5.9 Public Health

This section presents the methodology and results of a human health risk assessment performed to assess potential impacts and public exposure associated with airborne emissions from the construction and operation of the Lodi Energy Center (LEC). Section 5.9.1 introduces the subject of public health impact analysis for a power plant proposed in a California Energy Commission (CEC) Application for Certification (AFC). Section 5.9.2 describes the laws, ordinances, regulations and standards (LORS) relevant to potential public health impacts of such a project. Section 5.9.3 describes the potentially affected public health environment around the proposed project site. Section 5.9.4 discusses the environmental impacts from construction and operation of the power plant and associated facilities.

This public health section also describes project design features that keep potential impacts below public health-related thresholds of significance (e.g., the sole use of clean-burning natural gas in the gas turbines). Clean natural gas fuel, along with other design and operating aspects, will assure that the public health impacts of the LEC will be below the level of significance. Section 5.9.5 discusses potential cumulative public health impacts of the combined toxic air contaminant[1] (TAC) emissions from the proposed project, existing NCPA Lodi units that will continue to operate, and other projects, if any, in the process of obtaining Authority to Construct permits or reasonably known by the San Joaquin Valley Air Pollution Control District (SJVAPCD) to be entering the permitting process. Section 5.9.6 discusses mitigation measures as may be needed to reduce potentially significant impacts below a level of significance. Section 5.9.7 discusses the agencies involved in public health aspects of permitting and CEQA analysis for the proposed project, along with agency contact information. Section 5.9.8 describes public health-related permits for the LEC, and the schedule for obtaining those permits. Finally, Section 5.9.9 contains references cited or consulted in preparing this section.

5.9.1 Introduction

Air will be the dominant pathway for potential public exposure to non-criteria pollutants released by the LEC. Emissions to the air will consist primarily of combustion by-products produced by the combined-cycle gas turbine units. Potential health risks from combustion emissions will occur almost entirely by direct inhalation. To be conservative, additional pathways for dermal absorption, soil ingestion, home-grown vegetable consumption[2] and mother's milk ingestion were included in the health risk modeling. The health risk assessment was conducted in accordance with guidance established by the California Office of Environmental Health Hazard Assessment (OEHHA)[3], the California Air Resources Board (CARB)[4], and the SJVAPCD.[5]

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[1] Also called non-criteria pollutants.

[2] This non-standard pathway was included at the request of the SJVAPCD staff.

[3] OEHHA. Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, April 2005.

[4] CARB. Consolidated Table of OEHHA/CARB-Approved Risk Assessment Health Values, May 22, 2008 http://www.arb.ca.gov/toxics/healthval/healthval.htm.

[5] SJVAPCD. Guidance for Air Dispersion Modeling, January 2007.

LEC will use combined-cycle technology to minimize emissions of pollutants per unit of electric energy generated, and will use an optimized stack height to reduce ground-level concentrations of the emissions, thus reducing potential effects on public health. It is beyond the scope of this analysis to describe the public health benefits that derive from the generated electric power that is provided to homes, businesses, hospitals, and other societal institutions.

Combustion byproducts with established national and California ambient air quality standards (referred to as "criteria pollutants") are addressed in Section 5.1, Air Quality. Discussion of the potential health risks associated with these criteria pollutants is presented in this section. Human health risks potentially associated with accidental releases of stored hazardous materials at LEC (such as anhydrous ammonia) are discussed in Section 5.5, Hazardous Materials Handling.

5.9.2 Laws, Ordinances, Regulations and Standards

An overview of the regulatory process for public health issues is presented in this section. The relevant LORS that affect public health and are applicable to LEC are identified in Table 5.9-1. The compliance of the project with each of the LORS applicable to public health is also presented in this table.

TABLE 5.9-1
Laws, Ordinances, Regulations, and Standards for Public Health

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
Clean Air Act	Protect public health by limiting emissions and resulting exposure to air pollutants	U.S. Environmental Protection Agency (EPA) Region 9 CARB SJVAPCD	Based on acceptable risks shown in Section 5.9.4, computed in a health risk assessment that follows CARB/OEHHA and SJVAPCD guidelines, the project emission rates of non-criteria pollutants are acceptable. Emissions of criteria pollutants will be minimized by using efficient combined-cycle turbine technology and natural gas as the only fuel, and applying BACT to the facility, resulting in project ambient levels that would not exceed primary ambient air quality standards established to protect public health.
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Inform public at a facility of potential exposure to chemicals known to cause cancer or reproductive toxicity	OEHHA	Based on a health risk assessment that follows CARB/OEHHA and SJVAPCD guidelines, non-criteria pollutant emission rates and resulting doses and carcinogenic risks (see Section 5.9.4) will not exceed thresholds that require Proposition 65 exposure warnings.

TABLE 5.9-1
Laws, Ordinances, Regulations, and Standards for Public Health

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
40 CFR Part 68 (Risk Management Plan)	Public exposure to acutely hazardous materials	EPA Region 9 San Joaquin County Office of Emergency Services	As discussed in Section 5.5, Hazardous Materials Handling, a Risk Management Plan (RMP) is in place for the existing ammonia tank at the STIG facility. The RMP will be updated to include the LEC prior to commencement of facility operations.
Health and Safety Code, Article 2, Chapter 6.95, Sections 25531 to 25541; CCR Title 19 (Public Safety), Division 2 (Office of Emergency Services), Chapter 4.5 (California Accidental Release Prevention Program)	Public exposure to regulated substances	San Joaquin County Office of Emergency Services	As discussed in Section 5.5, Hazardous Materials Handling, a RMP is in place for the existing ammonia tank at the STIG facility. The RMP will be updated to include the LEC prior to commencement of facility operations.
Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Limit public exposure to toxic air contaminants based on a priority rating system.	SJVAPCD CARB	Non-criteria pollutant concentrations will not exceed acceptable levels, based on the emission inventory for the existing NCPA Lodi power plant and proposed for LEC, and previous SJVAPCD annual health risk assessment ratings per CARB/OEHHA guidelines.

5.9.3 Affected Environment

Because health risks from operation of LEC will be below public health significance criteria thresholds, no residential, workplace or sensitive receptors will be impacted. Sensitive receptors are locations where groups of individuals—including infants, children, the elderly and chronically ill—who may be more susceptible than the general population to health risks from air pollution may be found. Schools, day-care facilities, convalescent homes and hospitals are of particular concern. In accordance with guidance from the CEC,[6] a search was conducted for sensitive receptors within 3 miles of the LEC site. Daycare, preschool, and school receptors found within 3 miles are listed in Appendix 5.9A, Tables 5.9A-1 and 5.9A-2, with their Universal Transverse Mercator coordinates, and as shown in Appendix 5.9A, Figures 5.9A-1 and 5.9A-2.[7] The combined set of all sensitive receptors is shown on Figure 5.9-1, and in more detail on the scale of 1:24,000 in Appendix 5.9A, Figure 5.9A-3. The figure shows no public health impacts because indices of cancer risk and non-cancer chronic and acute health hazards are less than significant at and beyond the project boundary (see Section 5.9.4).

[6] Personal communication from Michael Ringer, CEC staff to Eric Walther, January 29, 1999.

[7] No nursing homes or hospitals were found within 3 miles of the facility.

The nearest residences to the LEC site are approximately 0.75 mile to the north. Additional residences to the northwest and southwest are between one and two miles from the plant site (see Figure 5.9-2).

Beneficial aspects of the LEC regarding protection of public health include the following:

- Use of clean-burning natural gas fuel.
- Low-sulfur content of the natural gas, which reduces sulfate fine particulate and sulfur dioxide (SO_2) generation.
- Advanced combined-cycle and Rapid Response combustion gas turbine technology to minimize the amount of fuel and associated combustion emissions needed to produce electricity.
- Selective catalytic reduction (SCR) technology to control nitrogen oxides (NO_x) emissions.
- Oxidation catalyst technology to control carbon monoxide (CO) emissions, and to reduce emissions of various TACs.
- Optimized stack height to reduce ground-level concentrations of exhaust pollutants below public health-related significance thresholds.

Air quality and health risk data presented by CARB in the 2008 Almanac of Emissions and Air Quality for the San Joaquin Valley Air Basin show that over the period 1990 through 2005, the average concentrations for the top ten TACs have been substantially reduced, and the associated health risks for the San Joaquin Valley Air Basin are showing a steady downward trend as well. CARB-estimated emissions inventory values for the top ten TACs for 2006 and ambient levels and associated potential risks are presented in Table 5.9-2 for the air basin.

A variety of studies have been published regarding cancer and respiratory illnesses and diseases in San Joaquin County and in the broader San Joaquin Valley area. Asthma diagnosis rates in the San Joaquin Valley are higher overall than average rates throughout the state. In San Joaquin County, the percentage of adults who have been diagnosed with asthma has increased from 12.1% in 2001 to 16.1% in 2005.[8] Rates for children are slightly higher, at 16.4% in 2005.[9] Cancer death rates in the county have remained relatively constant between 1999/2000 and 2003/2005, slightly above the statewide average of 180 per 100,000 population.[10,11] The local public health department, San Joaquin County Public Health Services, directed the applicant to the department's epidemiology website for information regarding public health issues for residents in the vicinity of the proposed power plant site.[12]

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[8] Healthier San Joaquin County Community Assessment – 2008.

[9] Great Valley Center, "The State of the Great Central Valley of California—Assessing the Region Via Indicators—Public Health and Access to Care," Second Edition, 2007.

[10] Great Valley Center, "The State of the Great Central Valley of California—Assessing the Region Via Indicators—Public Health and Access to Care," January 2003.

[11] Great Valley Center, 2007, op cit.

[12] http://www.sjcphs.org/Disease/Epidemiology.htm

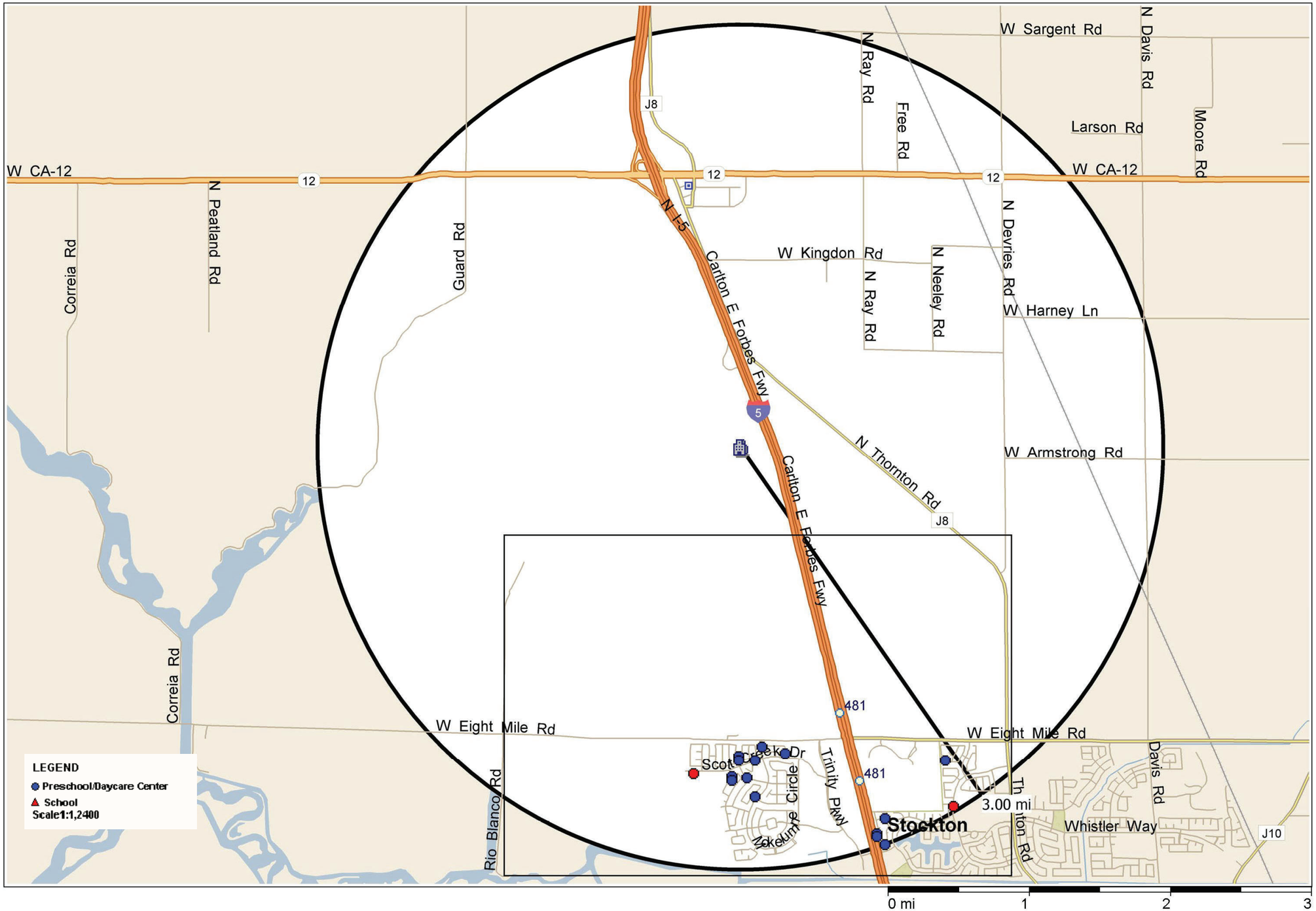


FIGURE 5.9-1
LOCATIONS OF SENSITIVE RECEPTORS
LODI ENERGY CENTER
LODI, CALIFORNIA

LEGEND

- House
- Houses and Shopping Center
- Park
- Proposed Plant Site
- One Mile Buffer

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 1,400 2,800
Feet

FIGURE 5.9-2
NEAREST RESIDENTS
LODI ENERGY CENTER
LODI, CALIFORNIA

CH2MHILL

SAC\\ZION\SACGIS\PROJ\LODIENERGYCENTER_371322\MAPFILES\LEC_RESIDENCES2.MXD MHASKELL 8/25/2008 13:34:05

TABLE 5.9-2
Top Ten TACs Emitted by All Sources in the San Joaquin Valley Air Basin

TAC	2006 Emissions (tons/year)	2006 Levels and Risks	
		Annual Average Concentration (ppbv)	Potential Carcinogenic Risk (in 1 million)
Acetaldehyde	1,761	1.3	6
Benzene	1,789	0.36	34
1,3-Butadiene	503	0.07	26
Carbon tetrachloride	0	0.10 (2003)	26 (2003)
Chromium, hexavalent	0.22	0.05 ng/m^3	8
Para-Dichlorobenzene	147	0.15	10
Formaldehyde	4,396	2.8	20
Methylene chloride	429	0.11	<1
Perchloroethylene	588	0.03	1
Diesel PM	7,695	1.3 $\mu g/m^3$ (2000)	390 (2000)

Source: CARB. The California Almanac of Emissions and Air Quality, 2008 Edition, http://www.arb.ca.gov/aqd/almanac/almanac08/almanac2008all.pdf

$\mu g/m^3$ = micrograms per cubic meter
ng/m^3 = nanograms per cubic meter
ppbv = parts per billion by volume

5.9.4 Environmental Analysis

This section is organized to discuss the sources and different kinds of air emissions associated with construction and operation of LEC (see Section 5.1, Air Quality), the methodology used in health risk assessment, and the results of the assessment of potential health risks from the project. Other potential public health risks associated with the project are discussed in different sections of the AFC as follows:

- Potential exposure to wastes generated by the project is discussed in Section 5.14, Waste Management.
- Potential exposure to the hypothetical accidental release of anhydrous ammonia onsite or during offsite transport is discussed in Section 5.5, Hazardous Materials Handling.
- Potential safety and health impacts relative to the work environment of project employees are discussed in Section 5.16, Worker Health and Safety.
- Potential exposure to transmission line electric and magnetic fields is discussed in Section 3.3, Transmission System Safety and Nuisance.

Project emissions to the air will consist of combustion by-products from the natural gas-fired turbine and the auxiliary boiler, and of particulate matter from cooling tower drift. After dispersion to ground-level, inhalation is the main pathway by which air pollutants can potentially cause public health impacts. Other pathways, including ingestion of soil, homegrown vegetables, and mother's milk, and dermal absorption, also are evaluated for potential exposure. As discussed below, these health risks are not significant.

To evaluate potential health risks, the measures of these risks are first described in terms of the types of public health effects and the significance criteria and thresholds for those effects.

5.9.4.1 Significance Criteria

Significance criteria exist for both carcinogenic and non-carcinogenic risks, and are discussed separately.

5.9.4.1.1 Cancer Risk

Cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are assumed to have no threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (i.e., a linear, no-threshold model). Under state and SJVAPCD regulations, an incremental cancer risk greater than 10-in-one million due to a project is considered to be a significant impact on public health if the emitting units are determined by the District to be using Toxics Best Available Control Technology (T-BACT).[13] The 10-in-one-million risk level is also used by the Air Toxics "Hot Spots" (AB 2588) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

5.9.4.1.2 Non-Cancer Health Impact

Non-cancer health effects can be either long-term (chronic) or short-term (acute). In determining potential non-cancer health risks from air toxics, it is assumed there is a dose of the TAC below which there would be no impact on human health. The air concentration corresponding to this dose is called the Reference Exposure Level (REL). A non-cancer health impact is measured in terms of a health hazard quotient for each TAC, which is the calculated maximum exposure (concentration) of each TAC divided by its REL. Health hazard quotients for TACs affecting the same target organ are typically summed with the resulting totals expressed as health hazard indices for each organ system. A health hazard index of less than 1.0 is considered to be a less-than-significant health risk.

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure, caused by chemicals accumulating in the body. Because chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The lowest no-effect chronic exposure level for a non-carcinogenic air toxic is the chronic REL. Below this threshold, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation. The chronic health hazard index was calculated as the sum of the chronic health hazard quotients, each of which is calculated as the chronic TAC annual concentration divided by the chronic REL of the TAC.

Acute toxicity is defined as adverse health effects caused by a brief chemical exposure of no more than 24 hours. For most chemicals, the air concentration required to produce acute effects is higher than the level required to produce chronic effects because the duration of exposure is shorter. Because acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures, all acute health hazard quotients are typically summed to calculate the acute health hazard index. The maximum one-hour average

[13] The threshold would be 1 in one million if the emitting units were determined not to be applying T-BACT.

concentration of each TAC with acute health effects is divided by the specific TAC's acute REL to obtain a health hazard quotient for health effects caused by relatively high, short-term exposure to air toxics. An additional conservative procedure in this health risk assessment is that the health hazard quotients for all TACs having potential acute impacts were summed regardless of target organ. This method leads to an upper bound assessment. RELs used in the hazard index calculations were those published in the CARB/OEHHA listings dated May 2008.

5.9.4.2 Construction Impacts

Construction of LEC is expected to take approximately 24 months. No significant public health effects are expected during construction. Strict construction practices that incorporate safety and compliance with applicable LORS will be followed. In addition, mitigation measures to reduce air emissions from construction impacts will be implemented as described in Section 5.1.

Temporary air emissions from construction are presented in detail in Appendix 5.1E, followed by a criteria pollutant air dispersion analysis that demonstrates ambient air quality standards will not be exceeded by construction of the project. The dominant emission with potential health risk is Diesel particulate matter (DPM) from combustion of Diesel fuel in construction equipment (e.g., cranes, dozers, excavators, graders, front-end loaders, backhoes). DPM emissions from construction are summarized in Table 5.9-3.

TABLE 5.9-3
Maximum Construction DPM Emissions

Emitting Activity	Pounds per Day	Tons per Year
Construction Equipment	4.5	0.4

The detailed HRA calculations in Appendix 5.1D demonstrate that the potential cancer risk of DPM emissions during project construction will exceed the significance threshold of 10 in one million, based on adjusting the 70-year lifetime risk for a period of 9 years in accordance with OEHHA (2003) guidance. The resulting maximum cancer risk would be approximately 24 in one million. The area in which the 10 in one million risk level barely extends beyond the construction and laydown/parking areas and does not include any residences or sensitive receptors (see Figure 5.9-3).

Ambient air modeling for PM_{10}, CO, SO_2, and NO_2 was performed as described in Section 5.1.5.3 and Appendix 5.1D. Construction-related emissions are temporary and localized, resulting in no long-term significant impacts to the public.

Small quantities of hazardous waste may be generated during the life of the project. Hazardous waste management plans will be in place so the potential for public exposure is minimal. Refer to Section 5.14, Waste Management, for more information. No acutely hazardous materials will be used or stored on-site during construction (see Section 5.5, Hazardous Materials Handling). To assure worker safety during construction, safe work practices will be followed (see Section 5.16, Worker Health and Safety).

5.9.4.3 Operations Impacts

Potential human health impacts associated with LEC result from exposure to air emissions from operation of the natural gas-fired combined-cycle unit and auxiliary boiler and, to a much lesser extent, the cooling tower. The non-criteria pollutants emitted from the project include certain volatile organic compounds and polycyclic aromatic hydrocarbons (PAHs) from the combustion of natural gas and ammonia from the SCR NOx control systems. These pollutants are listed in Table 5.9-4, and the detailed emission summaries and calculations are presented in Appendix 5.1D.

Emissions of criteria pollutants will not cause violations of the national or California ambient air quality standards as discussed in Section 5.1, Air Quality. The project will include Best Available Control Technology (BACT) as required under SJVAPCD rules.

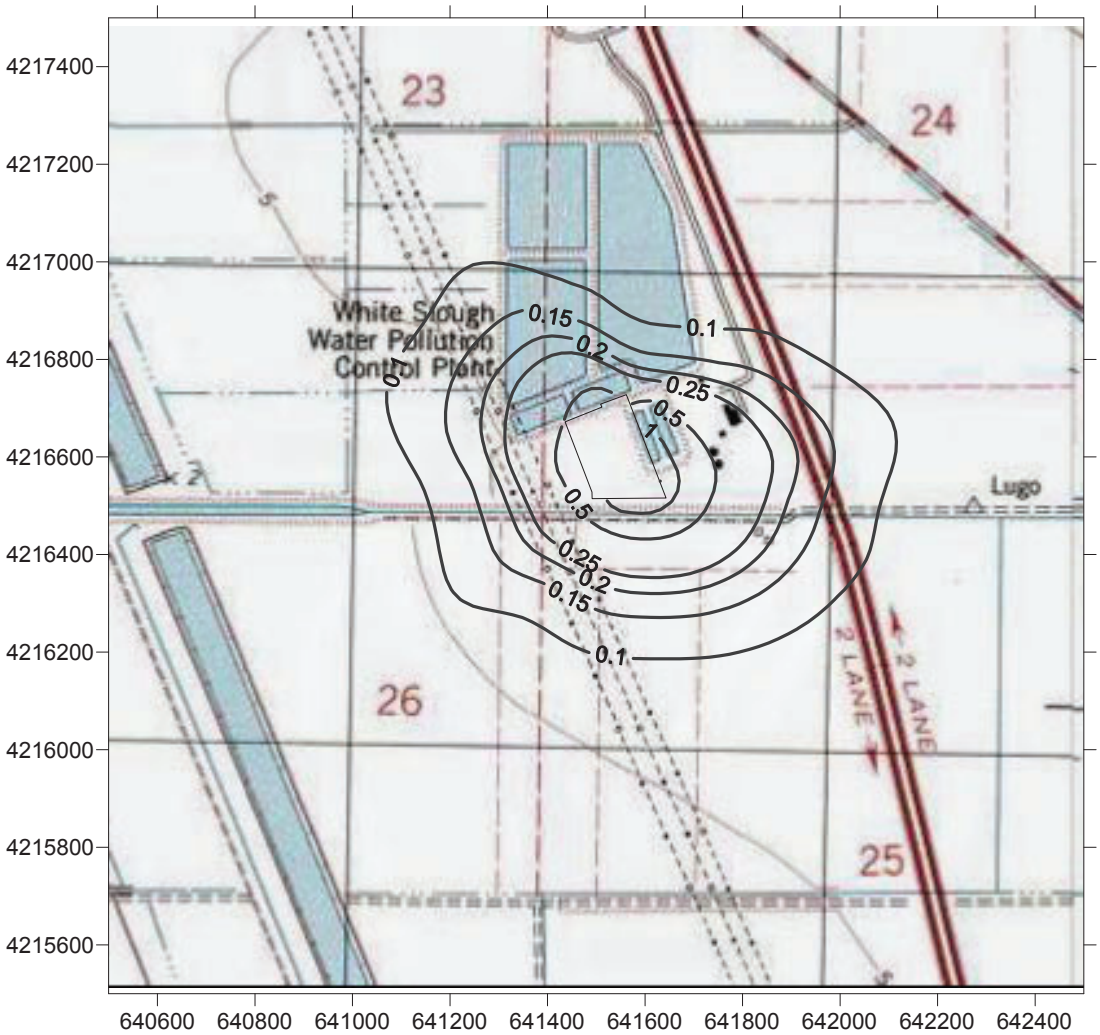
TABLE 5.9-4
Pollutants Emitted to the Air from Lodi Energy Center

Criteria Pollutants	**Non-criteria Pollutants (Continued)**
Carbon monoxide	Hexane
Oxides of nitrogen	Naphthalene
Particulate matter	Propylene
Oxides of sulfur	Propylene oxide
Volatile organic compounds	Toluene
	Xylene
Non-criteria (Toxic) Pollutants	Hexane
Ammonia	PAHs
Acetaldehyde	Benzo(α)anthracene
Acrolein	Benzo(α)pyrene
1,3-Butadiene	Benzo(β)fluoranthene
Benzene	Benzo(k)fluoranthene
Dichlorobenzene	Chrysene
Ethylbenzene	Dibenz(a,h)anthracene
Formaldehyde	Indeno(1,2,3-cd)pyrene

Air dispersion modeling results (see Section 5.1.5) show that emissions will not result in ambient concentrations of criteria pollutants that exceed ambient air quality standards, with the exception of the state PM_{10} and federal $PM_{2.5}$ standards. For these pollutants, existing 24-hour and annual average PM_{10} and $PM_{2.5}$ background concentrations already exceed ambient standards, while the project would not add a significant contribution. These standards are intended to protect the general public with a wide margin of safety. Therefore, the project will not have a significant impact on public health from emissions of criteria pollutants.

The health risk assessment presented in this section was implemented using the latest version (1.4) of the CARB's Hotspots Analysis and Reporting Program (HARP) model, and associated guidance.[14]

[14] OEHHA. Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, August 2003; and SDAPCD. Supplemental Guidelines for Submission of Air Toxics "Hot Spots" Program Health Risk Assessments (HRAs), March 2005.



Concentrations are shown in µg/m^3.

Cancer risk exceeds 10 in one million where modeled concentration exceeds approximately 0.2 µg/m^3.

FIGURE 5.9-3
MAXIMUM ANNUAL AVERAGE DIESEL PM IMPACTS DURING CONSTRUCTION ACTIVITIES
LODI ENERGY CENTER
LODI, CALIFORNIA

5.9.4.4 Public Health Impact Study Methods

Emissions of non-criteria pollutants from the project were estimated using emission factors approved by the SJVAPCD, CARB, and EPA. Air dispersion modeling combined the emissions with site-specific terrain and meteorological conditions to estimate short-term and long-term arithmetic mean concentrations in air for use in the health risk assessment. The EPA-recommended air dispersion model, AERMOD, was used along with five years (2000-2004) of compatible meteorological data assembled and provided by the staff of the SJVAPCD. The meteorological data combined surface measurements made at Stockton Metropolitan Airport with upper air data from Oakland Airport. Because HARP is built on a previous EPA-approved air dispersion model, Industrial Source Complex Short Term, Version 3 (ISCST3), a special method was used to integrate the air dispersion modeling output from the required air dispersion model, AERMOD, with the risk calculations in the HARP risk module.[15] The following paragraphs describe the procedures used to prepare this risk assessment.

5.9.4.4.1 Modeling Inputs

In order to use AERMOD modeling results with the HARP model, the following adjustments were made:

- The risk assessment module of the HARP model was run using unit ground level impacts (1 $\mu g/m^3$) as the input concentration for each TAC to obtain derived cancer risks for each TAC;[16]
- Cancer risks were obtained from the HARP model for the Derived (OEHHA) Method (for residential exposure) and the Derived (Adjusted) Method (for worker exposure);
- The HARP model output was cancer risk by pollutant and route for each type of analysis, based on an exposure of 1.0 $\mu g/m^3$ (i.e., individual TAC cancer risks are expressed by the HARP model in units of risk per $\mu g/m^3$ of exposure);
- To calculate the total risk for the project, the annual average emission rate in g/s for each TAC and each individual equipment unit were multiplied by the individual cancer risk output from the HARP model for that TAC in $(\mu g/m^3)^{-1}$; and
- The resulting weighted cancer risks for each TAC in units of (risk-g/s)/($\mu g/m^3$) were then summed for the emitting unit (see Appendix 5.1D, Tables 5.1D-2 and 5.1D-4), and the weighted totals were used as inputs to the AERMOD model as described below.

An identical approach was used to determine the acute and chronic health impacts associated with the project (see Air Quality Appendix 5.1D, Tables 5.1D-3 and 5.1D-5).

5.9.4.4.2 Risk Analysis Method

The screening analysis for the criteria pollutant modeling analysis was performed using the AERMOD model, the 2000 through 2004 Stockton meteorological data, specific receptor grids, and the stack parameters for operating cases at three different ambient temperatures.

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[15] Although CARB has recently provided an "on-ramp" designed to allow HARP to be used with AERMOD, the software was considered too new to use in this analysis.

[16] Procedure is described in Part B of Topic 8 of the HARP How-To Guides: How to Perform Health Analyses Using a Ground Level Concentration.

The results of the screening modeling analysis (see Section 5.1, Air Quality) were used to determine the maximum impact operating conditions in modeling the annual and 1-hour averaging periods, and these modeling results were used in determining cancer risk and chronic HHI, and acute HHI, respectively. The total weighted risk "rate" for each equipment unit, as described in the previous section, was used in place of emission rates in the modeling analysis. The weighted risk "rates" used for the HRA modeling are summarized in Appendix Table 5.1D-6. The value then calculated by the AERMOD model was the total risk at each receptor.

Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of potential lifetime cancer risk (for carcinogenic substances), or comparison with RELs for non-cancer health effects (for non-carcinogenic substances).

Health risks were evaluated for a hypothetical maximum exposed individual (MEI) located at the Point of Maximum Impact (PMI). Human health risks associated with emissions from the project are unlikely to be higher at any other location than at the PMI. If there is no significant impact associated with concentrations in air at the PMI location, it is assumed to be unlikely that there would be significant impacts in any other location. The Maximally Exposed Individual Resident (MEIR) is an individual assumed to be located at the MEIR point (i.e., a residential receptor) where the highest concentrations of air pollutants associated with facility emissions are predicted to occur, based on air dispersion modeling.

Health risks potentially associated with concentrations of carcinogenic pollutants in air were calculated as estimated excess lifetime cancer risks. The total carcinogenic risk at any specific location is found by summing the contributions from each carcinogen.

Potential non-cancer health effects from exposure to short-term and long-term concentrations in air were evaluated by comparing modeled concentrations in air with the RELs. An REL is a concentration in air at or below which no adverse health effects are anticipated. RELs are based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential non-cancer effects were evaluated by calculating a ratio of the modeled concentration in air and the REL. This ratio is referred to as a hazard quotient. The inhalation cancer potency factors and RELs used to characterize health risks associated with modeled concentrations in air are taken from the *Consolidated Table of OEHHA/CARB Approved Risk Assessment Health Values* (CARB, May 22, 2008) and are presented in Table 5.9-5.

TABLE 5.9-5
Toxicity Values Used to Characterize Health Risks

Toxic Air Contaminant	Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Chronic Reference Exposure Level ($\mu g/m^3$)	Acute Reference Exposure Level ($\mu g/m^3$)
Acetaldehyde	0.010	9.00	—
Acrolein	—	0.06	0.19
Ammonia	—	200	3,200
Benzene	0.10	60	1,300
1,3-Butadiene	0.60	20	—
Ethylbenzene	0.0087	2,000	—
Formaldehyde	0.021	3.0	94
Hexane	—	7,000	—
Naphthalene	0.12	9.0	—
PAHs (as BaP for HRA)	3.9	—	—
Propylene	—	3,000	—
Propylene oxide	0.013	30	3.100
Toluene	—	300	37,000
Xylene	—	700	22,000

Source: CARB/OEHHA, May 22, 2008.

5.9.4.5 Characterization of Risks from Toxic Air Pollutants

The estimated potential maximum cancer risk associated with concentrations in air estimated for the MIR location is shown in Table 5.9-6. The maximum carcinogenic risk is well below the 10×10^{-6} threshold of significance for emitting units determined by the District to be applying T-BACT.

TABLE 5.9-6
Summary of Potential Health Risks

Receptor	Carcinogenic Risk [a] (per million)	Cancer Burden	Acute Health Hazard Index	Chronic Health Hazard Index
Maximum Incremental Cancer Risk (MICR) at PMI	0.43	0	0.05	0.008
Maximally Exposed Individual Worker [b] (MEIW)	0.045		n/a	n/a
Significance Level	10	1.0	1.0	1.0

[a]Derived (Adjusted) Method used to determine significance of modeled risks.

[b]The worker is assumed to be exposed at the work location 8 hours per day, instead of 24, 245 days per year, instead of 365, and for 40 years, instead of 70. Therefore, a 70 year-based chronic HHI is not applicable to a worker.

Cancer risks potentially associated with the project also were assessed in terms of cancer burden. Cancer burden is a hypothetical upper-bound estimate of the additional number of cancer cases that could be associated with emissions from the project. Cancer burden is

calculated as the maximum product of any potential carcinogenic risk greater than 1 in one million and the number of individuals at that risk level. Because the MICR is less than 1 in one million, the potential cancer burden is zero. If the potential MICR had substantially exceeded 1 in one million, then the worst-case estimate of cancer burden would have been calculated based on the assumptions described below.

The MICR concentration would have been applied to all affected portions of identified census tracts within the radius area defined by the distance to the 1st high (MIR) concentration. A detailed listing and map of affected census tracts and year 2000 population estimates would then have been provided. Figures would then have been presented to show the 1-, 2-, and 3-mile radius plots in relationship to the census tract locations and site. This procedure, if it had been needed, would have resulted in a conservatively high estimate of cancer burden. However, as described above, because the calculated MICR for the project is less than 1 in one million, this procedure is not required.

By definition, human health risks associated with emissions from the project cannot be higher elsewhere than at the location of the MICR. Therefore, the potential cancer risk elsewhere also would be lower than the maximum listed in Table 5.9-6. Because the potential cancer burden listed in Table 5.9-6 is less than one, the emissions from the project would not be associated with any increase in cancer cases in the previously defined population.

The maximum potential acute non-cancer health hazard index associated with concentrations in air is shown in Table 5.9-6. The acute non-cancer health hazard index for all target organs falls below 1.0, the threshold of significance.

Similarly, the maximum potential chronic non-cancer health hazard index associated with concentrations in air is shown in Table 5.9-6. The chronic non-cancer health hazard index falls below 1.0, the threshold of significance.

The estimates of cancer and non-cancer risks associated with chronic or acute exposures fall below thresholds used for regulating emissions of toxic air contaminants to the air. Historically, exposure to any level of a carcinogen has been considered to have a finite risk of inducing cancer. In other words, there is no threshold for carcinogenicity. Because risks at low levels of exposure cannot be quantified directly by either animal or epidemiological studies, mathematical models have estimated such risks by extrapolation from high to low doses. This modeling procedure is designed to provide a highly conservative estimate of cancer risks based on the most sensitive species of laboratory animal for extrapolation to humans (i.e., the assumption being that humans are as sensitive as the most sensitive animal species). Therefore, the true risk is not likely to be higher than risks estimated using inhalation cancer potency factors and is most likely lower, and could even be zero (EPA, 1986; EPA, 1996).

The analysis of potential cancer risk described in this section employs methods and assumptions generally applied by regulatory agencies for this purpose. Given the importance of assuring public health, these methods and assumptions are highly conservative. Conservative methodology and assumptions are outlined below.

- The analysis includes representative weather data over a period of five years to assure that the least favorable conditions producing the highest ground-level concentration of power plant emissions are included.
- LEC is assumed to operate at hourly, daily, and annual emission conditions that produce the highest ground-level concentrations.
- The location of the highest ground-level concentration of LEC emissions is identified and the analysis then assumes that a sensitive individual resides at this location constantly over the entire 70-year period.

Taken together, these methods and assumptions create a scenario that cannot exist in the real world. For example, if the worst-case weather conditions occur on a winter evening, but the worst-case emission rates occur on a summer afternoon, the analysis nonetheless assumes that these events occur at the same time. The point of using these unrealistic assumptions is to consciously overstate the potential impacts. No one individual will experience exposures as great as those assumed for this analysis. By determining that even this highly overstated exposure will not be significant, the analysis enables a high degree of confidence that the much lower exposures that actual persons will experience will not result in any significant increase in cancer risk. In short, the analysis assures that there will not be any significant public health impacts at any location, under any weather condition, under any operating condition.

A separately transmitted compact disc contains the HRA modeling input and output files.

5.9.4.6 Hazardous Materials

Hazardous materials will be used and stored at the LEC site. The hazardous materials stored in significant quantities on-site and descriptions of their uses are presented in Section 5.5. Use of chemicals at the project site will be in accordance with standard practices for storage and management of hazardous materials. Normal use of hazardous materials, therefore, will not pose significant impacts to public health. While mitigation measures will be in place to prevent releases, if an accidental release migrated offsite, potential impacts to the public could result.

The California Accidental Release Program (CalARP) regulations and Code of Federal Regulations (CFR) Title 40 Part 68 under the Clean Air Act establish emergency response planning requirements for acutely hazardous materials. These regulations require preparation of an RMP, which is a comprehensive program to identify hazards and predict the areas that may be affected by a release of a program-listed hazardous material. Anhydrous ammonia is currently stored and used at the existing STIG plant and no new ammonia storage facilities will be constructed as part of the project. The existing RMP will be revised to include LEC.

5.9.4.7 Operation Odors

A small amount of ammonia used to control NO_x emissions can "slip" past the SCR catalyst and be emitted from the exhaust stack, but this amount is less than that required to produce an odor off site. The expected exhaust gas ammonia concentration, known as ammonia "slip," will be less than 10 ppmv. After mixing with the atmosphere, the concentration at ground level will be far below the detectable odor threshold of 5 ppmv that the Compressed

Gas Association has determined to be acceptable, as well as being below the ACGIH[17] TLV[18] and STEL[19] values of 25 and 35 ppm respectively (adopted 2003). Therefore, potential ammonia emissions would not create a significant odor. Other combustion contaminants are not present at concentrations that could produce a significant odor.

5.9.4.8 Electromagnetic Field Exposure

LEC will connect to the existing NCPA switchyard next to the existing NCPA power plant. The project will include additional onsite electric power handling transformers and associated equipment, which are discussed in more detail in Section 3.0. Based on recent findings of the National Institute of Environmental Health Sciences (NIEHS, 1999), electromagnetic field exposures from the electric power handling equipment would not result in a significant impact on public health. The NIEHS report to the U.S. Congress found that "the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm"(NIEH 1999).

5.9.4.9 Summary of Impacts

Results from the health risk assessment based on emissions modeling indicate that there will be no significant incremental public health risks from construction or operation of the proposed project. Results from criteria pollutant modeling for routine operations indicate that potential ambient concentrations of NO_2, CO, SO_2, and PM_{10} would not exceed ambient air quality standards, with the exception of the state PM_{10} and $PM_{2.5}$ standards. For these pollutants, existing 24-hour and annual average PM_{10} and $PM_{2.5}$ background concentrations already exceed applicable standards, while the project would not add a significant contribution. The ambient air quality standards protect public health with a margin of safety for the most sensitive subpopulations (Section 5.1).

5.9.5 Cumulative Effects

An analysis of potential cumulative air quality impacts that may result from the LEC and other reasonably foreseeable projects is required by the CEC. The following requirements for other projects to qualify for cumulative air quality impact analysis were submitted to the SJVAPCD in a request letter on June 19, 2008:

- Projects located within a six-mile radius of the LEC project site; and
- Projects issued a new Authority to Construct permit after July 1, 2007

The SJVAPCD responded with a list, from which one facility potentially satisfied these requirements.[20] As indicated in the District's letter. The applicant has now applied to install a different engine than the one for which the ATC was issued, and no information is yet available regarding the engine that will actually be installed. Therefore, the only required cumulative impacts analysis for either criteria pollutants or TACs is an evaluation of the

[17] American Congress of Government Industrial Hygienists
[18] Threshold Limit Value
[19] Short-Term Exposure Level
[20] Copies of the correspondence with the District is provided in Appendix 5.1G.

simultaneous operation of the existing NCPA Lodi power plant with the proposed LEC project. TAC emissions from the existing NCPA Lodi facility are shown in Table 5.1A-11, Appendix A (Air Quality). Details of the cumulative HRA are provided in Appendix 5.9B.

The results of the cumulative impact assessment of TACs are summarized in the Table 5.9-7. These results show that the maximum cumulative cancer, acute and chronic risks from the new plant and the existing plant are well below the levels that are considered significant.

TABLE 5.9-7
Summary of Potential Cumulative Health Risks

Receptor	Carcinogenic Risk* (per million)	Acute Health Hazard Index	Chronic Health Hazard Index
Maximum Incremental Cancer Risk, LEC	0.43	0.05	0.008
Maximum Incremental Cancer Risk, Existing NCPA Lodi Power Plant	4.1	0.009	0.003
Maximum Cumulative Combined Cancer Risk	4.1	0.05	0.01
Significance Level	10	1.0	1.0

*Derived (Adjusted) Method used to determine significance of modeled risks. Residential (70-year) exposure shown.

5.9.6 Mitigation Measures

The project has been designed to minimize emissions and impacts. No additional mitigation measures are needed for the LEC TAC emissions because the potential air quality and public health impacts are less than significant.

5.9.7 Agencies and Agency Contacts

Table 5.9-8 provides contact information for agencies involved with public health.

TABLE 5.9-8
Agency Contacts for Public Health

Issue	Agency	Contact
Public exposure to air pollutants	EPA Region 9	Gerardo Rios EPA Region 9 75 Hawthorne Street San Francisco, CA 94105 (916) 972-3974
Public exposure to air pollutants	CARB	Mike Tollstrup Project Assessment Branch California Air Resources Board 1001 I Street Sacramento, CA 95812 (916) 323-8473

TABLE 5.9-8
Agency Contacts for Public Health

Issue	Agency	Contact
Public exposure to air pollutants	San Joaquin Valley Air Pollution Control District	Rupi Gill Permit Services Manager Northern Region 4800 Enterprise Way Modesto, CA 95356-8718 (209) 557- 6400
Public exposure to chemicals known to cause cancer or reproductive toxicity	Cal-EPA, Office of Environmental Health and Hazard Assessment (OEHHA)	Cynthia Oshita or Susan Long Office of Environmental Health Hazard Assessment 1001 I Street, Sacramento, CA 95814 (916) 445-6900
Public exposure to accidental releases of hazardous materials	EPA Region 9	Deborah Jordan EPA Region 9 75 Hawthorne Street San Francisco, CA 94105 (916) 947-4157
Public exposure to accidental releases of hazardous materials	California Office of Emergency Services	Moustafa Abou-Taleb Governor's Office of Emergency Services 3650 Schriever Avenue Mather, CA 95655 (916) 845-8741

5.9.8 Permits and Permit Schedule

Agency-required permits related to public health are listed in Table 5.9-9, and include a Risk Management Plan for hazardous materials, and the SJVAPCD Final Determination of Compliance (FDOC). Upon approval of LEC by the CEC, the FDOC serves as the SJVAPCD Authority to Construct. A Permit to Operate will be issued by the SJVAPCD after construction and commencement of operation. These requirements are discussed in detail in Sections 5.1 (Air Quality) and 5.5 (Hazardous Materials Handling).

TABLE 5.9-9
Permits and Permit Schedule for Public Health

Permit	Agency Contact	Schedule
Determination of Compliance / Authority to Construct/ Permit to Operate	Rupi Gill San Joaquin Valley APCD 4800 Enterprise Way, Modesto, CA 95356-8718 (209) 557-6400 rupi.gill@valleyair.org	District must issue a Preliminary DOC within 180 days after issuing the Application Completeness Determination Letter.

TABLE 5.9-9
Permits and Permit Schedule for Public Health

Permit	Agency Contact	Schedule
Risk Management Plan (CalARP)	San Joaquin County Environmental Health Department Kasey Foley Program Coordinator 600 E. Main Street Stockton, CA 92505 (209) 468-3451 KFoley@sjcehd.com	Approximately 60 days before any regulated substance comes on site

5.9.9 References

California Air Resources Board (CARB). 2008. Consolidated table of OEHHA/CARB approved risk assessment health values. (http://arbis.arb.ca.gov/toxics/healthval/contable.pdf).

California Air Resources Board (CARB). HARP Model, Version 1.4, http://www.arb.ca.gov/toxics/harp/harp.htm.

National Institute of Environmental Health Sciences (NIEHS). 1999. Environmental Health Institute report concludes evidence is 'weak' that EMFs cause cancer. Press release. National Institute of Environmental Health Sciences, National Institutes of Health.

Office of Environmental Health Hazard Assessment (OEHHA). 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, California Environmental Protection Agency. August.

San Joaquin Valley Air Pollution Control District (SJVAPCD). 2007. Guidance for Air Dispersion Modeling. January.