenhouse Gas Emissions, published in November, 2006. In it, GHG emissions from various sources are calculated for each applicable GHG, and CO2-eq emissions are determined. The emissions focuses on direct GHG emissions due to human activities including commercial, transportation, domestic, forestry and agriculture activities in the San Francisco Bay region. This Source Inventory does not include indirect emissions, for example, electricity used by an industrial source or residence is not included, although emissions from Bay Area power plants are. Point sources, or sources of emissions that require BAAQMD permits are calculated directly from data submitted to BAAQMD by each facility, but area sources, which are groups of numerous small emission sources that do not require permits but collectively emit significant amounts of air pollutants, have been calculated based on estimated activities and emission factors for various categories. In addition, the emissions from mobile sources, such as cars, trucks, buses, boats, ships trains and aircraft have been calculated based on CARB's EMFAC2002 model or based on estimated fuel used and emissions factors.

The greenhouse gas with the greatest emissions is carbon dioxide (CO2). Carbon dioxide emissions from various activities in the Bay Area represented 89.9 percent of total greenhouse gas emissions in 2002. Carbon dioxide emissions are mainly associated with combustion of carbon-bearing fossil fuels such as gasoline, diesel, and natural gas used in mobile sources and energy-generation-related activities. Other activities that produce CO2 emissions include cement manufacturing, waste combustion, and waste and forest management. Methane (CH4) emissions from various sources represent 4.5 percent of Bay Area's total CO2-eq GHG emissions. Landfills, natural gas distribution systems, agricultural activities, fireplaces and wood stoves, stationary and mobile fuel combustion, and gas and oil production fields categories are the major sources of these emissions. Nitrous oxide (N2O) emissions represent approximately 5 percent of the overall GHG inventory. Municipal wastewater treatment facilities, fuel combustion, and agricultural soil and manure management are the major contributors of nitrous oxide emissions in the Bay Area. Emissions from high global warming potential gases such as HFCs, PFCs and SF6 make up approximately one half percent of the total CO2-eq emissions. Industrial processes such as semiconductor manufacturing and electric power transmission and distribution systems are the major sources of HFCs, PFCs and SF6 emissions in the Bay Area.

Direct GHG emissions by major source categories are shown in Table 3-6. Fossil fuel consumption in the transportation sector was the single largest source of Bay Area's GHG emissions in 2002. The transportation sector alone contributed 50.6 percent of GHG emissions in the Bay Area. Categories included in this sector are on-road motor vehicles, off-highway mobile sources, and aircraft.

Industrial and commercial sources (excluding petroleum refining and power plants, which are reported separately) were the second largest contributors of GHG emissions with 25.7 percent of total emissions. Industrial, commercial, and other sources include emissions from industrial processes such as waste management, cement manufacturing, fuel distribution, agriculture and forest management, and some other small sources.

Domestic sources, the third largest category, includes emissions from domestic combustion, but does not, as stated above, include impacts from electricity use. Domestic combustion includes emissions from residential furnaces, water heaters and cooking. Table 3-6 shows the relative and total contribution of major categories of emissions of GHG in the Bay Area. Based on population and emissions trends, the total amount of GHG emissions in the Bay Area has been estimated to be 95.8 million tons for 2008. Of this total, domestic combustion has been estimated to be 9.9 million tons, a slightly smaller percent of the total, at 10.3%.

Table 3-6: 2002 Greenhouse Gas Emissions by Major Category, BAAQMD

Major Category	Percent Contribution	CO2-eq (Million Tons/year)
Transportation	50.6%	43.2
Industrial/Commercial	25.7%	22.0
Power Plants	7.2%	6.1
Oil Refining	5.6%	4.8
Domestic	10.9%	9.3
Total	100%	85.4

3.2.1.4 Health Effects

Criteria Pollutants

Particulate Matter (PM10 & PM2.5): Of great concern to public health are the particles small enough to be inhaled into the deepest parts of the lung. Respirable particles (particulate matter less than about 10 micrometers in diameter) can accumulate in the respiratory system and aggravate health problems. Exposure to particulate pollution is linked to increased frequency and severity of asthma attacks and even premature death in people with pre-existing cardiac or respiratory disease. Those most sensitive to particulate pollution include infants and children, the elderly, and persons with impaired heart and lung function and immunology systems. Children, the elderly, exercising adults, and those suffering from asthma are especially vulnerable to adverse health effects of PM10 and PM2.5.

A consistent correlation between elevated ambient fine particulate matter (PM10 and PM2.5) levels and an increase in mortality rates, respiratory infections, number and severity of asthma attacks and the number of hospital admissions has been observed in different parts of the United States and various areas around the world. Studies have reported an association between long-term exposure to air pollution dominated by fine particles (PM2.5) and increased mortality, reduction in life-span, and an increased mortality from lung cancer.

Ambient PM is made up of particles that are emitted directly, such as soot and fugitive dust, as well as secondary particles that are formed in the atmosphere from reactions involving precursor pollutants such as oxides of nitrogen, sulfur oxides, volatile organic

compounds, and ammonia. Secondary PM and combustion soot tend to be fine particles (PM 2.5), whereas fugitive dust is mostly coarse particles. Directly-emitted particles come from a variety of sources such as cars, trucks, buses, industrial facilities, power plants, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood. Other particles are formed indirectly when gases from burning fuels react with sunlight and water vapor. These particles are an indirect product from fuel combustion in motor vehicles, at power plants, and in other industrial processes. Many combustion sources, such as motor vehicles and power plants, both emit PM directly and emit pollutants that form secondary PM.

In addition, particulate matter is responsible for a variety of other detrimental environmental effects, including visibility impairment, atmospheric deposition, aesthetic damages and public nuisances.

Ozone: Ozone (O_3), a colorless gas with a sharp odor, is a highly reactive form of oxygen. High ozone concentrations exist naturally in the stratosphere. Some mixing of stratospheric ozone downward through the troposphere to the earth's surface does occur; however, the extent of ozone transport is limited. At the earth's surface in sites remote from urban areas ozone concentrations are normally very low (0.03-0.05 ppm).

While ozone is beneficial in the stratosphere because it filters out skin cancer-causing ultraviolet radiation, it is a highly reactive oxidant. It is this reactivity which accounts for its damaging effects on materials, plants, and human health at the earth's surface.

The propensity of ozone for reacting with organic materials causes it to be damaging to living cells, and ambient ozone concentrations in the Bay Area are occasionally sufficient to cause health effects. Ozone enters the human body primarily through the respiratory tract and causes respiratory irritation and discomfort, makes breathing more difficult during exercise, and reduces the respiratory system's ability to remove inhaled particles and fight infection. People with respiratory diseases, children, the elderly, and people who exercise heavily are more susceptible to the effects of ozone.

Plants are also sensitive to ozone, at concentrations well below the health-based standards and ozone is responsible for significant crop damage. Ozone is also responsible for damage to forests and other ecosystems.

Volatile Organic Compounds (VOCs): It should be noted that there are no state or national ambient air quality standards for VOCs because they are not classified as criteria pollutants. VOCs are regulated, however, because VOC emissions contribute to the formation of ozone. They are also transformed into organic aerosols in the atmosphere, contributing to higher PM10 and lower visibility levels.

Although health-based standards have not been established for VOCs, health effects can occur from exposures to high concentrations of VOCs because of interference with oxygen uptake. In general, ambient VOC concentrations in the atmosphere are suspected to cause coughing, sneezing, headaches, weakness, laryngitis, and bronchitis, even at low

concentrations. Some hydrocarbon components classified as VOC emissions are thought or known to be hazardous. Benzene, for example, one hydrocarbon component of VOC emissions, is known to be a human carcinogen.

Carbon Monoxide (CO): CO is a colorless, odorless, relatively inert gas. It is a trace constituent in the unpolluted troposphere, and is produced by both natural processes and human activities. In remote areas far from human habitation, carbon monoxide occurs in the atmosphere at an average background concentration of 0.04 ppm, primarily as a result of natural processes such as forest fires and the oxidation of methane. Global atmospheric mixing of CO from urban and industrial sources creates higher background concentrations (up to 0.20 ppm) near urban areas. The major source of CO in urban areas is incomplete combustion of carbon-containing fuels, mainly gasoline. Consequently, CO concentrations are generally highest in the vicinity of major concentrations of vehicular traffic.

CO is a primary pollutant, meaning that it is directly emitted into the air, not formed in the atmosphere by chemical reaction of precursors, as is the case with ozone and other secondary pollutants. Ambient concentrations of CO in the Basin exhibit large spatial and temporal variations, due to variations in the rate at which CO is emitted, and in the meteorological conditions that govern transport and dilution. Unlike ozone, CO tends to reach high concentrations in the fall and winter months. The highest concentrations frequently occur on weekdays at times consistent with rush hour traffic and late night during the coolest, most stable atmospheric portion of the day.

When CO is inhaled in sufficient concentration, it can displace oxygen and bind with the hemoglobin in the blood, reducing the capacity of the blood to carry oxygen. Individuals most at risk from the effects of CO include heart patients, fetuses (unborn babies), smokers, and people who exercise heavily. Normal healthy individuals are affected at higher concentrations, which may cause impairment of manual dexterity, vision, learning ability, and performance of work. The results of studies concerning the combined effects of CO and other pollutants in animals have shown a synergistic effect after exposure to CO and ozone.

Nitrogen Dioxide (NO_2): NO_2 is a reddish-brown gas with a bleach-like odor. Nitric oxide (NO) is a colorless gas, formed from the nitrogen (N_2) and oxygen (O_2) in air under conditions of high temperature and pressure which are generally present during combustion of fuels; NO reacts rapidly with the oxygen in air to form NO_2. NO_2 is responsible for the brownish tinge of polluted air. The two gases, NO and NO_2, are referred to collectively as NO_X. In the presence of sunlight, NO_2 reacts to form nitric oxide and an oxygen atom. The oxygen atom can react further to form ozone, via a complex series of chemical reactions involving hydrocarbons. Nitrogen dioxide may also react to form nitric acid (HNO_3) which reacts further to form nitrates, which are a component of PM10.

NO_2 is a respiratory irritant and reduces resistance to respiratory infection. Children and people with respiratory disease are most susceptible to its effects.

Sulfur Dioxide (SO_2): SO_2 is a colorless gas with a sharp odor. It reacts in the air to form sulfuric acid (H_2SO_4), which contributes to acid precipitation, and sulfates, which are a component of PM10 and PM2.5. Most of the SO_2 emitted into the atmosphere is produced by the burning of sulfur-containing fuels.

At sufficiently high concentrations, SO_2 affects breathing and the lungs' defenses, and can aggravate respiratory and cardiovascular diseases. Asthmatics and people with chronic lung disease or cardiovascular disease are most sensitive to its effects. SO_2 also causes plant damage, damage to materials, and acidification of lakes and streams.

Non-Criteria Pollutants

Toxic Air Contaminants: Chemicals are considered toxic if exposure to the compound causes adverse effects in a living organism. In order for the chemical to illicit an adverse effect, it must gain entry into the body through either inhalation (respiratory tract), ingestion (gastrointestinal tract), and dermal contact (skin). Most toxic substances do not cause harmful effects at the point of entry. Instead, entry into the body starts the physiological processes of the body to either absorb, distribute, store, transform, and eliminate the chemical. To produce a toxic effect, the chemical or its biotransformation product must reach a sensitive body organ at sufficient high concentration for an extended period of time.

The rates at which toxic compounds are absorbed, metabolized, and eliminated are very critical. If the body eliminates a toxic compound rapidly, it may tolerate an otherwise toxic dose when partitioned into fractional doses. If the body eliminates a toxic compound slowly, a low dose over a long period could result in accumulation of the toxic compound to a critical concentration. Exposure times may range from one day to a person's lifetime. In humans, the following criteria may be used to characterize exposure:

- Acute: 1 day
- Sub-acute: 10 days
- Sub-chronic: 2 weeks to 7 years
- Chronic: 7 years to lifetime

Once the toxic compound reaches the body organ, the toxic compound joins, or binds with a molecule or a group of molecules from a cell of a target organ, called an enzyme. The binding of the toxic compound interferes with the normal beneficial biochemical reactions of the human body or initiate abnormal metabolic reactions, resulting in adverse effect. The effects may be short term effects such as headaches or nausea. They can also be fatal.

The common way of classifying toxic effects from chemical exposure is through two broad categories: carcinogenic effects and non-carcinogenic effects. Carcinogenic compounds induce cancer while non-carcinogenic effects comprise all other effects. Carcinogenic compound can be further divided into genotoxic and non-genotoxic

compounds. Genotoxic carcinogens initiate and progress mutations necessary for the development of human cancer while non-genotoxic carcinogens speed up development of malignancy through immunosuppression. For non-carcinogenic compounds, human may exhibit developmental and reproduction effects from exposure to the compound such that actual impact is unknown until the latter stages of life.

Toxicity studies with laboratory animal or epidemiological studies of human populations provide the data used to develop toxicity criteria which determines the relationship between the exposure of the chemical compound to the nature and magnitude of the adverse health effects. For carcinogenic effects, numerical estimates of cancer potency, defined as cancer slope factor, determine the cancer risk due to constant lifetime exposure. Carcinogenic slope factors assume no threshold for effects such that exposure to any level of concentration is likely to produce a carcinogenic effect.

For non-carcinogens, reference dose is used as a health threshold. The reference dose is an estimate of a daily exposure to the human population including sensitive subgroups that is likely to be without an appreciable risk of deleterious effects during a lifetime of exposure.

Greenhouse Gases

Greenhouse gases do not have human health impacts like criteria or toxic pollutants. Rather, it is the increased accumulation of GHG in the atmosphere that may result in global climate change. Due to the complexity of conditions and interactions affecting global climate change, it is not possible to predict the implications on human health. The effects of global warming due to an increase in GHG in the atmosphere may lead to higher maximum temperatures, more hot days and heat waves, resulting in an increase in deaths and serious illness among older age groups and urban poor, increased risk of disease epidemics, increased stress in livestock and wildlife and increased risk of crop damage; more intense precipitation events resulting in increased soil erosion, flooding, landslide, mudslide and avalanche danger; and increased summertime drying resulting in decreased water quality and quantity, increased risk of foundation damage due to ground shrinkage and increased forest fires among other potential direct and indirect impacts to human health.

3.2.1.5 Current Emission Sources

The two broad categories of emission sources include stationary and mobile sources.

Stationary Sources

Stationary sources can be further divided between point and area sources.

Point Sources: Point sources are those that are identified on an individual facility or source basis, such as refineries and manufacturing plants. BAAQMD maintains a computer data bank with detailed information on operations and emissions characteristics

for nearly 4,000 facilities, with roughly 20,000 different sources, throughout the Bay Area. Parameters that affect the quantities of emissions are updated regularly.

Area Sources: Area sources are stationary sources that are individually very small, but that collectively make a large contribution to the inventory. Many area sources do not require permits from the BAAQMD, such as residential heating, and the wide range of consumer products such as paints, solvents, and cleaners. Some facilities considered to be area sources do require permits from the BAAQMD, such as gas stations and dry cleaners. Emissions estimates for area sources may be based on the BAAQMD data bank, calculated by CARB using statewide data, or calculated based on surrogate variables. Wood stoves are considered area sources.

Mobile Sources

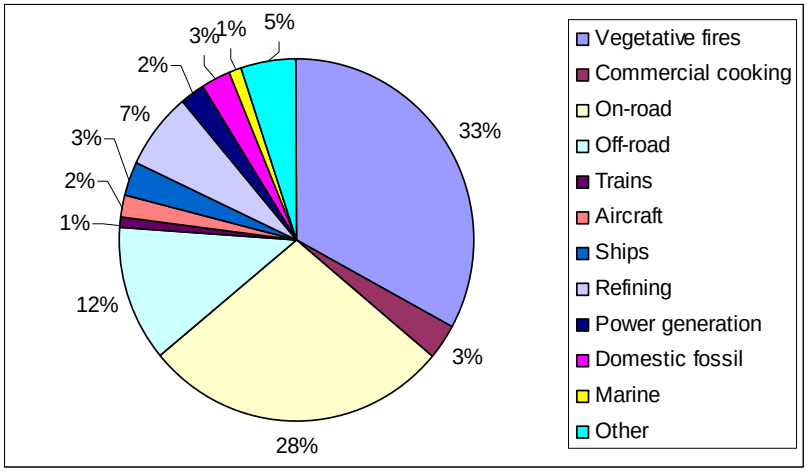
Mobile sources include on-road motor vehicles such as automobiles, trucks, and buses, as well as off-road sources such as construction equipment, boats, trains, and aircraft. Estimates of on-road motor vehicle emissions include consideration of the fleet mix (vehicle type, model year, and accumulated mileage), miles traveled, ambient temperatures, vehicle speeds, and vehicle emission factors, as developed from comprehensive CARB testing programs. The BAAQMD also receives vehicle registration data from the Department of Motor Vehicles. Some of these variables change from year to year, and the projections are based upon expected changes. Emissions from off-road mobile sources are calculated using various emission factors and methodologies provided by CARB and U.S. EPA.

3.2.1.6 Emissions From Wood Burning Devices

Wood-burning devices generate particulate matter. Combustion of wood also creates carbon dioxide, water vapor, carbon monoxide and volatile organic compounds, including toxic compounds. Partial or incomplete combustion, or burning wood that is not seasoned and dry, or burning garbage or other materials generates more particulate matter, carbon monoxide, and increases toxic compounds.

Residential wood combustion is an important contributor to ambient fine particle levels in the United States. District staff has identified wood smoke as the single greatest contributor on wintertime peak days (33 percent) to PM2.5 in the Bay Area, as shown in Figure 3.1.

FIGURE 3-1: PM2.5 Concentration on Peak Days by Constituent in the Bay Area.



Note: Smoke from residential wood burning constitutes nearly all of the vegetative fires category during peak periods. The other major contributors, agricultural and wildland management burns, are prohibited under District Regulation 5 during "no-burn" days, when peak concentrations occur.

Other studies find results and trends that support emission inventory estimates derived from the BAAQMD data. The California Air Resources Board (CARB) found (Magliano, 1999) that residential wood combustion makes up 20 percent to 35 percent of wintertime particulate matter.

To estimate the amount of particulate matter coming from wood-burning devices, including fireplaces, District staff used data from survey sample results from Bay Area residents. These results were then correlated with projected demographic trends from the Association of Bay Area Governments (ABAG), which were based on U.S. Census data, and used to arrive at the estimated number of devices. These data, along with an annual through-put (fuel load), also derived from survey results, and an emission factor were then used to generate a particulate matter 10 microns and below in diameter (PM10) estimate for each county in the Bay Area. These data are summarized in Table 3-7 in tons per day (tpd) and tons per year (tpy), for both PM10 and PM2.5.

TABLE 3-7: Summary of PM Emissions from Wood-Burning Devices by County

County	Wood Stove PM_{10} (tpd)	Fireplace PM_{10} (tpd)	Wood Stove $PM_{2.5}$ (tpd)	Fireplace $PM_{2.5}$(tpd)
Alameda	0.03	2.28	0.03	2.19
Contra Costa	0.76	4.32	0.73	4.15
Marin	1.03	0.37	0.99	0.36
Napa	0.33	0.41	0.32	0.39
San Francisco	0.03	0.28	0.03	0.27
San Mateo	0.38	0.70	0.36	0.67
Santa Clara	0.65	3.11	0.62	2.99
Solano	0.05	0.89	0.05	0.85
Sonoma	1.27	1.43	1.22	1.37
Total Emissions (tons per day)	**4.54**	**13.80**	**4.36**	**13.25**
Total Emissions (tons per year)	**1657**	**5037**	**1591**	**4836**

Because the category of PM10 also includes PM2.5, a large portion of PM10 particles are also PM2.5 particles. Therefore, the majority of particulate matter from wood smoke are fine particles which are of the greatest concern to public health.

Wood smoke emissions also has been found to contain numerous non-criteria pollutants, including toxic and carcinogenic air contaminants. These include formaldehyde and other aldehydes, chlorinated dioxins, and polyaromatic hydrocarbons (PAH). Among the PAH compounds present are pyrene, benzo(a)pyrene, benzo(e)pyrene, anthracene, fluoranthene, benzo(a)anthracene, benzofluoranthenes, and crysene.

Wood stoves emit greenhouse gases, including carbon dioxide and methane.

3.2.2 SIGNIFICANCE CRITERIA

3.2.2.1 Criteria Air Pollutants

The BAAQMD complies with the provisions of CEQA when they approve an individual project as lead agency or when they approve a regional project such as adoption of a rule or an air quality planning document. BAAQMD has established significance criteria, as discussed below. To determine whether or not air quality impacts from the proposed project are significant, impacts will be evaluated and compared to the significance criteria in Table 3-8. If impacts equal or exceed any of the following criteria, they will be considered significant.

Criteria air pollutants have a regional impact, meaning that the emissions have the potential to degrade the air quality in the Bay Area as a whole. The thresholds for ROG and NOx are equivalent to the BAAQMD offset requirement threshold (15 tons per year)

for stationary sources (Regulation 2-2-302). The threshold for PM10 is based on the BAAQMD's definition of a major modification to a major facility (Regulation 2-2-221). The carbon monoxide threshold is based on the potential of a project to exceed the state ambient air quality standard for CO, 9.0 ppm averaged over eight hours, or 20 ppm averaged over one hour.

TABLE 3-8: Air Quality Significance Thresholds for Project Operations

Significance Thresholds for Regional Impacts	
Pollutant	Significance Threshold
ROG	15 tons/yr; 80 lbs/day; 36 kg/day
NOx	15 tons/yr; 80 lbs/day; 36 kg/day
PM10	15 tons/yr; 80 lbs/day; 36 kg/day
CO	550 lbs/day

3.2.2.2 Non-Criteria Pollutants

Significance criteria for toxic air contaminants (TACs) are evaluated on a localized basis. The impacts of an increase in toxic air contaminants, unlike regional pollutants, may not be significant on a regional basis, but may be significant in their effect on populations located nearby the source. For this reason, significance criteria are based on the District's Risk Management Policy. Table 3.9 shows the significance thresholds for toxic air contaminants.

Table 3-9: Toxic Significance Thresholds for Project Operations

Significance Thresholds for Localized Impacts	
Pollutant	Significance Threshold
Toxic Air Contaminants (TACs)	Maximum Exposed Individual (MEI) Cancer Risk $\geq$ 10 in 1 million Hazard Index $\geq$ 1.0 at the MEI

3.2.2.3 Greenhouse Gases

The analysis of GHG is a much different analysis than the analysis of criteria pollutants. For criteria pollutants, significance thresholds are based on daily emissions because attainment or non-attainment is based on daily exceedances of applicable ambient air quality standards. Further, several ambient air quality standards are based on relatively short-term exposure effects on human health, e.g., one-hour and eight-hour. For non-criteria pollutants like toxic air contaminants, significance thresholds are based on risk to nearby receptors. The effects of GHG, however, are much longer term, affecting global climate over a relatively long time frame. In addition, GHG do not have health effects like criteria pollutants or toxic air contaminants. It is the increased accumulation of GHG in the atmosphere that may result in global climate change. Due to the complexity of conditions and interactions affecting global climate change, it is not possible to predict the specific impact, if any, attributable to GHG emissions associated with a single project.

While direct GHG emissions can, in some cases, be calculated, the emissions cannot be precisely correlated with specific impacts based on currently available science. Climate change is a global phenomenon, making it difficult to develop the scientific tools and policy needed to select a CEQA significance threshold for climate change or GHG emissions on a regional or local level. As there are currently no emission significance thresholds to assess GHG emission effects on climate change, neither the BAAQMD nor any other California lead agency currently has a "significance threshold" to determine whether a new rule or project will have a significant impact on global warming or climate change. In the absence of regulatory guidance, and before the resolution of various legal challenges related to global climate change analysis and the selection of significance thresholds, a significance determination will be made on a case-by-case basis.

3.2.3 ENVIRONMENTAL IMPACTS

3.2.3.1 Criteria Air Pollutants

The overall objective of the proposed project is to reduce PM10 and PM2.5 emissions from wood burning devices. Rule 6-3 would reduce emissions of criteria pollutants by prohibiting wood-burning devices in new construction unless they were EPA Phase II certified equipment or pellet stoves, restricting the sale or transfer of new or used wood burning devices to EPA Phase II certified equipment or pellet stoves, prohibiting the use of wood-burning devices during curtailment periods, and restricting materials burned in wood burning appliances.

To estimate the amount of PM coming from wood-burning devices, including fireplaces, Air District staff used data from survey sample results from Bay Area residents. These results were then correlated with projected demographic trends from the Association of Bay Area Governments (ABAG), which were based on U.S. Census data, and used to arrive at the estimated number of devices. These data, along with an annual through-put (fuel load), also derived from survey results, and an emission factor for each device were then used to generate an estimate for PM10 and PM2.5 in the Bay Area.

The remaining operational criteria pollutants, VOC, NOx, SOx and CO were estimated to demonstrate that, in addition to particulate matter, Rule 6-3 would reduce VOC, NOx, SOx and CO emissions. Table 3-10 illustrates the results.

Table 3-10: Emission Reductions due to Curtailment, tons per year

	PM2.5	VOC	NOx	SOx	CO
Wood Smoke Emissions	810	1300	200	19	6200
Emissions from Natural gas usage	1	1	10	0.1	4
Net Emission Reductions	810	1300	190	19	6200

3.2.3.2 Non-Criteria Pollutants

The project, proposed Rule 6-3, will reduce the emissions of toxic air contaminants. The proposed rule allows sale, transfer or installation of only EPA Phase II certified devices, these combust the unburned products of wood smoke, which include many TACs, in a more efficient manner than non-certified devices. Wood stoves or wood-burning fireplaces would be banned in newly constructed housing. Natural gas is a cleaner burning fuel than wood; therefore the installation or replacement of pre-EPA approved devices with natural gas appliances would reduce toxic emissions and prevent an increase in wood smoke emissions from new developments. Finally, the rule would prohibit wood burning on nights when the amount of particulate matter in ambient air would exceed 35 micrograms per cubic meter. This would reduce exposure of individuals to TACs associated with wood smoke. Rule 6-3 is expected to provide beneficial impacts on toxic air contaminants and related beneficial health impacts.

3.2.3.3 Greenhouse Gases

In general, GHG do not have human health effects like criteria pollutants. Rather, it is the increased accumulation of GHG in the earth's atmosphere that may result in global climate change. Due to the complexity of conditions and interactions affecting global climate change, it is not possible to predict the specific impact, if any, attributable to GHG emissions associated with a single project. Proposed Regulation 6, Rule 3 includes a provision that would prohibit burning on a night when the concentration of particulate matter in ambient air was predicted to exceed 35 μg/meter^3. To the extent that wood burning is used for heating, this could require the use of heat from other sources such as natural gas heaters on these curtailment nights. The NOP/IS suggested that the burning of fossil fuels such as natural gas rather than wood may increase greenhouse gas emissions. As explained below, there is some uncertainty about the GHG impacts of prohibiting wood burning on curtailment nights, but the most sophisticated life-cycle analyses of GHG emissions suggest that burning natural gas in relatively efficient furnaces produces lower GHG emissions than burning wood that has not been sustainably harvested.

Any analysis of GHG impacts must address a number of uncertainties and must rely on a variety of assumptions. For example, analysis of the use of wood as a fuel occasionally relies upon an assumption that wood burning is "carbon neutral," meaning that as trees are harvested for fuel, replacement trees sequester an equivalent amount of carbon dioxide so that, when measured over a period of time, there is no net increase in atmospheric carbon dioxide. However, more recent analyses of biofuels such as ethanol have suggested that the GHG emissions associated with their production and use may exceed GHG emissions from production and use of conventional fossil fuels when all

sources of GHG emissions – from land practices, to harvest, to transportation, to combustion – are included in the accounting.[1]

The primary determining factor in the GHG analysis for Rule 6-3 is whether burning wood is "carbon neutral," and, if not, whether burning wood in fireplaces and woodstoves produces lower GHG emissions than burning natural gas in furnaces. As a reference point, the District calculated a worst case scenario of the annual CO_2 increase from switching from wood to natural gas if wood burning is assumed to be completely carbon neutral. Assuming 100% compliance with the rule, and assuming that everyone who switches to natural gas on a "no burn" night would not otherwise use natural gas for heat, the result would be a 31,900 metric ton annual increase in CO_2. This figure would obviously be lower to the extent that there is less than 100% compliance or that a percentage of households were burning wood for ambiance and not for heat (the latter being a likely scenario for a large percentage of households).

Also for reference, the District compared this total carbon neutrality figure to the overall GHG inventory for the Bay Area and for the State. 31,900 metric tons is .03 % of the Bay Area total GHG inventory, and .007% of the total State GHG inventory. These percentages give some idea of the significance of a worst case GHG increase from 6-3 if carbon neutrality is assumed.

Although these figures may be useful reference points, available information indicates the carbon neutrality assumption is not valid for wood burning in the Bay Area. Since a switch from wood to natural gas on Rule 6-3 no-burn nights would increase GHG emissions only to the extent that either, (1) burning wood is carbon neutral (since burning natural gas is clearly not carbon neutral) or, (2) burning wood produces lower GHG emissions than burning natural gas, taking into account efficiency and other factors, and since neither is the case, it can safely be predicted that GHG emissions will not increase as a result of 6-3. In reaching this conclusion, the District reviewed available scientific literature and applied the most credible conclusions therein to information about the Bay Area obtained through published studies and data from a District-conducted survey.

In the winter of 2005 – 2006, a survey was conducted by a contractor to BAAQMD to estimate the amount and frequency of wood burning on winter nights in the Bay Area. The survey found that 4.5% of Bay Area households used (not just owned) wood stoves, and that 35.9% used fireplaces. Over the survey time period, conducted on days after cold winter evenings on which wood burning devices were used, the survey found that 45.3% of households that used wood stoves burned on the previous evening, and that 14.0% of fireplace users burned the previous evening. The survey also estimated a total number of logs burned, and found that, during the survey period, 319,115 logs were burned per day in fireplaces and 174,281 logs were burned per day in wood stoves.

[1] Fargione et al., "Land Clearing and the Biofuel Carbon Debt" *Science* 319, 1235 (2008); Searchinger et al., "Use of U.S. Croplands for Biofuels Increases Greenhouse Gas Emissions Through Emissions from Land Use Change" *Science* 319, 1238 (2008).

A limited number of studies address the GHG impacts of wood combustion. In general, earlier papers suggest that wood burning may be carbon neutral, while more recent papers qualify that assessment and either limit the CO_2 "credit" from sequestration by replacement trees or limit the circumstances under which wood combustion can be said to have GHG benefits over other fuels.

In a 1998 paper prepared for a U.S. EPA/Air and Waste Management Association conference, personnel from the Hearth Products Association, EPA, and OMNI-Test Laboratories, Inc., which tests appliances for the hearth products industry, summarized air quality impacts of various residential space heating options.[2] In reviewing GHG impacts, the authors state that "a reasonable estimate of the steady state condition produced by standard wood harvesting techniques is that 40% of the carbon produced by RWC is in the form of fixed carbon." By this, the authors meant that calculated CO_2 emissions for RWC (residential wood combustion) should be reduced by 40%, because young trees replace harvested trees and sequester an amount of carbon equal to 40% of the carbon emitted from burning the harvested wood. For their 40% figure, the authors cite a 1990 paper in Science[3] and a 1993 AWMA paper[4]. The 1990 Science paper concludes that conversion of old-growth forests to young fast-growing forests will not decrease atmospheric carbon dioxide because timber harvest reduces on-site carbon storage and does not approach old-growth storage capacity for at least 200 years. The 1993 AWMA paper states that wood burning for residential heating causes no net increase in atmospheric carbon dioxide if wood is sustainably harvested from properly-managed forests.

A much more sophisticated study prepared in 2003 for the Australian Greenhouse Office and Environment Australia concludes that burning wood for residential heating reduces GHG emissions relative to natural gas, but only under the scenarios examined in the study, which all involved sustainable firewood production systems. The three production systems were (1) collecting dead and fallen wood from remnant woodlands, (2) harvesting in a sustainably-managed native forest, and (3) harvesting in a new plantation planted on former agricultural land. No scenario involved production of wood through land clearing activities. Most importantly for present purposes, the study included a sensitivity analysis showing that, for wood collected from remnant woodlands, burning wood in an open fireplace has higher GHG emissions than burning natural gas. Specifically, the study concluded that burning wood from remnant woodlands in an open fireplace produces emissions of 0.70 kg CO_2/kW-hr, which is more than double the

[2] Houck, Crouch, Keithley, McCrillis, and Tiegs; Air Emissions from Residential Heating: The Wood Heating Option Put Into Environmental Perspective; The Proceedings of a US EPA and Air and Waste Management Association Conference: Emission Inventory: Living in a Global Environment,; v1, 373-384; 1998.

[3] M.E. Harmon, W.K. Ferrell, and J.E.Franklin, "Effects on Carbon Storage of Conversion of Old-Growth Forests to Young Forests," Science 247, 699 (1990).

[4] J.F. Gulland, O.Q. Hendrickson, "Residential Wood Heating: the Forests, the Atmosphere, and the Public Consciousness" Paper 93-RP-136.02 presented at the 86th Annual Meeting of the Air and Waste Management Association (1993).

emissions from producing heat from natural gas, for which emissions are 0.31 kg CO_2 /kW-hr.

Based on dealer advertising, the primary firewood sold in the San Francisco Bay Area is oak. Oak is both the most prevalent source of firewood and also the most desirable, due to burn qualities. Bay Area dealers often advertise tree service companies as the primary source of the wood. Oak has been harvested in significant quantities from California's remnant woodlands beginning with the advent of ranching in California. Oak woodlands have been reduced by about half since the 1800's.[5] From 1945 to 1973, most of the loss came from land clearing to support livestock production.[6] Since 1973, woodland loss is attributable to urban growth, firewood harvesting, range clearing, and conversion to intensive agriculture.[7] Between 1945 and 1985, oaks were cleared from 480,000 hectares in California.[8] A more recent threat to the oak woodlands has been the conversion of native habitat to vineyards.[9] This is occurring throughout Northern California on the periphery of the San Francisco Bay Area and in the foothills to the east of the Central Valley. In addition, the loss of oaks through Sudden Oak Death is primarily occurring in the San Francisco Bay Area, as fourteen counties are affected, including all nine Bay Area counties.[10]

Based on the Australian study discussed above and the available information about firewood used in the Bay Area, the imposition of no-burn requirements in the Bay Area is not expected to result in an increase in GHG emissions. Bay Area survey data shows that approximately two-thirds of the wood burned in the Bay Area is burned in fireplaces. According to the Australian study, GHG emissions from fireplace burning of wood gathered sustainably from remnant woodlands are more than double the GHG emissions from burning natural gas. Because oak firewood used in the San Francisco Bay Area comes largely from land clearing activities, GHG emissions from Bay Area wood burning would be expected to be even higher than those from the remnant woodland production system analyzed in the Australian study. This result should not be surprising because when a tree is harvested and not replaced, carbon dioxide is generated by burning the wood and, at the same time, an ongoing means of sequestering carbon is removed.

If no assumptions are made regarding carbon sequestration by trees, and wood and natural gas are compared purely on the basis of carbon dioxide produced per unit of heat

[5] Standiford et al., "The Bioeconomics of Mediterranean Oak Woodlands: Issues in Conservation Policy" Paper presented at the XII World Forestry Congress, Québec City, Canada (2003).
[6] Ibid.
[7] Ibid.
[8] C. Bolsinger, "The Hardwoods of California's Timberlands, Woodlands, and Savannas. U.S. Forest Service Resource Bulletin PNW-RB-148 (1988).
[9] A.M. Merenlender, C.N. Brooks, G.A. Giusti "Policy Analysis Related to the Conversion of Native Habitat to Vineyard: Sonoma County's Vineyard Erosion and Sediment Control Ordinance as a Case Study" (2000) Available from the University of California Integrated Hardwood Range Management Program at http://danr.ucop.edu/ihrmp/policy_paper.pdf.
[10] California Oak Mortality Task Force, Map: "Distribution of Sudden Oak Death as of February 14, 2008" (2008) Available from http://www.suddenoakdeath.org/html/maps.html.

energy delivered, burning natural gas on no-burn nights would produce lower GHG emissions than burning wood. Using the survey data, Table 3-11, below, compares the GHG emissions from wood-burning devices to the GHG emission that would be produced if the same amount of heat was produced by burning natural gas, as would be required on no burn nights. GHG emissions are reduced by a total of over 100,000 metric tons per year.

Table 3-11: GHG Emissions Direct Comparison, Wood Heat Replaced by Natural Gas Heat

Heat Value of Fuel, per curtailment day	GHG emissions; metric tons/yr
Wood; fireplaces, 2137.4 MM Btu useful heat	78,065
Wood; mfg. logs, 153.2 MM Btu useful heat	11,212
Wood, stoves, 8564.2 MM Btu useful heat	40,933
Wood; total, 3145 MM Btu useful heat input	130,210
Natural Gas; 3145 MM Btu useful heat input	29,419
Difference	(100,791)

Assumptions

- Efficiencies. This analysis uses a 10% heating efficiency factor for fireplaces, a 70% heating efficiency factor for wood stoves, and an 80% heating efficiency factor for a natural gas heater.
- Combustion efficiency. For these GHG emissions calculations, it is assumed that CO_2 emissions are the only GHG emissions from each type of combustion device.
- Number of no burn nights. Over the past five years, the average number of no burn nights was 17.1.
- Type of wood burned. The emissions estimates replace the Btu value of wood with natural gas combusted to get an equivalent Btu value. The Btu values used are based on the Btu value of red oak.

Even if one were to assume that emissions from wood burning should be reduced by 40% to account for carbon sequestration by trees, despite the lack of evidence to support such an assumption for the Bay Area, GHG emissions from burning wood would still be significantly higher than GHG emissions from burning natural gas to generate the same heat.

3.2.4 MITIGATION MEASURES

No significant adverse air quality impacts are anticipated from adoption of proposed Regulation 6, Rule 3: Wood-Burning Devices. No mitigation measures are required.

3.2.5 CUMULATIVE AIR QUALITY IMPACTS

The project, proposed Regulation 6, Rule 3: Wood-Burning Devices, does not have air quality impacts that are individually less than significant, but cumulatively significant. Adoption of the proposed rule will reduce emissions of particulate matter and other criteria air pollutants, toxic air contaminants and greenhouse gases.

3.2.6 CUMULATIVE MITIGATION MEASURES

No cumulatively significant adverse air quality impacts are anticipated from adoption of proposed Regulation 6, Rule 3: Wood-Burning Devices. No mitigation measures are required.

3.3 CONCLUSION

The project, proposed Regulation 6, Rule 3: Wood-Burning Devices, will have considerable environmental benefits. These include a reduction of peak concentrations of PM2.5, as well as a reduction in ozone forming volatile organic compounds, oxides of nitrogen, carbon monoxide, sulfur dioxide, and non-criteria pollutants, including toxic and carcinogenic compounds. Based on this analysis, an increase in greenhouse gas emissions is not anticipated.

CHAPTER 4

ALTERNATIVES

Discussion

4.0 ALTERNATIVES

4.1 DISCUSSION

An EIR is required to describe a reasonable range of feasible alternatives to the proposed project that could feasibly attain most of the basic project objectives and would avoid or substantially lessen any of the significant environmental impacts of the proposed project (CEQA Guidelines §15126.6(a)). As discussed in Chapter 3 of this EIR and the Initial Study (see Appendix A), the proposed new rule is not expected to result in significant impacts to any environmental resources including aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and traffic, and utilities service systems. Because no significant impacts have been identified for the proposed project, alternatives are not required to be analyzed in this EIR. The requirement to develop alternatives under CEQA Guidelines §15126.6 has been satisfied because no significant adverse impacts were identified for the proposed project. No further discussion of alternatives is required for this EIR.

CHAPTER 5

OTHER CEQA TOPICS

Relationship Between Short-Term and Long-Term Productivity
Significant Irreversible Environmental Changes
Growth-Inducing Impacts

5.0 OTHER CEQA TOPICS

5.1 RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM PRODUCTIVITY

An important consideration when analyzing the effects of a proposed project is whether it will result in short-term environmental benefits to the detriment of achieving long-term goals or maximizing productivity of these resources. Implementing Rule 6-3 is not expected to achieve short-term goals at the expense of long-term environmental productivity or goal achievement. The purpose of the proposed rule is to reduce emissions of particulate matter and visible emissions, particularly on winter nights when particulate matter concentrations could exceed the national health-based air quality standard for fine particulate matter with a diameter less than 2.5 microns. The proposed rule is expected to control air pollution from wood-burning stoves, fireplaces, and heaters, including wood pellet stoves. By reducing particulate matter and visible emissions, human exposure to air pollutants would also be reduced, providing long-term health benefits.

Implementing Rule 6-3 would not narrow the range of beneficial uses of the environment. Of the potential environmental impacts discussed in Chapter 3, no significant impacts to any environmental resource are expected. The beneficial air quality and health impacts associated with implementation of Rule 6-3 are expected to far outweigh any potential increase in CO_2 emissions. Existing programs are expected to provide long-term CO_2 emission decreases. Because no short-term environmental benefits are expected at the expense of long-term environmental goals being achieved, there is no justification for delaying the proposed action. The proposed project should be implemented now in order to meet the requirements of Senate Bill 656 (SB 656, Sher), adopted in 2003, as the District was required to develop a Particulate Matter Implementation Schedule in order to make progress toward attaining state and federal particulate matter standards. The District's wood burning program was identified in the District's Particulate Matter Implementation Schedule as one of the measures for enhancement and amendment. Rule 6-3 responds to that commitment. No short-term benefits at the expense of long-term impacts have been identified. In fact, the proposed project is expected to result in long-term emission reductions and long-term public health benefits.

5.2 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

CEQA requires an EIR to discuss significant irreversible environmental changes which would result from a proposed action should it be implemented. Irreversible changes include a large commitment of nonrenewable resources, committing future generations to specific uses of the environment (e.g., converting undeveloped land to urban uses), or enduring environmental damage due to an accident.

Implementation of the proposed rule is not expected to result in significant irreversible adverse environmental changes. Of the potential environmental impacts discussed in Chapter 3, no significant impacts to any environmental resource are expected. Air quality impacts are expected to be less than significant as implementation of proposed rule will result in overall emission reductions of PM10 and PM2.5. The rules would also result in a decrease in other criteria pollutants, toxic air contaminants and greenhouse gases.

Proposed Rule 6-3 is expected to result in long-term benefits associated with improved air quality even though the use of natural gas in the Bay Area is expected to increase. The project would result in reduced emissions of all pollutants, thereby improving air quality and related public health.

5.3 GROWTH-INDUCING IMPACTS

A growth-inducing impact is defined as the "ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." Growth-inducing impacts can generally be characterized in three ways. In the first instance, a project is located in an isolated area and brings with it sufficient urban infrastructure to result in development pressure being placed on the intervening and surrounding land. This type of induced growth leads to conversion of adjacent acreage to higher intensity uses because the adjacent land becomes more conducive to development and, therefore, more valuable because of the availability of the extended infrastructure.

A second type of growth-inducing impact is produced when a large project, relative to the surrounding community or area, affects the surrounding community by facilitating and indirectly promoting further community growth. The additional growth is not necessarily adjacent to the site or of the same land use type as the project itself. A project of sufficient magnitude can initiate a growth cycle in the community that could alter a community's size and character significantly.

A third and more subtle type of growth-inducing impact occurs when a new type of development is allowed in an area, which then subsequently establishes a precedent for additional development of a similar character (e.g., a new university is developed which leads to additional educational facilities, research facilities and companies, housing, commercial centers, etc.)

None of the above scenarios characterize the project in question. Rule 6-3 will control emissions from wood-burning devices and no new development would be required as part of the proposed new rule. The proposed project is part of the Particulate Matter Implementation Schedule developed by the District to comply with SB656 to accommodate making progress toward attainment of state and federal particulate matter standards. The proposed project would not change jurisdictional authority or responsibility concerning land use or property issues (Section 40716 of the California Health and Safety Code) and, therefore, is not considered to be growth-inducing.

CHAPTER 6

REFERENCES

6.0 REFERENCES

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6.2 ORGANIZATIONS AND PERSONS CONSULTED

The CEQA statues and Guidelines require that organizations and persons consulted be provided in the EIR. A number of organizations, state and local agencies, and private industry have been consulted. The following organizations and persons have provided input into this document.

Organizations

California Air Resources Board
Bay Area Air Quality Management District
South Coast Air Quality Management District

List of Environmental Impact Report Preparers

Bay Area Air Quality Management District
San Francisco, California

Environmental Audit, Inc.
Placentia, California

CHAPTER 7

ACRONYMS

ACRONYMS

ABBREVIATION	DESCRIPTION
AB	Assembly Bill
ABAG	Association of Bay Area Governments
AB2588	Air Toxic "Hot Spots" Information and Assessment Act
AB32	California's Global Warming Solutions Act of 2006
ATCM	Airborne Toxic Control Measure
ATHS	Air Toxics Hot Spots Program
BAAQMD	Bay Area Air Quality Management District
Btu/cord	British thermal units per cord
CalEPA	California State Environmental Protection Agency
CARB	California Air Resources Board
CAT	Climate Action Team
CEQA	California Environmental Quality Act
CH_4	Methane
CHP	California Highway Patrol
CO	Carbon monoxide
CO_2	Carbon dioxide
CPUC	California Public Utilities Commission
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control
EIR	Environmental Impact Report
EPS	Emissions Performance Standard
GHG	Greenhouse Gases
g/hr	grams per hour
H_2SO_4	Sulfuric Acid
HFCs	Haloalkanes
HNO_3	Nitric Acid
HWCL	Hazardous Waste Control Law
LPG	Liquefied petroleum gas
MACT	maximum achievable control technology
MEI	maximum exposed individual
MW-hr	Megawatt-hour
N_2	Nitrogen
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NFC	National Fire Codes
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NOP	Notice of Preparation
NOP/IS	Notice of Preparation/Initial Study
NOx	Nitrogen Oxide
NSR	New Source Review

O_2	Oxygen
O_3	Ozone
OES	Office of Emergency Services
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Office of Planning and Research
PFCs	Perfluorocarbons
PM2.5	particulate matter less than 2.5 microns equivalent aerodynamic diameter
PM10	particulate matter less than 10 microns equivalent aerodynamic diameter
ppb	parts per billion
pphm	parts per hundred million
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RMP	Risk Management Plan
ROG	Reactive Organic Gases
RWQCB	Regional Water Quality Control Board
SB97	California Senate Bill 97
SB 656	Senate Bill 656
SCAQMD	South Coast Air Quality Management District
SF_6	Sulfur Hexafluoride
SO_2	sulfur dioxide
SOx	sulfur oxide
STAT	Spare the Air Tonight
TACs	toxic air contaminants
TPD	Tons per Day
TPY	Tons per Year
U.S. EPA	United States Environmental Protection Agency
ug/m^3	micrograms per cubic meter
VOC	volatile organic compounds