5.10 Public Health

This AFC section addresses potential public health issues related to PHPP. These issues include the potential for health risks from the emissions of toxic air contaminants (TAC) and airborne pathogens. Related topics are discussed in separate sections of the AFC document. Impacts on Federal or State ambient air quality standards due to criteria pollutant emissions are addressed in Section 5.2, Air Quality, and the potential for exposure to hazardous materials and/or hazardous wastes are addressed in Section 5.6, Hazardous Materials Handling, and Section 5.16, Waste Management. A discussion of electromagnetic fields (EMF) is provided in Section 5.14, Transmission Line Safety and Nuisance. This section presents the methodology and results of a human health risk assessment (HRA) performed to evaluate potential impacts and public exposure associated with airborne emissions from the Project operation.

Chemical substances released to ambient air that pose potential risks to human health from the Project operations include natural gas combustion byproducts from the Project combustion turbines, auxiliary boiler, and heat transfer fluid (HTF) heater, and diesel combustion byproducts from the emergency generator and emergency diesel fire water pump. Byproducts from chemical treatment for biological growth control in the cooling tower also contribute to the air contaminants from the operation of the Project. For public health, the term chemical substances refer to chemical substances in ambient air that are regulated by either the U.S. Environmental Protection Agency (EPA) and/or the State of California. The California Office of Environmental Health Hazard Assessment (OEHHA) and the California Air Resources Board (ARB) use the term TAC, which currently includes over 244 chemical substances. The EPA uses the term Hazardous Air Pollutants (HAP), and has currently identified 188 substances as HAPs, all of which are presently included in California's list of TACs. The term TAC will be used throughout this section to mean both TAC and HAP. TAC emissions from the various operating units of the PHPP such as combustion turbines, cooling tower, auxiliary boiler, HTF heater, emergency generator and emergency fire water pump, are analyzed for public health impacts.

5.10.1 LORS Compliance

The LORS relevant to public health that are applicable to the PHPP are summarized briefly in Table 5.10-1 and discussed in the text following the table.

Table 5.10-1 Summary of LORS Applicable to Public Health

LORS*	Applicability	Where Discussed in AFC
Federal:		
U.S. Clean Air Act, Section 112, 40 Code of Federal Regulations (CFR) Parts 61 and 63	National Emissions Standards for Hazardous Air Pollutants (NESHAP) requires the control of specific substances (Part 61) or HAP emissions for specific sources (Part 63).	Section 5.10.1.1
State:		
Health and Safety Code (HSC) Section 39650 et seq.	Mandates the establishment of safe exposure limits for TACs and identification of control technologies.	Sections 5.10.1.2 and 5.10.3
HSC Section 39666	Delegates the enforceability of California Airborne Toxic Control Measures (ATCMs) to local air quality district.	Section 5.10.1.2
HSC Section 41700	Prohibits odors and emissions from causing injury, detriment, nuisance, or annoyance to any considerable number of people.	Section 5.10.1.2
HSC Sections 44360 to 44366 (Air Toxics “Hot Spots” Information and Assessment Act -- AB2588)	Requires the preparation of a health risk assessment by facilities that are determined to be high risk by the local administering agency.	Sections 5.10.1.2 and 5.10.3
HSC Sections 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986 -- Proposition 65)	Requires notification related to public exposure to chemicals known to cause cancer or reproductive toxicity.	Section 5.10.1.2
Title 17 California Code of Regulations (CCR), Section 93115, Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines	Establishes emission limits and operating limits on stationary compression ignition engines, including emergency fire pump and emergency generator engines.	Sections 5.10.1.2 and 5.10.3
Title 22, CCR Section 60306	Regulates the use of reclaimed water in cooling towers and requires the use of biocides to control the growth of bacteria and other pathogens.	Sections 5.10.1.2 and 5.10.4
Title 17 and 26, CCR Section 93103, Subchapter 7.5, Chapter 1, Part III	Regulates the use of hexavalent chromium and chromate substances in cooling towers through notification, concentration limits, and testing record retention.	Section 5.10.1.2
Cooling Technology Institute (CTI) Guidelines: “Best Practices for Control of Legionella.”	Establishes industry recommendations and guidelines for the best practice and management for control of bacteria and to minimize the risk from Legionella.	Sections 5.10.1.2 and 5.10.3.5, 5.10.4

LORS*	Applicability	Where Discussed in AFC
CEC Staff Cooling Water Management Program Guidelines For Wet and Hybrid Cooling Towers at Power Plants (CEC, 2004)	Provides example of adequate contents of a biocide application and monitoring program designed to control microorganisms, to the maximum extent feasible, within cooling towers using open recirculating water systems.	Sections 5.10.1.2 and 5.10.4
Local (Antelope Valley Air Quality Management District [AVAQMD]):		
AVAQMD Rule 212	Discusses notification requirements for significant projects which are defined as projects having cancer risk greater than or equal to one-in-one-million.	Section 5.10.1.3
AVAQMD Rule 402 (Nuisance)	Prohibits the discharge of air contaminants or other material that can cause nuisance or injury.	Sections 5.10.1.3 and 5.10.4
AVAQMD Regulation X – Notification of ATCMs and MACT Standards	Notifies sources of the requirement and local enforceability and practices for California ATCM and Federal MACT standards for the control of California TAC and Federal HAP emissions, respectively; assigns a prioritization score for toxics; and requires the preparation of a HRA by high risk facilities.	Sections 5.10.1.3 and 5.10.4.2
AVAQMD Rule 1000 (National Emission Standards for Hazardous Air Pollutants)	Implements the Federal NESHAP promulgated under 40 CFR Part 61 (see above).	Section 5.10.1.3
AVAQMD Rule 1401 (New Source Review for Toxic Air Contaminants)	Discusses new source review for air toxics.	Sections 5.10.1.3 and 5.10.3.2
AVAQMD CEQA and Federal Conformity Guidelines	Provides significance thresholds under CEQA for exposure of sensitive receptors to cancer and non-cancer public health risk impacts.	Sections 5.10.1.3 and 5.10.3

* The LORS in this table relate only to public health concerns due to the emissions of TAC and other air contaminants. See other AFC sections for LORS related to other public health topics such as air quality, EMF, hazards, waste streams, etc.

5.10.1.1 Federal LORS

National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Parts 61 and 63

EPA regulations related to HAPs will have limited applicability to the Project because PHPP is not a major source of HAP emissions. Even so, the Project will meet the Maximum Achievable Control Technology (MACT) emission standard specified in 40 Code of Federal Regulations (CFR) Part 63, Subpart YYYY for stationary gas turbines through the use of air emissions control technologies, including exclusive firing on natural gas and installation of an oxidation catalyst, which will be enforceable through permitted operating conditions. The Asbestos NESHAP, 40 CFR 61 Subpart M requires notification when the demolition occurs at the facility, even though no asbestos will be used in its construction. These Federal NESHAP regulations have been incorporated by reference in AVAQMD Regulation X.

5.10.1.2 State LORS

HSC Sections 39650 et seq.

These sections of the California HSC establish a broad statewide program of public protection against exposure to TACs determined to be carcinogenic, teratogenic, mutagenic, or otherwise toxic or injurious to humans, including control technology requirements and cumulative impact analysis. The PHPP will meet all applicable measures to control and minimize TAC emissions and, as evidenced by the HRA provided in Section 5.10.3, will not compromise the public's health.

HSC Section 39666

The California HSC delegates the enforceability of California ATCM to local air quality agencies. Airborne toxic control measures have been adopted to reduce emissions of TACs from non-vehicular sources. The goal is to limit the emissions of TAC to the maximum extent possible. The PHPP is not a major source of HAP emissions as can be seen from the discussions in the following sections. The Project will employ diesel-fueled emergency generator and emergency fire water pump engines and an ATCM has already been adopted to control diesel particulate matter (DPM) emissions from the new stationary compression ignition (CI) engines. Both the generator and the fire water pump engines at the PHPP will be limited to an annual non-emergency (e.g., testing and maintenance) operating time of 50 hours per year to minimize DPM emissions.

HSC Section 41700

The HSC prohibits the discharge of air pollutants that cause injury, detriment, nuisance, or annoyance to the public. This requirement is implemented through AVAQMD Rule 402.

HSC Sections 44360-44366 – Air Toxic "Hot Spots" Information and Assessment

Under California HSC Sections 44360-44366, the PHPP will file the required TAC emissions information. This filing requirement applies after the start of operations. Assessments provided in this AFC Public Health section indicate that the PHPP will have no significant adverse impacts from TAC emissions. The administering agency for the Air Toxics "Hot Spots" program is the AVAQMD. It is the responsibility of the AVAQMD to identify high risk facilities and require the development of a HRA that satisfies AB2588 requirements. Due to the predicted risk (see Section 5.10.3), PHPP does not anticipate that it would be identified as a high risk facility; however, if it is, PHPP will comply with the requirements by the preparation of a HRA.

HSC Sections 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986 - Proposition 65)

Under this code, facilities that emit chemicals identified under the Proposition 65 and known to cause cancer or reproductive harm are required to notify the exposed individuals and provide warnings. Based on the HRA provided in this section, TAC emission rates and resulting cancer risks do not exceed significance thresholds that require Proposition 65 warnings. The appropriate warning signs will be posted at the facility entrance, the entrance to any facility structures or areas in which Proposition 65 chemicals are stored, used, or released, and appropriate training will be provided to employees.

Title 17 CCR, Section 93115 Airborne Toxic Control Measure for Stationary Compression Ignition Engines

The California ATCM for compression ignition (CI) engines specifies operating requirements and exhaust emission standards for stationary CI engines. Although this is an air toxic control measure, it contains emission standards for criteria pollutants as well as diesel particulate matter. In addition, it requires the use of ARB diesel fuel (15 ppm sulfur by weight).

The facility will limit the hours of operation of the fire pump engine to one hour per week, not to exceed 50 hours per year, as recommended by NFPA 25, and will install a totalizing hour meter to substantiate compliance with the use limitation. The Project will also install a new emergency generator stationary CI engine that will meet the Tier 2 emissions standards for offroad engines and will limit the non-emergency hours of operation to no more than 50 hours per year, and will install a totalizing hour meter to substantiate compliance with the use limitation. The facility will use only ARB diesel fuel in both the engines and retain purchase records and Material Safety Data Sheets (MSDSs) to substantiate compliance with the fuel sulfur requirement.

CCR Titles 17 and 26, Section 93103, Subchapter 7.5, Chapter 1, Part III

These requirements regulate hexavalent chromium and chromate substances in cooling towers. These requirements will be met as part of the Project operations and maintenance program, which will not use any biocide or other substances in the cooling water system that contains hexavalent chromium or chromate substances.

Cooling Technology Institute (CTI) Guidelines: "Best Practices for Control of Legionella"

These guidelines will be reviewed to ensure all necessary controls and operational considerations are established when developing the Project cooing tower maintenance plan to ensure industry recommendations and guidelines for the best practice and management, for control of bacteria are followed to minimize the risk from Legionella.

CCR Title 22, Section 60306

This CCR section regulates the use of reclaimed water in cooling towers. The Project will develop and implement a cooling tower management plan that will address all requirements for the use of biocides to control the growth of bacteria and other pathogens in reclaimed water systems.

CEC Staff Cooling Water Management Program Guidelines for Wet and Hybrid Cooling Towers at Power Plants (CEC, 2004)

The PHPP will develop and implement a cooling tower maintenance plan in accordance with the CEC Cooling Water Management Program Guidelines (2004). The plan will be documented and submitted to the CEC for review and approval prior to commencement of cooling tower operation. The plan will contain a description of the biocide(s) selected and the reasons for their selection, a description of how the biocide is to be administered (continuous or intermittent feed, level of residual concentrations, etc.), detailed description of the microbial testing protocol, response to microbial control following an upset, shutdown, startup, and maintenance procedures, and a description of documents related to maintaining the microbiological control program.

5.10.1.3 Local LORS

AVAQMD has several local rules and regulations, as well as Federal and State programs addressing TAC emissions, as described below.

Rule 212– Standards for Approving Permits

This AVAQMD rule discusses public notification requirements prior to granting a Permit to Construct (PTC) for a significant project. AVAQMD defines significant project as one with an individual cancer risk greater than, or equal to, one-in-one-million for a lifetime (70 years) exposure period.

Rule 419 – Nuisance

Under this local implementation of HSC Section 41700 (see above), the AVAQMD does not allow the discharge from any source quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public. The provisions of this rule will be met through existing control and operational limits on the Project.

Regulation X – National Emission Standards for Hazardous Air Pollutants

This AVAQMD regulation simply provides notice to the regulated community that California ATCM and Federal MACT rules are enforceable by the AVAQMD within its jurisdiction.

Rule 1000 - National Emission Standards for Hazardous Air Pollutants (NESHAP)

This AVAQMD rule adopts the Federal NESHAP requirements promulgated under 40 CFR Parts 61 and 63 by reference. As discussed in Section 5.10.1, there are no Part 61 or Part 63 standards applicable to the facility operations.

Rule 1401 – Toxic Air Contaminants New Source Review

This rule requires that a HRA be performed if facilities with emissions of TAC have high facility priority score. A detailed HRA is necessary if TAC emissions exceed AVAQMD significance threshold levels of “moderate risk” (defined as a maximum individual cancer risk [MICR] of greater than one, but less than 10), “significant health risk” (defined as a MICR that is greater than or equal to 10 but less than 100), and “significant risk” (defined as a MICR greater than 100). Toxics Best Available Control Technology (T-BACT) must be installed if the HRA shows a theoretical cancer risk greater than one-in-one-million. Based on the significance classification, the PHPP’s risk is less than the “moderate risk”, and consequently preparation of a HRA should not be required under the rule.

CEQA and Federal Conformity Guidelines

Under the California Environmental Quality Act (CEQA), the AVAQMD is the responsible agency on air quality and related matters within its jurisdiction or impacting on its jurisdiction. The AVAQMD has developed its own CEQA guidelines dated May 2008 for evaluating projects within its jurisdiction. The AVAQMD CEQA Guidelines define significance threshold for cancer risk as equal to or greater than 10-in-one-million for the Maximum Exposed Individual (MEI) and a MEI hazard index significance threshold equal to or greater than one for non-cancer impacts.

5.10.1.4 Agency Contacts

The primary agency responsible for public health in the vicinity of the PHPP is the AVAQMD. Agencies and agency contacts relevant to public health issues analyzed in this section are provided in Table 5.10-2. Agency contacts for air quality and hazardous materials handling are provided in AFC Sections 5.2 and 5.6 respectively.

Table 5.10-2 Administering Agency and Contact Information

Agency Contact	Phone/E-mail	Permits/Issue
Bret Banks Antelope Valley AQMD 43301 Division St., Ste. 206 Lancaster, CA 93535-4649	(661) 723-8070 bbanks@avaqmd.ca.gov	Implementation of AB2588, ATCM's, review of HRAs

5.10.1.5 Required Permits and Permit Schedule

No permits are specifically required to address the requirements for public health. Instead, the permits required for air quality (see Section 5.2, Air Quality) will restrict the TAC emissions as well as the criteria pollutants. The project will be required to receive a Determination of Compliance (DOC) issued by the AVAQMD. This AFC will serve as the application for the DOC. The DOC will include requirements related to the control of TAC emissions from this facility.

5.10.2 Affected Environment

The 377 acre Project site is located in the City of Palmdale, California at the southwestern edge of the Mojave Desert at an average elevation of 2,505 feet above mean sea level (amsl). The Tehachapi Mountains, located to southwest of the project site reach elevations above 5,000 amsl within 10 miles of the site. The site is bounded by East Avenue M on the north side, Site 1 Road on the east side, East Avenue M-12 on the south side, and will have a new property boundary on the west. The Air Force Plant 42 facility is located directly across Site 1 Road and East Avenue M-12 on the east and south sides, respectively. To the west of the site, the land use is zoned Light Industry, Office, Business Park and Commercial. Other land uses in the immediate vicinity of the Project include unused parcels, light industry, e.g., automobile wrecking yards, trucking companies, and automobile/heavy truck repair facilities. These land uses are confined predominately in the area to the north-northwest of the project site. The nearest residential land use zone is in the City of Lancaster, one mile north of Avenue M and east of 15th Street. The nearest existing residential area is approximately 600 ft north of Avenue L and east of 10th Street, over 1.5 miles from the center of the PHPP plant site. A few scattered residences were identified within a one mile north of the Project.

Population density in the area immediately around the PHPP plant site is sparse and dispersed. Figure 5.10-1 presents the distribution of the population (population density) within a three-mile radius around the plant boundary, which is considered inclusive of the area of potential exposure to TAC emissions from PHPP operations. According to the CEC, sensitive receptors are defined as groups of individuals that may be more susceptible to health risks due to TAC exposure, including infants and children, the elderly, the chronically ill, and any other member of the general population who is more susceptible to the effects of the exposure than the population at large, and usually include schools, day care facilities, convalescent homes and hospitals (CEC, 2007). The nearest sensitive receptor identified (adult day health care center) is about

0.40 miles west of the Project. To evaluate public health within this area, individual exposure points were identified where residences, workers, or a sensitive population may be located. Identified receptors included residential and occupational receptors, and sensitive receptors such as preschools, daycare, schools, hospitals and elderly care centers within a three-mile radius; a list of these receptors is presented in Appendix G.7. Figure 5.10-2 shows the residential, worker and sensitive receptors within a three-mile radius of the Project.

The AVAQMD and Antelope Valley Service Planning Area 1 (AVSPA1) were consulted to determine if any public health studies related to respiratory, cancers, or related illnesses were conducted within a six-mile radius of the PHPP site. A few studies have been conducted to study asthma related issues within the Antelope Valley. A ten-year long California ARB sponsored Children's Health Study was completed in 2004. The study focused on over 6,000 elementary school and middle school children within 12 southern California communities (including Lancaster and Palmdale) with a primary goal to determine whether air pollution caused chronic adverse respiratory health effects. Particulate matter (hourly PM10, two-week-integrated PM2.5, and several constituents including elemental and organic carbon, metals, and ions), ozone, nitrogen dioxide, and acid vapor (primarily nitric acid) were measured in each community during the study period. Different health outcomes assessed included annual pulmonary function tests, annual questionnaires on respiratory conditions and symptoms, and school absence monitoring. The study found that children's lung function growth was adversely affected by air pollution, and new cases of asthma and asthma exacerbations were associated with ambient air pollution levels. School absences from acute respiratory illnesses were also noticed following rises in ozone levels. The study concluded that current levels of ambient air pollution in Southern California are associated with clinically important chronic health effects that have substantial health and economic impacts (Peters, 2004). A 2004 study by Los Angeles County Department of Public Health (LACDPH) estimated high lung cancer death rates in the AVSPA1 area when compared to other service planning areas in the county (46.9 per 100,000 population). In addition, a 2005 health survey, showed AVSPA1 to have the highest asthma rate in the county with 15.7 percent of children under the age of 17 and 11.4 percent of adults diagnosed with the respiratory disease (LACDPH, 2007).

5.10.3 Environmental Impacts

Potential environmental impacts addressed in this section are limited to human exposure to the emissions of chemical substances of concern associated with the Project's operation. The method used to assess potential human health risks are consistent with those proposed by the Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2003), referred to as the "Guidance Manual" hereafter. The Guidance Manual describes algorithms, exposure methods, and cancer and non-cancer health values needed to perform a HRA under AB2588 and is generally considered the best available reference for conducting human HRA in California. Additional references include the Health Assessment Document for Diesel Engine Exhaust (EPA, 2002).

A list of the TAC emitted by the Project under normal operating conditions which may cause an adverse public health impact are presented in Table 5.10-3. The human health risks potentially associated with these substances are evaluated in the HRA. No appreciable quantity of TAC is expected to be emitted from the solar field, oil/water separator or the fire water pump or emergency generator diesel fuel tanks. Since construction impacts are temporary, no significant impacts to public health are expected to occur from construction, and this HRA does not quantify risks from construction activities.

Table 5.10-3 TAC Potentially Emitted from the PHPP

1,3-Butadiene	Polycyclic aromatic hydrocarbons (PAHs)
Acetaldehyde	Benzo(a)anthracene
Acrolein	Benzo(a)pyrene [B(a)P]
Ammonia	Benzo(b)fluoranthene
Arsenic	Benzo(k)fluoranthene
Benzene	Chrysene
Beryllium	Dibenz(a,h)anthracene
Chloroform	Indeno(1,2,3-cd)pyrene
Copper	Perchloroethylene (tetrachloroethene)
Cyanide compounds	Phenol
Diesel Particulate Matter	Propylene
p-Dichlorobenzene	Propylene Oxide
Ethylbenzene	Selenium
Formaldehyde	Toluene
Hexane	Trichloroethylene
Naphthalene	Vanadium
	Xylenes

5.10.3.1 Risk Definitions and Significance Criteria

Cancer Risk

Cancer risk is the probability or chance of contracting cancer over a human life span, which is assumed to be 70 years. Carcinogens are not assumed to have a threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (i.e., a linear, no-threshold model). In assessing public health impacts, cancer risk is the expected incremental increase in cancer cases based on an equally exposed population of individuals, typically expressed as excess cancer cases per million exposed individuals.

State and local regulations have developed cancer risk levels above which a project is considered to have a potential significant impact on public health. California's AB2588 Air Toxic Hot Spots Program and California's Proposition 65, for example, have developed a significance level for incremental cancer risk of 10-in-one-million as the public notification level for TAC emissions from existing sources. The AVQMD has also established cancer risk significance thresholds for permitting new stationary sources. AVQMD Rule 1401 allows for an incremental risk of between one-in-one-million (1×10^{-6}) and 10-in-one-million (1×10^{-5}), provided T-BACT is employed. AVAQMD Rule 212(c)(3) discusses public notification requirements prior to granting a Permit to Construct (PTC) for a significant project. AVAQMD defines significant project as one with an individual cancer risk greater than, or equal to, one-in-one-million for a lifetime (70 years) exposure period.

Non-Cancer Health Hazard

Non-cancer health effects are characterized as either chronic or acute. In determining potential non-cancer health risks from TAC emissions, it is assumed that there is a dose of the chemical of concern below which there would be no impact on human health. The air concentration corresponding to this dose is called the reference exposure level (REL). Non-cancer health risks are measured in terms of a hazard index (HI), which is the calculated exposure of each contaminant divided by its REL. HIs for those pollutants affecting the same target organ are typically summed, with the resulting totals expressed as HIs for each organ system.

Similar to cancer risk, non-cancer impacts also have determined significance thresholds based on the estimated HI for the project. RELs used in the HI calculations were those published in the California Air Pollution Control Officers Association (CAPCOA) AB2588 Risk Assessment Guidelines (CAPCOA, 1993), as updated by the OEHHA in the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (OEHHA, 2008).

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure. Chronic exposure is one which is occurs over a period exceeding 12 percent of a 70-year lifetime. 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-cancer TAC is the chronic REL. Below this threshold, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation.

Acute toxicity is defined as adverse health effects caused by a short-term chemical exposure of less than or equal to one hour. For most chemicals, the multi-pathway exposure required to produce acute effects is higher than levels required to cause chronic effects because of the shorter exposure period. Because acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures, all hazard indices are typically summed to calculate the total acute HI.

State and local regulations have developed chronic and acute risk levels above which a project is considered to have a potential significant impact on public health. For health risk, a chronic or acute HI exceeding one (1) is considered significant.

Diesel Particulate Risk

In 1990, the State of California administratively listed under Proposition 65 the particulates formed in the exhaust of diesel powered equipment as a chemical known to the State to cause cancer. For estimating risks due to DPM emissions, the risk assessment methodology used was consistent with that employed by the ARB in the document entitled Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles (ARB, 2000).

OEHHA has estimated that 130 to 2,400 excess cancer cases would be expected to occur in a population of one million people breathing an average concentration of DPM of one (1) microgram per cubic meter ($\mu g/m^3$) over a 70-year lifetime. These excess cancer cases are beyond what would be expected to occur if there were no DPM in the air. An independent review by the ARB Scientific Review Panel (SRP) derived a best-estimate of the cancer unit risk factor as 300 excess cancer cases per million people breathing 1 $\mu g/m^3$ of DPM over a lifetime (OEHHA, 2000).

California Environmental Quality Act Significance Criteria for Health Impacts

California has not established State-wide significance thresholds for cancer and non-cancer health risk impacts under CEQA. However, most air districts in California have adopted local significance thresholds for health risks in their policy guidance to project proponents. The AVAQMD California Environmental Quality Act (CEQA) and Federal Conformity Guidelines, dated May 2008, defines significance thresholds for cancer health impacts as equal to or greater than 10-in-one-million for the Maximum Exposed Individual (MEI) cancer risk and a MEI HI significance threshold equal to or greater than one (1) for non-cancer impacts. The AVAQMD Guidelines note that these thresholds are not applicable to all projects.

5.10.3.2 Health Risk Assessment Approach

The HRA contains three quantitative determinations: emission estimation, air dispersion analysis, and health risk characterization. With limited exceptions, source emissions of TAC from the Project were estimated based on EPA emission factors and quantification methods for facility operations. Exposure calculations were performed using air dispersion modeling analysis to predict ground-level air concentrations, by source. Results of the air modeling exposure predictions were then applied to the emission estimates and, along with the respective cancer health risk factors and chronic and acute non-cancer reference exposure levels for each toxic substance, a health risk characterization was performed that quantified individual health risks associated with predicted levels of exposure.

The Project HRA was performed using the Hotspots Analysis and Reporting Program (HARP) software package (Version 1.4) developed by the ARB for conducting health risk assessments in California under the Air Toxics Hot Spots Program (ARB, 2008). The HARP modeling system is a comprehensive health risk assessment tool that contains air emissions, dispersion and risk analysis modules. The Project HRA is a multi-pathway risk analysis. Air contaminant inhalation and plant ingestion are the dominant pathways for public exposure to chemical substances released by the PHPP. In addition, combustion by-products produced in the natural gas-fired combustion turbines and duct burners, as well as secondary emissions of metals in cooling tower drift potentially emitted by the Project cooling tower, are considered multi-pathway air toxics. Therefore the multi-pathway assessment also includes an evaluation of soil ingestion, dermal absorption, and mother's milk ingestion. The inhalation pathway would be the dominant pathway for public exposure to chemical substances released by the Project and is expected to represent the majority of the predicted risk.

Health Risk Factors

Chemical substance were evaluated in this analysis using health values that have been approved by OEHHA and ARB for use in facility HRAs conducted for the AB2588 Air Toxics Hot Spots Program (OEHHA, 2003). The chemical substances of concern that are addressed in this HRA are listed in Table 5.10-4, along with their respective published OEHHA health effect values. The table lists the OEHHA-adopted inhalation and oral cancer slope factors, non-cancer acute RELs, and inhalation and oral non-cancer chronic RELs. The cancer potency factors and RELs used are consistent with the current values as determined by OEHHA.

Table 5.10-4 Risk Assessment Health Values for TAC of Concern

Compound	Inhalation Unit Risk Factor $(\mu g/m^3)^{-1}$	Cancer Risk		Non-cancer Effects	
		Inhalation Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$	Oral Slope Factor $(\mu g/m^3)^{-1}$	Chronic Inhalation REL $(\mu g/m^3)$	Acute Inhalation REL $(\mu g/m^3)$
Acetaldehyde	2.7E-06	1.0E-02	--	9.0E+00	--
Acrolein	--	--	--	6.0E-02	1.9E-01
Ammonia	--	--	--	2.0E+02	3.2E+03
Arsenic	3.3E-03	1.2E+01	1.5 E+00	3.0E-02	1.9E-01
Benzene	2.90E-05	1.0E-01	--	6.0E+01	1.3E+03
Beryllium	2.4E-03	8.4E+00		7.0E-03	--
1,3-Butadiene	1.7E-04	6.0E-01	--	2.0E+01	--
Chloroform	5.3E-06	1.9E-02	--	3.0E+02	1.5E+02
Copper	--	--	--	--	1.0E+02
Cyanide Compounds	--	--	--	9.0E+00	3.4E+02
Diesel Particulate Matter	--	1.1E+00	--	5.0 E+00	--
Ethylbenzene	2.5E-06	8.7E-03	--	2.0E+03	--
p-Dichlorobenzene	1.1E-05	4.0E-02	--	8.00E+02	--
Formaldehyde	6.00E-06	2.1E-02	--	3.0E+00	9.4E+01
Hexane	--	--	--	7.0E+03	--
Naphthalene	3.40E-05	1.2E-01	3.4E-05	9.0E+00	--
Perchloroethylene	5.9E-06	2.1E-02	--	3.5E+01	2.0E+04
Phenol	--	--	--	2.0E+02	5.8E+03
Propylene	--	--	--	3.0E+03	--
Propylene oxide	3.7E-06	1.3E-02	--	3.0E+01	3.1E+0
Selenium	--	--	--	2.0E+01	--
Toluene	--	--	--	3.0E+02	3.7E+04
Trichloroethylene	2.0E-06	7.0E-03	--	6.0E+0	--
Vanadium	--	--	--	--	3.0E+01
Xylenes	--	--	--	7.0E+02	2.2E+04
PAHs					
Benzo(a)anthracene	1.1E-04	3.9E-01	1.2E+00	--	--
Benzo(a)pyrene [B(a)P]	1.10E-03	3.9E+00	1.2E+01	--	--
Benzo(b)fluoranthene	1.1E-04	3.9E-01	1.2E+00	--	--
Benzo(k)fluoranthene	1.1E-04	3.9E-01	1.2E+00	--	--
Chrysene	1.1E-05	3.9E-02	1.2E-01	--	--
Dibenz(a,h)anthracene	1.2E-03	4.1E+00	4.1E+00	--	--
Indeno(1,2,3-cd) pyrene	1.1E-04	3.9E-01	1.2E+00	--	--
Source: Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, OEHHA 2008.					

TAC Emissions

Emission sources of TAC that may be associated with the PHPP include combustion turbines, duct burners, cooling tower, auxiliary boiler, HTF heater, and diesel-fueled emergency generator and emergency fire-water pump engines. No appreciable quantities of TAC are expected to be emitted from operation of the solar field array, oil/water separator, or the emergency generator or fire water pump fuel tanks. Detailed calculations in support of TAC emissions discussed below are provided in Appendix G.3.

The Project will not be a major source of Federal HAP emissions. The emissions inventory shows total Federal HAP emissions of 6.77 tons per year (tpy). The primary contributor to the total HAP emissions is toluene with emissions of 2.26 tpy (~33 percent) of the total HAP emissions. Regulatory major source thresholds are 10 tpy for any single HAP and 25 tpy for total HAP emissions. The PHPP therefore accounts for only up to 23 percent of the major source thresholds for a single HAP and 27 percent of the major source threshold for total HAP emissions. The total HAP emissions from the Project are summarized in Appendix G.3.

Fugitive dust emissions were not included in the HRA. As shown in Appendix G.3, maintenance and other vehicles driving on the solar field during operation would produce less than 0.4 tpy of PM10 emissions. These emissions would be spread out over the nearly 300 acres and only a portion of these emissions could be TAC. Therefore, these emissions were excluded as they would have a negligible impact on the otherwise conservative results.

Combustion Turbines and Duct Burners. Combustion-related TAC emissions associated with the combustion of natural gas in the combustion turbines and duct burners were calculated using emission factors from AP-42, Section 3.1, Stationary Gas Turbines (EPA, 2000a). For polycyclic aromatic hydrocarbon (PAH) emissions, a speciation profile derived from the California Air Toxics Emission Factor (CATEF) database for stationary gas-fired turbines was applied to the AP-42 composite (unspeciated) emission factor for PAH emissions. For HRA purposes, benzo(a)pyrene or B(a)P which is most potent carcinogen among the PAH's was used as the surrogate carcinogen for all PAH emissions, in accordance with OEHHA guidance (OEHHA, 2003) for conservative risk estimates (overestimated risk). Although the oxidation catalyst will reduce the emissions of most organic TACs, the exact control efficiency is unknown. EPA found that formaldehyde emissions will be reduced by a 90 percent control factor due to installation a catalytic oxidation system, so this reduction was applied to the uncontrolled AP-42 emission factor for this individual HAP (EPA, 2000a). Ammonia slip from the selective catalytic reduction (SCR) emission control system was calculated based on an emissions limit of five (5) parts per million by volume, dry (ppmvd) at 15 percent excess oxygen for each stack. Emission factors and TAC emissions for both turbines and the duct burners are provided in Table 5.10-5.

For the purposes of determining the potential maximum ambient concentrations of chemical substances emitted by the combustion turbines, the turbines were assumed to operate at base load conditions. For annual emissions, the annual average natural gas consumption rate of 1.82 million standard cubic feet (MMscf) per hour per turbine plus 0.12 MMscf per hour per duct burner (1.94 MMscf per hour combined) was used, assuming that the continuous operation of both combustion turbine/duct burner set. Duct burner fuel usage was incorporated into the emission estimates assuming 8,760 hours of turbine and duct burner operations per year at the maximum firing rate. Detailed emission calculations are provided in Section 5.2, Air Quality and Appendix G.3.

Table 5.10-5 TAC Emissions for Turbines/Duct Burners with SCR and Oxidation Catalyst

TAC	Emission Factor [1] (lb/MMscf)	Maximum Hourly Emissions (lb/hr)		Annual Emissions (lb/yr)	
		Turbine/ DB (each)	Total	Turbine/ DB (each)	Total
Ammonia[2]	7.09E+00	1.37E+01	2.74E+01	1.20E+05	2.40E+05
Acetaldehyde	4.08E-02	7.93E-02	1.59E-01	6.94E+02	1.39E+03
Acrolein	6.53E-03	1.27E-02	2.54E-02	1.11E+02	2.22E+02
Benzene	1.22E-02	2.38E-02	4.76E-02	2.08E+02	4.17E+02
1,3-Butadiene	4.39E-04	8.52E-04	1.70E-03	7.46E+00	1.49E+01
Ethylbenzene	3.26E-02	6.34E-02	1.27E-01	5.55E+02	1.11E+03
Formaldehyde[3]	7.24E-02	1.41E-01	2.81E-01	1.23E+03	2.46E+03
Naphthalene	1.33E-03	2.58E-03	5.15E-03	2.26E+01	4.51E+01
Propylene Oxide	2.96E-02	5.75E-02	1.15E-01	5.03E+02	1.01E+03
Toluene	1.33E-01	2.58E-01	5.15E-01	2.26E+03	4.51E+03
Xylenes	6.53E-02	1.27E-01	2.54E-01	1.11E+03	2.22E+03
PAH[4]					
Benz(a)anthracene	7.75E-05	1.50E-04	3.00E-04	1.31E+00	2.63E+00
Benzo(a)pyrene	4.76E-05	9.22E-05	1.84E-04	8.08E-01	1.62E+00
Benzo(b)fluoranthene	3.87E-05	7.49E-05	1.50E-04	6.57E-01	1.31E+00
Benzo(k)fluoranthene	3.77E-05	7.30E-05	1.46E-04	6.39E-01	1.28E+00
Chrysene	8.64E-05	1.67E-04	3.34E-04	1.46E+00	2.93E+00
Dibenzo(a,h)anthracene	8.06E-05	1.56E-04	3.12E-04	1.37E+00	2.73E+00
Indeno(1,2,3-cd)pyrene	8.06E-05	1.56E-04	3.12E-04	1.37E+00	2.73E+00

1 AP-42 Natural Gas Combustion Emission Factors (Table 3.1-3), (EPA, 2000a)

2 Based on maximum ammonia slip (5 ppmvd) from the SCR control device. Note that ammonia is not a HAP and is not included in the HAP total.

3 Formaldehyde AP-42 emission factor adjusted for 90 percent emissions control using carbon monoxide catalyst.

4 Unspeciated PAH (polycyclic aromatic hydrocarbon) emissions based on composite emission factor. Benzo(a)pyrene or B(a)P was modeled as the surrogate carcinogen for all PAH emissions. Since the (B(a)P) surrogate for total PAH emissions is the most or nearly-the-most potent carcinogens in the class, use of this cancer potency factor with total emissions will tend to overestimate the theoretical risk.

Cooling Tower. The Palmdale Water Reclamation Plant (PWRP) from which the reclaimed water will be provided for PHPP cooling currently does not produce tertiary treated water, and this quality of water will only be available about the same as the power plant construction nears completion. Other tertiary treated reclaimed water from a similar area is expected to be more representative for the purpose of calculating emissions than would secondary treated water from PWRP. Concentrations of toxics present in the cooling tower make-up water were taken from an effluent water quality analyses from the Victor Valley Water Reclamation Authority (VVWRA) for the years 2004-2005, which is considered to be the best available data

to represent the reclaimed water used by the PHPP cooling tower. Cooling tower emissions were estimated based on a mass balance technique using the water supply quality, cooling tower maximum cycles of concentration(s), water recirculation rate (gallons per minute [gpm]), and mist eliminator drift rate (0.0005 percent). The chloroform emissions from the cooling tower from the use of sodium hypochlorite as a biocide for cooling tower maintenance were estimated using an emission factor of 0.0034 pounds of chloroform per pound of chlorine added (Rogozen, M. B., et al., 1988). The chloroform emissions were estimated for an annual biocide usage of 2,500 gallons per month. Emission rates for the cooling tower are summarized in Table 5.10-6. Hourly and annual emissions rates for sources were converted to a modeled emission rate in pounds per year (lb/year) for use in evaluating long-term risks, and pounds per hour (lb/hour) for use in short-term health impact modeling.

Table 5.10-6 TAC Emissions for Cooling Tower

TAC	Emission Factor[1] (µg/L)	Maximum Hourly Emissions (lb/hr)		Annual Emissions (lb/yr)	
		Cooling Tower (Each)[2]	Cooling Tower (Total)	Cooling Tower (Each)[2]	Cooling Tower (Total)
Arsenic	6.98E-03	6.741E-09	6.74E-08	1.87E-05	1.87E-04
Beryllium	8.03E-03	2.462E-09	2.46E-08	2.16E-05	2.16E-04
Copper	2.45E-02	1.502E-08	1.50E-07	6.58E-05	6.58E-04
Cyanide compounds	4.00E-05	1.839E-11	1.84E-10	1.07E-07	1.07E-06
Selenium	1.16E-02	6.741E-09	6.74E-08	3.13E-05	3.13E-04
Vanadium	2.21E-02	1.287E-08	1.29E-07	5.94E-05	5.94E-04
p-Dichlorobenzene	8.34E-04	5.900E-07	5.90E-06	1.73E-03	1.73E-02
Chloroform[3]	N/A	1.383E-03	1.38E-02	1.21E+01	1.21E+02
Perchloroethylene	1.10E-05	2.596E-09	2.60E-08	2.27E-05	2.27E-04
Trichloroethylene	5.00E-07	1.180E-10	1.18E-09	1.03E-06	1.03E-05
Toluene	7.78E-04	1.836E-07	1.84E-06	1.61E-03	1.61E-02
Xylenes	7.60E-04	1.794E-07	1.79E-06	1.57E-03	1.57E-02
Phenol	4.00E-05	9.440E-09	9.44E-08	8.27E-05	8.27E-04

1 Based on effluent water quality analysis of reclaimed water from the VVWRA for the years 2004-2005.

2 Ten cooling tower stack units. Each unit modeled separately with 1/10th of the total emissions.

3 Chloroform emission factor taken from a study contracted by ARB for sources of chloroform in the South Coast Air Basin (M.B. Rogozen et.al., 1998).

Auxiliary Boiler and HTF Heater. The PHPP auxiliary boiler and HTF heater are both fired exclusively on natural gas. The Project will include an auxiliary boiler that will be used to provide sealing steam earlier in the start process, and a heater to increase the temperature of the HTF received from the solar field during those periods when the ambient temperature during non-generation periods (i.e., at night) is so low that HTF freezing is possible (an undesirable operating scenario). Emissions for these units were based on operating conditions that represent the maximum emissions profile (being permitted) for the Project. The emissions from the boiler were based on an assumed maximum of 500 hours per year of operation, and the emissions

from the HTF heater were based on 1,000 hours per year for operation. Table 5.10-7 summarizes TAC potentially emitted from the natural gas-fired auxiliary boiler and HTF heater. For HRA purposes, benzo(a)pyrene or B(a)P was used as the surrogate carcinogen for all PAH emissions, in accordance with OEHHA guidance (OEHHA, 2003). Since the surrogate for total PAH is the most or nearly-the-most potent carcinogens in the class, use of this cancer potency factor with total emissions will overestimate the risk.

Table 5.10-7 TAC Emissions for Auxiliary Boiler and HTF Heater

Toxic Air Contaminant	Emission Factor [1] (lb/MMscf)	Maximum Hourly Emissions (lb/hr)		Annual Emissions (lb/yr)	
		Boiler	HTF Heater	Boiler	HTF Heater
Benzene	0.0058	5.66E-04	2.27E-04	2.83E-01	2.27E-01
Formaldehyde	0.0123	1.20E-03	4.80E-04	6.01E-01	4.80E-01
PAH's (excluding naphthalene)	0.0004	3.91E-05	1.56E-05	1.95E-02	1.56E-02
Naphthalene	0.0003	2.93E-05	1.17E-05	1.46E-02	1.17E-02
Acetaldehyde	0.0031	3.03E-04	1.21E-04	1.51E-01	1.21E-01
Acrolein	0.0027	2.64E-04	1.05E-04	1.32E-01	1.05E-01
Propylene	0.53	5.18E-02	2.07E-02	2.59E+01	2.07E+01
Toluene	0.0265	2.59E-03	1.04E-03	1.29E+00	1.04E+00
Xylenes	0.0197	1.92E-03	7.70E-04	9.62E-01	7.70E-01
Ethyl benzene	0.0069	6.74E-04	2.70E-04	3.37E-01	2.70E-01
Hexane	0.0046	4.49E-04	1.80E-04	2.25E-01	1.80E-01

[1] EPA AP-42 emission factors for natural gas combustion (EPA, 1998).

[2] Unspeciated PAH (polycyclic aromatic hydrocarbon) emissions based on composite emission factor. Benzo(a)pyrene or B(a)P was modeled as the surrogate carcinogen for all PAH emissions, as indicated by the CAS number shown. Since the (B(a)P) surrogate for total PAH emissions is the most or nearly-the-most potent carcinogens in the class, use of this cancer potency factor with total emissions will tend to overestimate the theoretical risk.

Emergency Generator and Fire Water Pump Engines. Other PHPP combustion sources include an emergency power generator and an emergency fire-water pump engines. Emissions for these units were based on operating conditions that represent the maximum emissions profile (being permitted) for the Project. The emissions from the emergency generator and the emergency fire-water pump engines were quantified for routine testing and maintenance operation only, and these activities will be limited to no more than 50 hours per year. The Project will operate two diesel-fired emergency engines, one 2 MW engine for the emergency generator and one 135 kW engine for the fire water pump. TAC emissions were characterized as aggregate particulate emissions from diesel-fired engines (OEHHA, 2003) and DPM is assumed to be equal to the PM10 emissions.

Table 5.10-8 TAC Emissions for Emergency Internal Combustion Engines

Source	Emission Factor (g/kW-hr) [1]	Maximum Emissions	
		(lb/hr)	(lb/yr)[2]
Emergency Generator	0.2	8.8E-01	4.41E+01
Fire-water Pump	0.2	4.00E-02	3.00E+03

[1] Emission Factor obtained from a similar Caterpillar engine and complies with EPA Tier 2 engine emission requirements for Emergency Generator and EPA Tier 3 engine emission requirements for the Fire-water Pump.

[2] Annual estimates based on 50 hours of engine operation and do not include emergency operation.

Dispersion Modeling Methodology

Concentrations of TAC in ambient air resulting from potential TAC emissions were estimated using the AVAQMD-approved HARP software package. The methods and requirements used to conduct the air dispersion modeling analysis in HARP for estimating concentrations of TAC are presented below.

Air Dispersion Model. The dispersion analysis performed in HARP uses the ISCST3 dispersion model developed by EPA, which estimates both short-term and long-term average ambient concentrations at receptor locations to produce exposure estimates. HARP incorporates ISCST3 version 99155. ISCST3 accounts for site-specific terrain, meteorological conditions, and emissions parameters such as stack exit velocities and temperatures in order to estimate ambient concentrations. Although EPA adopted AERMOD as the guideline air quality model (the air dispersion model used in the Section 5.2, Air Quality) in 2006, the ARB has not yet integrated AERMOD into HARP, the preferred tool for conducting multi-pathway health risk assessment in California. Health risks potentially associated with the estimated concentrations of chemical substances in ambient air were characterized in terms of excess lifetime cancer risks (for substances listed by OEHHA as cancer causing), or comparison with RELs for non-cancer health effects (for substances listed by OEHHA with non-cancer effects**).**

Meteorological Data. Air dispersion analysis was conducted using three consecutive years (2002-2004) of sequential hourly meteorological data. The data parameters used to develop the ISCST3 air dispersion modeling files were based largely on the same meteorological data obtained for processing in AERMOD, the air dispersion model used for evaluating criteria pollutant air quality impact analysis (see Section 5.2, Air Quality). These included wind speed, wind direction and temperature data from the Palmdale Regional Airport (KPME, WMO ID 72382), and concurrent upper air data from Mercury Desert Rock Airport in Mercury, NV (WMO ID 72387). Meteorological data for the year 2004 was determined through modeling analysis to produce worst-case (highest) annual air toxic concentrations and risks from the proposed Project.

Modeled Source Release Parameters. Sources of TAC emissions from operation of the Project were modeled as point sources with release parameters consistent with those used for modeling air quality impact analysis of criteria pollutants. A detailed discussion of modeled source release parameters including stack height and stack diameter, exhaust gas temperature, exit velocity, and a calculated volumetric flowrate for each equipment type is provided in Section 5.2, Air Quality.

Building Downwash. HARP incorporates the Building Profile Input Program (BPIP) version dated 04112. Building downwash was modeled for the risk assessment using building dimensions consistent with those used for modeling air quality impact analysis of criteria pollutants. BPIP was run to determine dominant structures for building downwash calculations run in ISCST3 for point sources. Direction-specific building heights and widths of the dominant downwash structure(s) were included in the ISCST3 model data input file directly from BPIP results.

Terrain. Terrain elevations were included in the dispersion modeling analysis to evaluate receptors above stack height and above final plume height for point source releases. ISCST3 incorporates complex terrain algorithms that are enabled to predict ground-level concentrations at receptors above source plume heights (effective stack-height) or between stack and plume heights. Digital Elevation Model (DEM) files for the project area were opened in the HARP software package and elevations calculated for all sources, buildings, and receptors. Terrain below source elevation is treated as flat terrain by the dispersion model.

Receptors. Sensitive receptors, locations where a sensitive population segment such as children, elderly, or the infirmed may be exposed to TAC from the Project were identified and modeled within a three-mile radius of the Project. A network of residential and occupational receptors was also developed to identify the locations of the maximum exposed individual at an existing residential receptor (MEIR), and the maximum exposed individual at an existing occupational worker receptor (MEIW). Individual receptors identified and modeled in the study included residences, work-places, schools, medical facilities, daycares, and elderly care centers. The receptors were identified using GoogleEarth, SwitchBoard Digital Directory, Yahoo Yellow Pages, and community elements contained in geographic information system (GIS) software packages. Figure 5.10-2 shows the residential, worker and sensitive receptor locations within a three-mile radius of the project. A list of these receptors is provided in Appendix G.7.

Risk Characterization. The PHPP HRA evaluated the facility for cancer risk and non-cancer health hazards. The health risk methodology is based on the OEHHA Guidance Manual.

The evaluation of potential non-cancer health effects from inhalation exposure to short-term and long-term airborne TAC concentrations was performed by comparing modeled concentrations at the MEIR and MEIW with RELs. In accordance with the HARP model requirements and OEHHA AB2588 risk assessment guidelines, non-cancer health hazard assessment was conducted using the maximum 1-hour and annual TAC emission rates, along with the OEHHA health risk values, to determine predicted health risks due to potential TAC exposure.

Carcinogenic risks and potential chronic and acute non-cancer health effects were assessed using the dispersion modeling described above and numerical values of toxicity provided by OEHHA. Cancer risk evaluated potential health impacts from inhalation, skin contact, and oral pathways as required by OEHHA guidelines. Additionally, this assessment included highly-conservative assumptions such as a 70-year exposure duration for residential receptors and a 40-year exposure duration for commercial/industrial receptors. An additional conservative assumption for worker exposure point estimate was the use of the OEHHA-defined 95th percentile breathing rate of 393 liters of air/kg-day.

The following HARP modeling options were used for the risk analysis to estimate cancer and non-cancer impacts at the MEIR and the MEIW.

- 70-year Resident Cancer Risk – Derived (Adjusted) Method
- 9-year (Child Resident) Cancer Risk – Derived (OEHHA) Method

- Worker Cancer Risk – Point Estimate
- Chronic Hazard Index – Derived (OEHHA) Method
- Acute Hazard Index – Simple Acute HI

The Derived (OEHHA) risk analysis method uses the high-end point-estimates of exposure for the two dominant (driving) exposure pathways, while the remaining exposure pathways use average point estimates. The Derived (Adjusted) method is identical to the Derived (OEHHA) method but uses the breathing rate at the 80th percentile of exposure rather than the high-end point-estimate when the inhalation pathway is one of the dominant exposure pathways. The cancer risk estimates using the Derived equations/methods are based on a 70-year exposure. The point-estimate analysis uses a single value rather than a distribution of values in the dose equation for each exposure pathway. Simple acute risk method is a conservative approach where the maximum concentrations from each emission source are superimposed to impact receptors at the same time, irrespective of wind direction and/ or atmospheric stability and is a health protective approach to assess acute impacts. The environmental pathways that were analyzed consist of all pathways recommended for a refined HRA. Exposure pathways that were enabled include homegrown produce (default: 15 percent), dermal absorption, soil ingestion, and mother's milk. For the cancer and chronic HI impacts at the MEIW, the HARP modeling option "modeled GLC and default exposure assumptions" was used.

Exposure Assumptions. The chief exposure assumption is one of continuous exposure to the TAC concentrations produced by continuous emissions at the maximum emission rates over a 70-year period at each receptor location. The actual risks are not expected to be any higher than the predicted risks and are likely to be substantially lower. The cancer risk for an inhaled TAC is estimated by multiplying the exposure concentration by the breathing rate (L/kg-day) times the inhalation cancer potency factor $(mg/kg\text{-}day)^{-1}$. The averaging time for the cancer risk estimate is usually 70 years, which is used to represent a lifetime exposure. A discussion of uncertainty factors is presented in Section 5.10.3.3 below.

5.10.3.3 Risk Assessment Analytical Uncertainties

Sources of uncertainty in the assessment of risks to public health include emissions estimates, dispersion modeling, exposure characteristics, and extrapolation of toxicity data in animals to humans used to develop unit risk factors (cancer) and RELs (non-cancer). To address this uncertainty, highly conservative assumptions were used in this HRA, as discussed below. In aggregate, these assumptions overestimate the predicted risks such that actual risks are unlikely to be higher, but could be considerably lower or non-existent.

Emissions

There are inherent uncertainties in the emission factor estimates used for gas turbines and duct burners obtained from EPA. However, for both the 1-hour and annual averaging periods, it was assumed that both gas turbines and duct burners operate at the maximum heat input rate. The annual averaging period emission estimates are based on a maximum operation of 8,760 hours per year. Under actual operations, the hours of operation and typical heat input rates will be lower. There may also be some reduction of the organic HAP emissions due to the use of an oxidation catalyst which was not accounted for any organic HAP, except formaldehyde. Therefore, the emission estimates have uncertainties, but are used in a manner that tends to over-estimate exposures and corresponding risks resulting from those emissions.

Air Dispersion Modeling

In general, EPA-dispersion models such as ISCST3 (used in this HRA) are designed to over-predict concentrations rather than under-predict. For example, the model algorithms assume chemical emissions are not transformed in the atmosphere into other chemical compounds (e.g., photochemical reactions). For certain pollutants, conversion may occur quickly enough to reduce concentrations substantially.

Exposure Assessment

Important uncertainties related to exposure include the identification of exposed populations and their exposure characteristics. The choice of a "residential" MEI is very conservative in the sense that no real person is likely to spend 24 hours a day, 365 days a year over a 70-year period at exactly the point of highest toxicity-weighted annual average air concentration.

Toxicity Assessment

Another area of uncertainty is in the use of toxicity data in risk estimation. Estimates of toxicity for the HRA obtained from OEHHA are conservative compilations of toxicity information. Toxicity estimates are derived either from observations in humans or from projections derived from experiments with laboratory animals. When toxicity estimates are derived from animal data, they usually involve extra safety factors to account for possibly greater sensitivity in humans, and the less-than-human-lifetime observations in animals. Overall, the chemical toxicity factors (e.g., unit risk factors and RELs) used in the Project HRA are biased toward over-estimating risk. The amount of the bias is unknown, but could be substantial.

DPM Unit Risk Factor

The DPM inhalation potency factor is a best-estimate value established by the ARB SRP based on review of more than 30 DPM exposure studies. The established potency risk factor is a 95th percentile upper confidence limit value, meaning that there is only a five percent chance that the value is underestimated (too low). The most significant of these studies reviewed by the SRP are occupational studies of exposure to DPM by railroad workers. The occupational results were then extrapolated to the general population, which may include more sensitive individuals than the railroad workers evaluated in the study (ARB, 2004a).

5.10.3.4 Risk Assessment Results

As noted above, the HRA provides results for the maximum exposed residential individual, worker, and sensitive receptors. The MEIR and MEIW were identified based on locations of residential and occupational receptors within a three-mile radius of the proposed Project site. A summary of cancer risk and non-cancer health impacts values at MEIR, MEIW, and other sensitive receptors is shown in Table 5.10-9.

Fifty-one (51) residential locations were identified for evaluating maximum individual health risk impacts at the MEIR. Cancer risk at the MEIR was determined to be 0.36-in-one-million. Non-cancer chronic health impact at the MEIR was determined to have a chronic HI of 0.0008. Non-cancer acute health impacts at the MEIR were determined to have an acute HI of 0.028. The MEIR for cancer risk and non-cancer chronic health impact occurred at the same residential receptor located approximately 3.17 miles southwest of power block. The MEIR for the acute health impact occurred at another receptor approximately 3.58 miles southwest of the power block. Non-cancer acute health impacts were based on the maximum short-term (e.g., 1-hour) air concentration.

Sixty-two (62) work place locations were identified for evaluating maximum individual health risk impacts at the MEIW. Cancer risk at the MEIW, based on a worker exposure, was determined to be 0.04-in-one million. Non-cancer chronic health impact at the MEIW was determined to have a chronic HI of 0.0009. Non-cancer acute health impacts at the MEIW were determined to have an acute HI of 0.03. The MEIW for cancer risk, chronic health impact occurred at the same occupational receptor, located approximately 3.58 miles southwest of the power block, while the acute impact occurred at another southwest receptor approximately 3.2 miles.

Table 5.10-9 Summary of Maximum Impacts

Receptor Type	Maximum Cancer Risk (per million)	Maximum Acute Hazard Index	Maximum Chronic Hazard Index
MEIR	0.36	0.028	0.0008
MEIW	0.04	0.03	0.0009
Sensitive	0.07[1]	0.029	0.0008
Significance Criteria	**10**	**1**	**1**

[1]9-year child resident receptor exposure scenario

MEIR – maximum exposed individual at an existing residential receptor
MEIW – maximum exposed individual at an existing occupational worker receptor

The other forty (40) sensitive receptors identified within the three-mile radius of the Project comprised of daycares, preschools, schools, medical facilities, adult daycares, senior assisted living and care centers. The school and daycare sensitive receptors were evaluated for potential health risk impacts to children attending the school using the 9-year child exposure scenario available in the HARP model to estimate health risk to children. This exposure scenario accounts for a higher breathing rate to body mass ratio of a child compared to an adult and is appropriate for use in estimating child exposure. The care-centers were evaluated for potential health risk to the elderly using a 70-year adult exposure scenario. All these receptors were also evaluated as occupational (worker) receptor, similar to the analysis performed for the identification of impacts at the MEIW. Results for assessing cancer risk impacts at these sensitive receptors showed a risk 0.07-in-one-million based on a child resident exposure scenario at a school 3.36 miles southwest of the power block. Non-cancer impacts were determined to be 0.029 for the acute HI and 0.0008 for the chronic HI (non-cancer does not differentiate between child and adult or include alternative exposure periods) at the same sensitive receptor.

The maximum cancer risk among all the receptors evaluated in this HRA occurs at the MEIR. Tables 5.10-10 and 5.10-11 present source and pollutant contribution to the 70-year cancer risk at this residential receptor. As seen in Table 5.10-10, TAC emissions from combustion turbines are the primary contributor to cancer risk impacts, accounting for approximately 92 percent of the total cancer risk at the MEIR. Risk analysis by individual TAC supports this conclusion, showing that approximately 92 percent of the cancer risk at the MEIR is due to PAH emissions, which are primarily emitted from the combustion turbines (Table 5.10-11). DPM emission from the emergency generator engine contributes to approximately six percent of the risk at the MEIR. All other cancer risk exposures evaluated show lower risks, and have a similar breakdown of contribution by source and TAC. HARP modeling results are presented in Appendix G.6.

Table 5.10-10 Summary of Cancer Risk at the MEIR by Source and Pathway

Emission Source	Inhalation	Dermal	Soil Ingestion	Home-grown Vegetables	Oral Exposure	Total
Combustion Turbines	7.40E-09	6.62E-08	9.93E-09	2.43E-07	3.19E-07	**3.27E-07**
Cooling Towers	1.93E-10	1.13E-12	5.48E-13	1.03E-12	2.71E-12	**1.96E-10**
Auxiliary Boiler	5.67E-11	1.11E-09	1.67E-10	4.08E-09	5.36E-09	**5.42E-09**
Fire-Water Pump Engine	1.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**1.35E-09**
Emergency Generator	2.02E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**2.02E-08**
HTF Heater	4.30E-11	8.46E-10	1.27E-10	3.10E-09	4.07E-09	**4.11E-09**
Total	**2.92E-08**	**6.82E-08**	**1.02E-08**	**2.50E-07**	**3.28E-07**	**3.57E-07**

Table 5.10-11 Summary of Cancer Risk at the MEIR by Toxic Contaminant and Pathway

Emission Source	Inhalation	Dermal	Soil Ingestion	Homegrown Vegetables	Oral Exposure	Total
Benzo[a]pyrene	2.05E-09	6.82E-08	1.02E-08	2.50E-07	3.28E-07	**3.30E-07**
DPM	2.15E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**2.15E-08**
Formaldehyde	1.95E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**1.95E-09**
Benzene	1.58E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**1.58E-09**
Acetaldehyde	5.21E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**5.21E-10**
Propylene Oxide	4.90E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**4.90E-10**
Ethylbenzene	3.64E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**3.64E-10**
1,3-Butadiene	3.35E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**3.35E-10**
Naphthalene	2.04E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**2.04E-10**
Chloroform	1.93E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**1.93E-10**
Arsenic	1.69E-13	1.13E-12	5.48E-13	1.03E-12	2.71E-12	**2.88E-12**
Beryllium	1.52E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**1.52E-13**
p-DiChlorobenzene	5.78E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**5.78E-14**
Perchloroethylene	4.00E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**4.00E-16**
Trichloroethylene	6.06E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**6.06E-18**
Total	**2.92E-08**	**6.82E-08**	**1.02E-08**	**2.50E-07**	**3.28E-07**	**3.57E-07**

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

any potential carcinogenic risk greater than one-in-one-million and the number of individuals at that risk level. Because the MICR is less than one-in-one-million, the potential cancer burden is zero.

In conclusion, estimated cancer risks at all receptors in the health risk analysis were very low, with a worst-case cancer risk of 0.36-in-one-million at the MEIR, which is significantly lower than the T-BACT threshold. All estimated health risks were below the AVAQMD significance criterion of 10-in-one-million for cancer risk and one for non-cancer chronic and acute health impacts. Based on results of the risk assessment, the Project poses an insignificant incremental cancer risk and non-cancer health risk impact, according to established regulatory guidelines.

5.10.3.5 Non-Chemical Substances of Potential Concern

Along with TAC emissions, water systems such as cooling towers can also be sources of bacteria growth, including Legionella. Legionella is the bacterium that can cause Legionellosis, otherwise known as Legionnaires' disease. Outbreaks of Legionellosis have been linked to untreated or inadequately treated cooling water systems in the United States, including Texas and Wisconsin. The EPA has investigated and published about the presence of Legionella in water systems and its possible transmission in air (EPA, 1999). In most cases the EPA has determined that disease outbreaks from Legionella have involved indoor exposure or outdoor exposure within 200 meters of the source. The most prevalent transmission was found to be through the heating, ventilation, and air conditioning (HVAC) systems in older buildings but it is possible for growth to occur in industrial cooling towers. The EPA has not developed a dose-response threshold due to inadequate quantitative data on the infectivity of Legionella in humans. However it is known that normally functioning immune systems would have antibodies to Legionella and would be able to defend against infection. Individuals susceptible to Legionella typically have a compromised immunization system, including some of the elderly.

The Cooling Technology Institute (CTI), an industry consortium, has issued guidelines for best practices to control Legionella (CTI, 2000). To minimize risks from Legionella, the CTI recommends eliminating to the maximum extent possible water stagnation and nutrient sources that lead into the cooling system, and to maintain the overall system cleanliness which includes the application of corrosion inhibitors, microbiological disinfectants, and the use of high efficiency mist eliminators. Good preventative maintenance is very important in the efficient operation of cooling towers and other evaporative equipment. Preventive maintenance includes having effective drift eliminators, periodically cleaning the system if appropriate, maintaining mechanical components in working order, and maintaining an effective water treatment program with appropriate biocide concentrations. The following management strategies are directed at minimizing colonization/amplification within the cooling tower system:

- Avoid piping that is capped and has no flow (dead legs).
- Control input water temperature to avoid temperature ranges where Legionella grow. Keep cold water below 25° C (77° F) and hot water above 55° C (131° F).
- Apply biocides in accordance with label dosages to control growth of other bacteria, algae, and protozoa that may contribute to nutritional needs of Legionella. Rotating biocides and using different control methods is recommended. These include thermal shock, oxidizing biocides, chlorine-based oxidants and ozone treatment.
- Conduct routine periodic "back-flushes" to remove bio-film buildup on the inside walls of the pipes.

Regulatory agencies have addressed the question of controlling bacteria levels in water systems. The EPA also published a Legionella Drinking Water Health Advisory (EPA, 2001), which suggests control measures for disinfecting water in cooling systems, including thermal, hyperchlorination, copper-silver ionization, ultraviolet light sterilization, ozonation, and instantaneous steam heating systems.

The California Department of Health Services regulates microbial growth and reduction of the potential for Legionella in the California Code of Regulations, Title 22, Section 60306. The section states, in part, that whenever a cooling system, using recycled water in conjunction with an air conditioning facility, utilizes a cooling tower or otherwise creates a mist that could come into contact with employees or members of the public, the cooling system will operate a drift eliminator whenever the cooling system is in operation and that chlorine or another biocide will be used to treat the cooling system recirculating water to minimize the growth of Legionella and other microorganisms.

Cooling tower maintenance will help to prevent and reduce the chances of any growth or emissions of biological nature (e.g., mold and bacteria). To control bacteria levels in cooling water, the PHPP will ensure that the potential for bacterial growth is kept to a minimum by establishing and implementing a cooling tower biocide use, biofilm prevention, and a monitoring program. The details of a cooling tower management plan are discussed in Section 5.10.4.

5.10.3.6 Cumulative Impacts

An analysis of the cumulative impacts of the Project with other projects within a six-mile radius is required by the CEC. AVAQMD identified two neighboring facilities, Lockheed Martin and Northrop Grumman that have been evaluated for health risk impact. The evaluation of these two facilities was conducted by the AVAQMD using a prioritization score method[1]. The facility prioritization score for the two facilities are 9.927 and 4.088 respectively. AVAQMD ranked these facilities as intermediate priority, not requiring a detailed HRA. Based on the priority scores of these two stationary sources, the background health risk impacts would not be significant in the area neighboring the Project power plant site. In addition, the cancer risks and non-cancer health impacts estimated for the PHPP using conservative assumptions are insignificant with minimal predicted impacts to offsite receptors. Therefore, a significant cumulative increase in health risk impacts will not occur due to the operation of the PHPP.

In 1998, the OEHHA listed DPM, a primary combustion product from diesel engines, as a TAC, based on its potential to cause cancer, premature deaths, and other health problems. According to ARB and EPA, mobile source emissions account for much of the sources of cancer risk associated with TAC. According to EPA estimates, mobile sources (e.g., cars, trucks, and buses) of TAC account for as much as half of all cancers attributed to outdoor sources of TAC (EPA, 1994). More recent research illustrates that health risks from DPM are highest in areas of concentrated emissions, such as near ports, rail yards, freeways, or

[1] A facility prioritization method has been developed by the CAPCOA for the Air Toxics Hot Spots Program as a way for air districts to screen various existing sources for health risks. Under this approach, facility scores are calculated for both carcinogenic and non-carcinogenic effects, and the highest of the two scores determines the ranking of the facility. A facility score of ten or more is given the highest priority/most risk, between one and 10 is considered intermediate, and a score of less than one is low priority/minimal risk. Generally, only facilities with a score of 10 or more are required to perform an HRA.

warehouse distribution centers (ARB, 2004a; SCAQMD, 2008). Additionally, the MATES-III study conducted by the South Coast Air Quality Management District (SCAQMD) showed that mobile sources in the South Coast Air Basin represent the greatest contributors to the estimated cancer risks (about 84 percent) (SCAQMD, 2008).

Standards have been adopted by ARB and EPA to reduce DPM emissions from new on-road heavy-duty vehicles. EPA estimates that, when fully implemented, the program will result in particulate emission levels and the corresponding health impacts that are 95 percent below baseline levels (EPA, 2000b). In addition, ongoing Federal and State diesel motor vehicle emission reduction programs are in place and will continue to significantly reduce DPM emissions. These programs will support the finding that the Project's potential health impact will not be cumulatively significant.

5.10.4 Mitigation Measures

Emissions of criteria pollutants will be minimized by applying BACT to the emission sources, which will include the use of natural gas as fuel in the combustion turbines, duct burners, HTF heater and auxiliary boiler, and low-sulfur diesel fuel in the fire water pump and emergency generator engines. These measures also effectively minimize TAC emissions. Power generation with solar energy will also result in lower health risks per unit of energy generated when compared to conventional fossil-fueled power projects. As demonstrated in the HRA presented in this section, no significant public health impact is expected from the operation of the PHPP. Therefore, no TAC emission mitigation beyond that proposed for air quality is needed to protect public health.

To control bacteria levels in cooling water, the Project operators will accept a condition of certification to ensure that the potential for bacterial growth is kept to a minimum by establishing and implementing a cooling tower Biocide Use, Biofilm Prevention, and Legionella Monitoring Program.

To minimize cooling tower drift, the Project will install a high efficiency drift eliminator and implement a drift eliminator inspection and maintenance program. Drift eliminators on the cooling tower will control misting and significantly reduce non-criteria emissions from the cooling tower by minimizing cooling tower drift, mist, and water aerosolization, and emission of contaminants that may be present in the cooling tower make-up water that may become entrained in liquid water droplets. The drift eliminators must be properly installed and maintained in order to achieve efficient operation over the life of the facility. Following installation, proper maintenance includes periodic inspection and repair or replacement of any components found to be broken or missing.

Although impacts are expected to be less than significant, the measure listed below will be implemented to further mitigate any potential adverse impacts to public health from the cooling tower recirculation water.

PH-1 The Project owner shall develop and implement a Cooling Water Management Plan that is consistent with either the CEC Staff's Cooling Water Management Program Guidelines or the Cooling Technology Institute's Best Practices for Control of Legionella guidelines.

5.10.5 References

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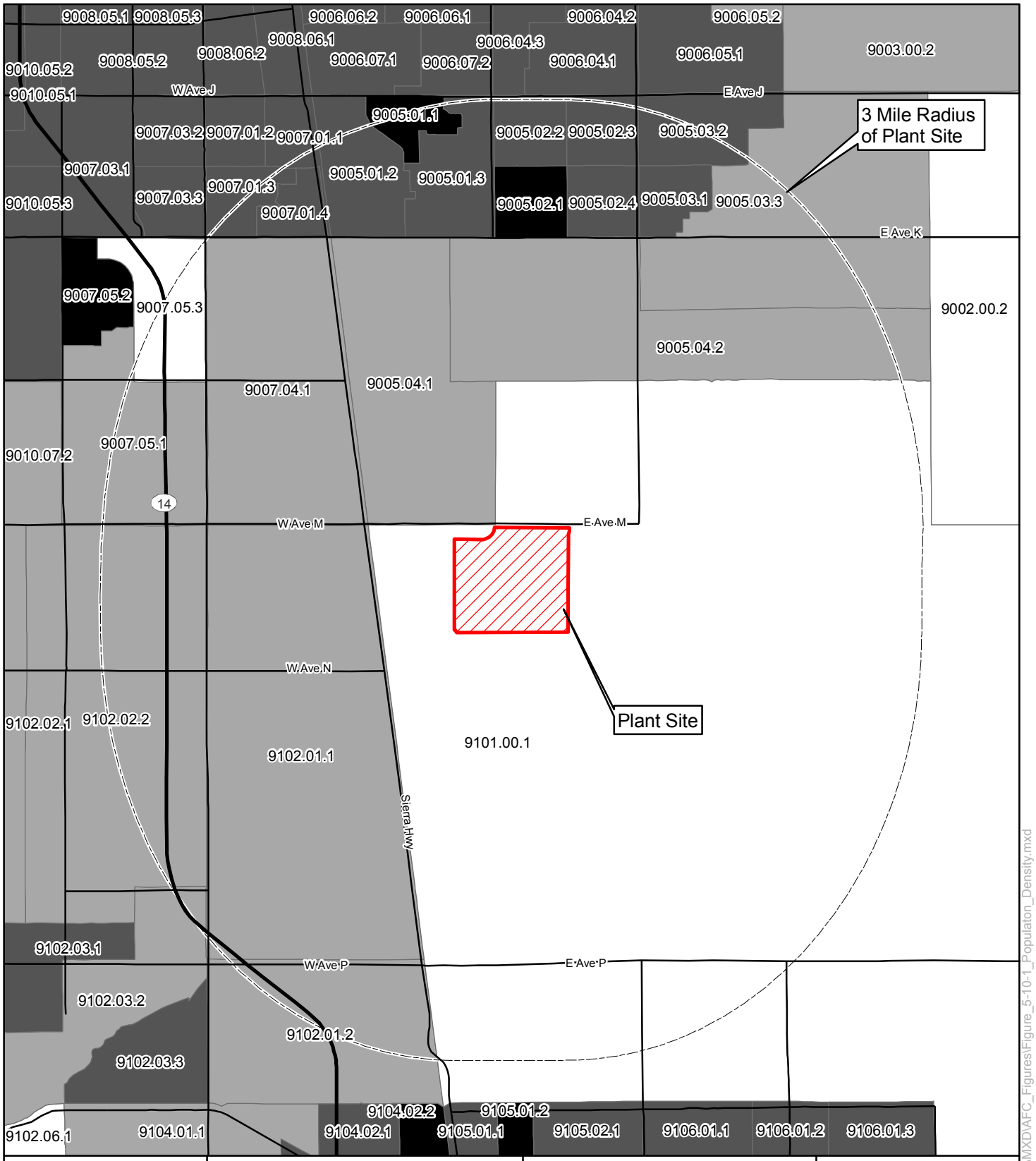
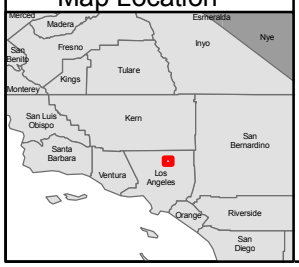


Map Location



Population per Sq. Mile by Block Group

0-215	Below State Average 215
215-2329	Below County Average 2329
2329-8000	Above State and County Averge
8000-15000	

N W E S

Palmdale Hybrid Power Project

Figure 5.10-1
Population Density by Block Group
3 Mile Radius of Plant Site

1:60,000

0 0.5 1 1.5 Miles

PALMDALE
a place to call home

Inland Energy, Inc.

ENSR | AECOM

Project: 10855-002
Date: July 2008

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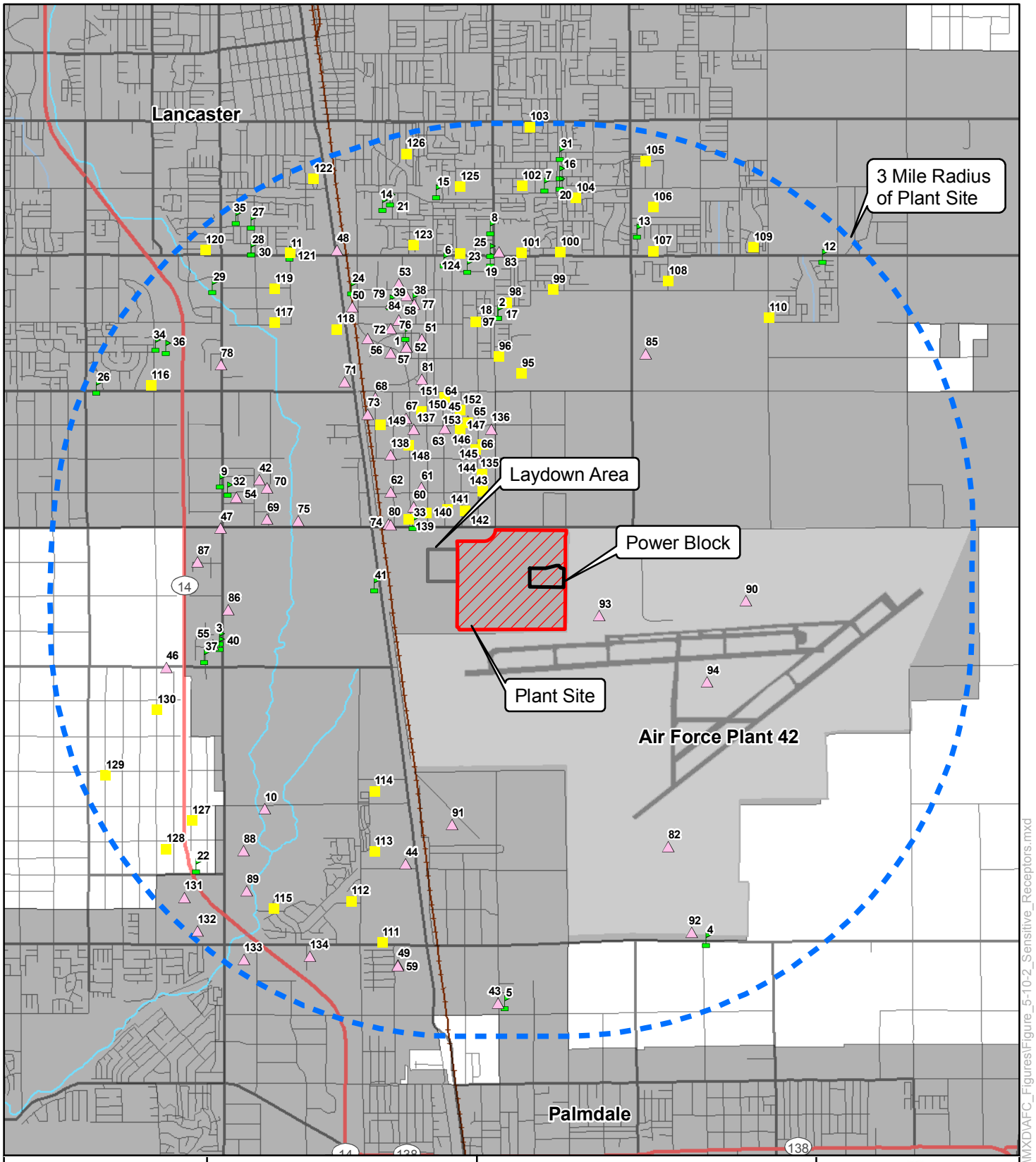

Map Location

Legend

- Plant Site
- Power Block
- Laydown Area
- Daycare, School, Medical Facility, Care Center
- Residence
- Worker Receptor

See Legend for Receptor Information

N W E S

Palmdale Hybrid Power Project

Figure 5.10-2

Residential, Worker and Sensitive Receptors Within 3 Miles of the Plant Site

1 inch equals 1 mile

0 0.5 1 2 Miles

PALMDALE a place to call home

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Project: 10855-002
Date: July 2008

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Receptor List for Figure 5.10-2

Receptor ID	UTM Easting	UTM Northing	Receptor Name (if known)	Category	Distance to Powerblock Centroid (meters)
1	397017	3836646	Learning Adventures Preschool	Preschool	3357.088144
2	398119	3836889	Learning Tree Preschool Eastside	Preschool	3204.492853
3	394776	3833055	Adventureland Preschool	Preschool	3972.1561
4	400513	3829421	Just Plane Kids	Preschool	4684.143971
5	398120	3828692	Head Start State Preschool	Preschool	5075.141549
6	397484	3837517	Lilliput Nursery Academy	Preschool	3968.83165
7	398685	3838391	Lancaster School District: Early Childhood Education	Preschool	4655.377897
8	398038	3837888	La Petite Academy: Lancaster	Preschool/School	4203.116802
9	394798	3834919	Child Care Resource Center: Admin Offices	Preschool	4068.078548
10	395282	3831031	Offfice@ West Avenue O	Worker	4350.572123
11	395653	3837615	Lancaster Parent Cooperative Nursery	Daycare/Preschool	4926.801328
12	401974	3837512	Baker Family Daycare	Daycare/Preschool	5005.186477
13	399779	3837836	Antelope Valley Day Care	Daycare/Preschool	4242.069237
14	396759	3838179	YMCA Child Care Center	Daycare/Preschool	4845.247338
15	397402	3838327	A Little Explorer's Day Care	Daycare/Preschool	4769.147201
16	398870	3838533	Over the Rainbow Day Care	Daycare/Preschool	4800.913646
17	398119	3836889	LFC Life Choices	Daycare/Preschool	3204.492853
18	398119	3836889	Desert Christian Schools	School	3204.492853
19	398034	3837511	Jack Northrop Elementary School	School	3831.778907
20	398869	3838411	Lincoln Elementary School	School	4678.962997
21	396851	3838245	Joshua Elementary School	School	4869.787042
22	394470	3830353	Westside Christian School	School	5408.038203
23	397758	3837436	New Vista Middle School	School	3816.086136
24	396381	3837196	Antelope Valley Community Day	School	4160.232779
25	398035	3837622	Endeavour Middle School	School	3940.882816
26	393344	3836044	Calvary Chapel Christian?	School	5823.037184
27	395199	3837986	Sierra Elementary School	School	5500.368893
28	395195	3837665	Desert Sands Charter School	School	5258.225249
29	394732	3837226	Opportunities For Learning	School	5277.089135
30	395195	3837665	Antelope Valley Learning Academy	School	5258.225249
31	398873	3838766	Columbia Elementary School	School	5033.73453
32	394888	3834818	Antelope Valley Adult Day Health Care Center	Care Centers	3952.777585
33	397083	3834405	Lancaster Adult Day Healthcare Center	Care	1740.417617
34	394052	3836546	Merrill Gardens (Senior Alzheimer's and Dementia Care, post-surgery care)	Care	5422.743671
35	395016	3838044	Lancaster Community Hospital	Care Centers	5661.681144
36	394174	3836512	Kaiser Permanente Medical Care Program: Appointments-Information	Care Centers	5300.726682
37	394590	3832836	Ca Allergy-Asthma Medical Group	Care Centers	4196.948092
38	397113	3837044	La County Mental Health Services	Care Centers	3665.267018
39	396837	3837025	A V Health Center	Care Centers	3775.12916

40	394776	3832989	AV Meridien Medical Group	Care Centers	3984.832379
41	396617	3833667	Penny Lane Center	Care Centers	2074.31262
42	395256	3834935	Lancaster School District: Antelope Valley Schools Transportation Office	Worker	3637.429729
43	398028	3828693	Palmdale School District	Worker	5085.24929
44	396946	3830358	Chapman University Palmdale	Worker	3800.919304
45	397555	3835642	Desert Equine Hospital Inc	Worker	2218.278314
46	394131	3832719	Antelope Valley Animal Hospital	Worker	4671.036154
47	394791	3834364	Animal Emergency Clinic?	Worker	3948.929189
48	396203	3837653	North Valley Veterinary Clinic?	Worker	4640.239096
49	396841	3829161	Marteney Wayne DVM	Worker	4933.534602
50	396379	3836975	State of California: Rehabilitation Dept	Worker	3979.069343
51	397199	3836588	Lance Camper Manufacturing Corporation	Worker	3218.828934
52	397015	3836491	Robert F Chapman Manufacturing	Worker	3224.320074
53	396932	3837246	Hardway Manufacturing	Worker	3925.943025
54	394979	3834728	Dunn Accurately Saw & Manufacturing	Worker	3841.523373
55	394684	3832979	Wise Software & Computer Products	Worker	4076.885263
56	396831	3836426	Nu Science Corporation?	Worker	3270.365878
57	397015	3836494	B M Green Enterprises Inc	Worker	3227.073304
58	396927	3836813	Well Done Designs	Worker	3546.933554
59	396841	3829150	Cafra Manufacturing Inc	Worker	4943.864456
60	397085	3834593	Canine Country Club	Worker	1819.388644
61	397180	3834825	Andy Gump Inc	Worker	1862.297842
62	396812	3834774	Dale's Hitchin Station	Worker	2145.423429
63	397462	3835521	Sierra Delivery Services	Worker	2166.535675
64	397466	3835820	Pestmaster Services	Worker	2417.526496
65	397738	3835606	Advanced Conservation Systems	Worker	2099.008416
66	397825	3835217	Budget Truck Rental	Worker	1715.386409
67	398532	3835598	J B Construction	Worker	2551.688079
68	396642	3835896	Western Equipment Services Co	Worker	2976.969139
69	395342	3834469	Bob Howle Automotive & RV	Worker	3426.78409
70	395346	3834835	Merry Maids	Worker	3519.322292
71	396277	3836089	Clark Pest Control	Worker	3370.074599
72	396558	3836596	IMS Specialty Services Inc	Worker	3567.2597
73	396548	3835697	Nu-Ease Inc Cleaning Materials	Worker	2904.666314
74	396808	3834386	Ruben's Bar & Grill	Worker	1990.937827
75	395709	3834442	Los Angeles County Superior Ct	Worker	3063.743058
76	396834	3836714	County of Los Angeles: Waterworks Lancaster Office	Worker	3509.707423
77	397112	3837000	County of Los Angeles: Antelope Valley MH	Worker	3625.490319
78	394813	3836305	City of Lancaster: Activity Center	Worker	4650.580813
79	396837	3837014	County of Los Angeles	Worker	3765.531001
80	396783	3834397	Credit Bureau West	Worker	2018.251467
81	397194	3836112	Signature Fundraising	Worker	2807.718165

82	400066	3830535	LA/Palmdale Regional Airport Terminal Building	Worker	3484.357128
83	398127	3837610	Financial Consulting and Trading International	Worker	3914.748288
84	397022	3837101	Concord Media Group	Worker	3755.847492
85	399854	3836382	Gift Boutique	Worker	2891.158509
86	394872	3833398	Birdies Driving Range	Worker	3832.80198
87	394512	3833968	Four Day Mattress	Worker	4184.561979
88	395023	3830535	WALMART	Worker	4867.384595
89	395058	3830056	SAMS CLUB	Worker	5169.991395
90	401014	3833441	Space Shuttle Assembly	Worker	2342.965269
91	397502	3830818	Lockheed-Skunk Works	Worker	3150.470841
92	400330	3829511	Musuem - Airport	Worker	4531.551797
93	399271	3833283	Bldg next to PHPP	Worker	736.6640776
94	400546	3832481	Airport: Palmdale Regional/usaf Plant 42	Worker	2239.808198
95	398386	3836165	RES1	Residential	2448.303997
96	398113	3836368	RES2	Residential	2694.441108
97	397843	3836781	RES3	Residential	3160.965903
98	398212	3837010	RES4	Residential	3308.900519
99	398763	3837159	RES5	Residential	3424.194285
100	398860	3837602	RES6	Residential	3869.725309
101	398402	3837595	RES7	Residential	3870.683103
102	398410	3838394	RES8	Residential	4666.773452
103	398510	3839092	RES9	Residential	5359.075474
104	399050	3838243	RES10	Residential	4521.562791
105	399879	3838677	RES11	Residential	5082.943545
106	399965	3838122	RES12	Residential	4567.896195
107	399959	3837601	RES13	Residential	4068.231821
108	400139	3837244	RES14	Residential	3795.646713
109	401151	3837632	RES15	Residential	4608.679158
110	401325	3836798	RES16	Residential	4040.58031
111	396661	3829430	RES17	Residential	4760.010178
112	396300	3829922	RES18	Residential	4501.000243
113	396581	3830506	RES19	Residential	3856.67919
114	396589	3831227	RES20	Residential	3271.721004
115	395382	3829843	RES21	Residential	5108.209508
116	393986	3836070	RES22	Residential	5251.462856
117	395460	3836796	RES23	Residential	4449.557528
118	396192	3836711	RES24	Residential	3884.24535
119	395465	3837196	RES25	Residential	4729.991724
120	394646	3837671	RES26	Residential	5642.88668
121	395653	3837626	RES27	Residential	4935.461356
122	395938	3838499	RES28	Residential	5501.413808
123	397120	3837698	RES29	Residential	4262.499435

124	397668	3837592	RES30	Residential	3989.875302
125	397677	3838391	RES31	Residential	4764.23172
126	397040	3838786	RES32	Residential	5313.184506
127	394418	3830903	Res33	Residential	5125.559601
128	394108	3830565	Res34	Residential	5571.804304
129	393399	3831442	Res35	Residential	5766.511395
130	3940200	3832216	Res36	Residential	4910.786891
131	394315	3829986	Mall1	Worker	5761.746147
132	394468	3829585	Mall2	Worker	5920.335721
133	395015	3829241	Office @Trade Center Drive	Worker	5805.588983
134	395797	3829271	Offfice Complex @Rancho Vista	Worker	5319.798963
135	397904	3834965		Worker	1459.147212
136	398014	3835508		Worker	1896.883449
137	397093	3835515		Worker	2390.857075
138	396818	3835212		Worker	2384.106378
139	397028	3834444		Residential	1806.437933
140	397237	3834526		Residential	1653.969165
141	397492	3834562		Residential	1455.737952
142	397697	3834539		Residential	1277.50547
143	397897	3834772		Residential	1296.249063
144	397903	3834973		Residential	1466.544872
145	397908	3835324		Residential	1770.033664
146	397825	3835275		Residential	1765.92723
147	397644	3835517		Residential	2065.937203
148	397035	3835329		Residential	2297.155783
149	396701	3835576		Residential	2709.25688
150	397191	3835730		Residential	2495.137102
151	397466	3835892		Residential	2478.994463
152	397648	3835742		Residential	2260.703113
153	397739	3835589		Residential	2083.446039