5.9 Public Health

5.9.1 Introduction

The Hidden Hills Solar Electric Generating System (HHSEGS) will be located on privately owned land in Inyo County, California, adjacent to the Nevada border. It will comprise two solar fields and associated facilities: the northern solar plant (Solar Plant 1) and the southern solar plant (Solar Plant 2). Each solar plant will generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. Solar Plant 1 will occupy approximately 1,483 acres (or 2.3 square miles), and Solar Plant 2 will occupy approximately 1,510 acres (or 2.4 square miles). A 103-acre common area will be established on the southeastern corner of the site to accommodate an administration, warehouse, and maintenance complex, and an onsite switchyard. A temporary construction laydown and parking area on the west side of the site will occupy approximately 180 acres.

Each solar plant will use heliostats—elevated mirrors guided by a tracking system mounted on a pylon—to focus the sun's rays on a solar receiver steam generator (SRSG) atop a solar power tower near the center of each solar field. The solar power tower technology for the HHSEGS project design incorporates an important technology advancement, the 750-foot-tall solar power tower. One principle advantage of the HHSEGS solar power tower design is that it results in more efficient land use and greater power generation. The new, higher, 750-foot solar power tower allows the heliostat rows to be placed closer together, with the mirrors at a steeper angle. This substantially reduces mirror shading and allows more heliostats to be placed per acre. More megawatts can be generated per acre and the design is more efficient overall.

In each solar plant, one Rankine-cycle steam turbine will receive steam from the SRSG (or solar boiler) to generate electricity. The solar field and power generation equipment will start each morning after sunrise and, unless augmented, will shut down when insolation drops below the level required to keep the turbine online. Each solar plant will include a natural-gas-fired auxiliary boiler, used to augment the solar operation when solar energy diminishes or during transient cloudy conditions, a startup boiler, used during the morning startup cycle, and a nighttime preservation boiler, used to maintain system temperatures overnight. On an annual basis heat input from natural gas will be limited by fuel use and other conditions to less than 10 percent of the heat input from the sun. To save water in the site's desert environment, each solar plant will use a dry-cooling condenser. Cooling will be provided by air-cooled condensers, supplemented by a partial dry-cooling system for auxiliary equipment cooling. Raw water will be drawn daily from onsite wells located in each power block and at the administration complex. Groundwater will be treated in an onsite treatment system for use as boiler make-up water and to wash the heliostats.

Two distinct transmission options are being considered because of a unique situation concerning Valley Electric Association (VEA). Under the first option, the project would interconnect via a 230-kilovolt (kV) transmission line to a new VEA-owned substation (Tap Substation) at the intersection of Tecopa Road[1] and Nevada State Route (SR) 160 (the Tecopa/SR 160 Option). The other option is a 500-kV transmission line that

[1] The road is also called Tecopa Highway and Old Spanish Trail Highway. The names are generally used interchangeably.

interconnects to the electric grid at the Eldorado Substation (the Eldorado Option), in Boulder City, Nevada.

A 12- to 16-inch-diameter natural gas pipeline will be required for the project. It will exit the HHSEGS site at the California-Nevada border and travel on the Nevada side southeast along the state line, then northeast along Tecopa Road until it crosses under SR 160. From this location a 36-inch line will turn southeast and continue approximately 26 miles, following the proposed Eldorado Option transmission line corridor, to intersect with the Kern River Gas Transmission (KRGT) pipeline. A tap station will be constructed at that point to connect it to the KRGT line. The total length of the natural gas pipeline will be approximately 35.3 miles.

The transmission and natural gas pipeline alignments will be located in Nevada, primarily on federal land managed by the U.S. Bureau of Land Management (BLM), except for small segments of the transmission line (both options) in the vicinity of the Eldorado Substation, which is located within the city limits of Boulder City, Nevada. A detailed environmental impact analysis of the transmission and natural gas pipeline alignments will be prepared by BLM.

This section presents the methodology and results of a human health risk assessment (HRA) performed to assess potential impacts and public exposure associated with airborne emissions from HHSEGS construction and operation. This screening HRA has been performed in accordance with guidance established by the California Office of Environmental Health Hazard Assessment (OEHHA, 2003) and the California Air Resources Board (CARB, 2010). Beneficial aspects of the project regarding protection of public health include the following:

- Use of solar technology to generate electricity with minimal use of fossil fuel
- Use of clean-burning, low sulfur content natural gas for support equipment, which reduces sulfur dioxide (SO_2) emissions and subsequent sulfate fine particulate generation
- Optimized stack height to reduce ground-level concentrations of exhaust pollutants below public health-related significance thresholds

These features will ensure that the public health impacts of the project will be avoided or minimized.

HHSEGS will not be a major stationary source under Great Basin Unified Air Pollution Control District (GBUAPCD) New Source Review (NSR) regulations because maximum facility emissions of each criteria pollutant will be below 250 pounds per day. The project will not be a major source under the federal Prevention of Deterioration (PSD) program because it will have the potential to emit less than 100 tons per year (tpy) of each PSD criteria pollutant, and less than 100,000 tons per year of greenhouse gases (GHG).

Air will be the dominant pathway for potential public exposure to non-criteria pollutants released by the project. Emissions to the air will consist primarily of combustion by-products produced by the boilers and emergency engines. Potential health risks from combustion emissions will occur almost entirely by direct inhalation. To be conservative, additional pathways for dermal absorption, soil ingestion, and mother's milk ingestion were

included in the health risk modeling; however, direct inhalation is the dominant exposure pathway. Consistent with OEHHA guidance, because of the remote desert location of the proposed project, the produce and fish pathways were not evaluated.[2]

Combustion byproducts with established national and California ambient air quality standards (referred to as "criteria pollutants") are addressed in Section 5.1, Air Quality. Some discussion of the potential health risks associated with these substances is also presented in this section. Potential public exposure to accidental releases of hazardous materials on the project site during operation is addressed in Section 5.14, Hazardous Materials Handling. To ensure worker safety during operations and construction, safe work practices will be followed (see Section 5.16, Worker Health and Safety).

The details of the public health analysis are contained in the following sections. 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 project site. Section 5.9.4 discusses the environmental impacts from construction and operation of the power plant and associated facilities. Section 5.9.5 discusses potential cumulative public health impacts of the combined toxic air contaminant (TAC[3]) emissions from the project and other projects, if any, in the process of obtaining permits to construct or reasonably known by GBUAPCD or other local air permitting agencies to be entering the permitting process. These other projects are also considered in the cumulative impacts analysis (Section 5.9.5 and Air Quality Appendix 5.1G). Section 5.9.6 discusses mitigation measures that may be needed to reduce potentially significant impacts below a level of significance. Section 5.9.7 provides the agencies involved in public health aspects of permitting and the California Environmental Quality Act (CEQA) analysis for the project, along with agency contact information. Section 5.9.8 describes public health-related permits for the project, and the schedule for obtaining those permits. Section 5.9.9 provides the references cited or consulted in preparing this section.

5.9.2 Laws, Ordinances, Regulations and Standards

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

[2] "*The other exposure pathways (e.g., the ingestion of homegrown produce or fish) are evaluated on a site-by-site basis. If the resident can be exposed through an impacted exposure pathway, then it must be included in the HRA.* ***However, if there were no vegetable gardens or fruit trees within the zone of impact for a facility, for example, then the produce pathways would not be evaluated****."* [emphasis added) Source: OEHHA, 2003.

[3] Also called non-criteria pollutants.

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

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
Federal			
Clean Air Act	Requires large facilities to provide offsets and demonstrate that new emissions will not cause or contribute to violation of a federal ambient air quality standard	U.S. Environmental Protection Agency (EPA) Region 9, CARB, and GBUAPCD	Section 5.9.2.1
40 Code of Federal Regulations (CFR) Part 68 (Risk Management Plan)	Requires facilities storing or handling significant amounts of acutely hazardous materials to prepare and submit Risk Management Plans	EPA Region 9 and Inyo County Environmental Health Department	Section 5.9.2.1
State			
Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	Activities resulting in doses or carcinogenic risks above specified thresholds require Proposition 65 exposure warnings.	CA OEHHA	Section 5.9.2.2
Health and Safety Code, Article 2, Chapter 6.95, Sections 25531 to 25541; California Code of Regulations (CCR) Title 19 (Public Safety), Division 2 (Office of Emergency Services), Chapter 4.5 (California Accidental Release Prevention Program)	Requires facilities storing or handling significant amounts of acutely hazardous materials to prepare and submit Risk Management Plans	Inyo County Environmental Health Department	Section 5.9.2.2
Health and Safety Code Sections 44360 to 44366 (Air Toxics “Hot Spots” Information and Assessment Act—AB 2588)	Requires preparation and biennial updating of facility emission inventory of hazardous substances; risk assessments.	GBUAPCD and CARB	Section 5.9.2.2
Local			
GBUAPCD Rule 220, Construction or Reconstruction of Major Sources of Hazardous Air Pollutants	Requires the evaluation of the potential impact of TACs from new sources and modifications.	GBUAPCD	Section 5.9.2.3

5.9.2.1 Federal LORS

5.9.2.1.1 Clean Air Act

The Clean Air Act requires large projects (new or modified sources at major stationary sources) to go through a federal permitting process that ensures that the project will not

cause or contribute to a violation of a national ambient air quality standard. The emissions from HHSEGS are below the thresholds for applicability of the federal permitting requirements.

5.9.2.1.2 40 CFR Part 68 (Risk Management Plan)

Facilities storing or handling significant amounts of acutely hazardous materials are required to prepare and submit risk management plans. No regulated substance will be present in quantities exceeding the applicability thresholds. A Risk Management Plan (RMP) is not required.

5.9.2.2 State LORS

5.9.2.2.1 Health and Safety Code 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)

Activities which expose the public to significant levels of chemicals that are carcinogenic or that can cause reproductive harm must provide warnings.

Based on an HRA that follows CARB/CA OEHHA guidelines, non-criteria pollutant emission rates and resulting doses and carcinogenic risks will not exceed thresholds that require Proposition 65 exposure warnings.

5.9.2.2.2 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)

Facilities storing or handling significant amounts of acutely hazardous materials are required to prepare and submit risk management plans.

No regulated substance will be present in quantities exceeding the applicability thresholds. An RMP is not required.

5.9.2.2.3 Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)

Under this program, facilities with emissions of toxic air contaminants are prioritized based on emissions. If the facility's priority score is high enough, the facility is required to prepare an HRA. High risk facilities may be required to provide notification to neighbors or to develop and implement a risk reduction plan.

Based on the emission estimates described in this report, HHSEGS will not be a high-priority facility.

5.9.2.3 Local LORS

5.9.2.3.1 Inyo County Renewable Energy Ordinance

The Inyo County Renewable Energy Ordinance requires developers of renewable energy projects to apply for and obtain from the County Planning Commission a renewable energy impact determination that identifies environmental and other impacts expected to result from such projects, and mitigation for those impacts.

The identification of potential air quality impacts and mitigation that would be provided to the County but for the California Energy Commission's (CEC) jurisdiction over this project is provided in this Application for Certification.

5.9.2.3.2 New Source Review Requirements for Air Toxics

The GBUAPCD's Toxic Risk Assessment Policy describes the requirements and standards for evaluating the potential impact of TACs from facilities that emit TACs. The rule requires a demonstration that a new or modified source will not exceed the applicable health risk thresholds.

The GBUAPCD's NSR rule for air toxics (Regulation II, Rule 220, Construction or Reconstruction of Major Sources of Hazardous Air Pollutants) describes the requirements, procedures, and standards for evaluating the potential impact of TAC from new sources and modifications to existing sources. Based on the emissions estimates described in this report, HHSEGS is not a major source of hazardous air pollutants.[4]

5.9.3 Affected Environment

The CEC defines sensitive receptors as infants and children, the elderly, the chronically ill, and any other members of the general population who are more susceptible to the effects of exposure to environmental contaminants than the population at large. For the purposes of this analysis, sensitive receptors are defined as the locations occupied by groups of individuals who may be more susceptible to health risks from a chemical exposure: schools (public and private), day-care facilities, convalescent/nursing homes, retirement homes, health clinics, and hospitals. Because sensitive individuals may be located at any residential site, risk-based standards apply to existing residences and places where residences may be built without a change in zoning as well as sensitive receptors. If project impacts are protective of sensitive individuals at the point of maximum impact, they are protective at all locations.

Identification of sensitive receptors is typically done to ensure that notice of possible impacts is provided to the community. No daycare, hospital, park, preschool, or school receptors were found within 6 miles of the project site. The St. Therese Mission, a commercial facility, is under construction approximately 0.5 mile southeast of the HHSEGS site (see Figure 5.9-1). Because this development is planned to include a chapel, garden, restaurant, visitor center that will include a children's playground, and a residential unit, this future development will be treated as a sensitive receptor.

The nearest residence to the HHSEGS property boundary is approximately 300 feet west of the fenceline (see Figure 5.9-1). The nearest residence to any power block equipment is approximately 3,500 feet south of the Solar Plant 2 power block and about 950 feet south of the project's southern boundary.

A variety of studies have been published regarding cancer and respiratory illnesses and diseases in Inyo County and in the broader Great Basin Valleys Air Basin (GBVAB). Asthma diagnosis rates in the GBVAB area are higher than average rates throughout the state for adults and children (Wolstein et al., 2010). The percentage of adults who have been diagnosed with asthma was 9.3 percent in 2005 and 2007, compared with 7.7 percent of the population statewide. However, rates for children were 13.2 percent compared with 10.1 percent statewide for the same time period (Wolstein et al., 2010). Cancer death rates in the county have remained stable between 2003 and 2007, slightly over 200 per 100,000.

[4] Not all TACs are Hazardous Air Pollutants (HAPs). For example, diesel particulate matter and ammonia are TACs but are not listed federal HAPs.

However, cancer death rates in the county remain slightly higher than the statewide average of 170 per 100,000 population (National Cancer Institute, 2011). The local public health department, Inyo County Health and Human Services, provides information on its website regarding public health issues for county residents (Inyo County, 2011).

There are no ambient monitors measuring TACs in the GBVAB. However, air quality and health risk data presented by CARB in the *California Almanac of Emissions and Air Quality – 2009 Edition* (CARB, n.d.) for the upwind San Joaquin Valley Air Basin (SJVAB)[5] 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 are showing a steady downward trend as well. CARB-estimated emissions inventory values for the top ten TACs for 2008 for Inyo County and ambient levels and associated potential risks for the SJVAB are presented in Table 5.9-2 for the air basin.

TABLE 5.9-2
Top Ten TACs Emitted by All Sources in the Project Area

		2007 Levels and Risks, SJVAPCD[a]	
TAC	**2008 Emissions, Inyo County (tons/year)**	**Annual Average Concentration (ppbv)**	**Potential Health Risk[b] (in 1 million)**
Acetaldehyde	27	1.2	6
Benzene	39	0.32	29
1,3-Butadiene	12	0.07	24
Carbon tetrachloride	0	0.10 (2003)	26 (2003)
Chromium, hexavalent	<0.01	0.08 ng/m^3	12
Para-Dichlorobenzene	<1	0.15 (2006)	10 (2006)
Formaldehyde	56	2.5	18
Methylene chloride	2	0.1	<1
Perchloroethylene	2	0.03	1
Diesel PM[c]	42	1.3 µg/m^3 (2000)	390 (2000)
Total Health Risk[d]			90

[a]There are no ambient monitors in GBVAB that measure air toxics, so data from the SJVAB, which is upwind of the GBVAB, is provided as a conservative estimate of background concentrations and health risks.

[b]Health Risk represents the number of excess cancer cases per million people based on a 70-year exposure to the annual average concentration. Health risk represents only the compounds listed in this table and only those with data for the year. There may be other significant compounds for which monitoring and health risk information are not available.

[c]The diesel PM concentrations are estimates based on receptor modeling, and are available only for selected years.

[d]Total Health Risk shown excludes diesel PM because diesel PM concentrations are not available for 2007.

Notes:

µg/m^3 = micrograms per cubic meter
ng/m^3 = nanograms per cubic meter
ppbv = parts per billion by volume
SJVAPCD = San Joaquin Valley Air Pollution Control District

Source: CARB, 2009a. Tables C-1 and C-34.

[5] Air pollution transport from the SJVAB to the GBVAB is discussed in Title 17 CCR Section 75000, Transport Identification.

5.9.4 Environmental Analysis

This public health section discusses the sources and different kinds of air emissions associated with construction and operation of the project (see Section 5.1, Air Quality), the methodology used in the HRA, and the results of the assessment of potential health risks from the project.

Project emissions to the air will consist of combustion byproducts from the natural-gas-fired boilers. Another source of combustion pollutants will be the routine testing and maintenance of the diesel-fueled emergency standby generators and the emergency fire water pump engine. Inhalation is the main pathway by which air pollutants can potentially cause public health impacts. Other pathways, including dermal absorption and ingestion of soil, homegrown vegetables, and mother's milk, are also evaluated for potential exposure. As discussed below, these health impacts will not be significant.

Construction emissions are presented in detail in Appendix 5.1F, followed by an air dispersion analysis demonstrating that with the exception of the state 24-hour PM_{10} (particulate matter smaller than 10 microns in diameter) standard (which is already being exceeded), ambient air quality standards will not be exceeded during project construction. The dominant emission with potential health risk is diesel particulate matter from combustion of diesel fuel in construction equipment (e.g., cranes, dozers, excavators, graders, front-end loaders, backhoes). A screening-type calculation in Appendix 5.1F demonstrates that the potential carcinogenic risk of diesel particulate matter emissions during construction will be less than significant.

To evaluate potential health risks during project operation, 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 cancer and non-cancer risks, and are discussed separately below.

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. 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 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. 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.

Animal studies or human epidemiological studies (often based on workplace exposures) are used to estimate the relationship between the dose of a particular carcinogen and the resulting excess cancer risk. The cancer potency factor for that carcinogen is the slope of that dose-response relationship. Cancer risk is estimated by multiplying the dose of a particular

carcinogen times its cancer potency factor. The dominant exposure pathway is inhalation; however, additional exposure pathways are considered in this screening HRA.

5.9.4.1.2 Non-Cancer Health Impacts

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 modeled maximum annual 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 by the regulatory agencies to be a less-than-significant health risk. For this HRA, as a conservative assumption that will tend to overpredict risk, all hazard quotients were summed regardless of target organ.

This methodology leads to a conservative (upper bound) assessment. RELs used in the hazard index calculations were those published in the CARB/CA OEHHA listing, updated as of February 14, 2011 (CARB, 2011) (see Sections 5.1.4.6 and Appendix 5.1E of Section 5.1, Air Quality).

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. This method leads to an upper bound assessment.

The maximum 1- and 8-hour average concentrations of each TAC with acute health effects is divided by the specific TAC's acute 1- and 8-hour REL, respectively, to obtain the 1- and 8-hour health hazard quotient for health effects caused by relatively high, short-term exposure to air toxics. RELs used in the hazard index calculations were those published in the CARB/OEHHA listing, updated February 14, 2011 (CARB, 2011). New RELs initially adopted by OEHHA on December 19, 2008, included 8-hour average RELs for acetaldehyde, acrolein and formaldehyde.[6] However, because these 8-hour RELs are not yet included in

[6] Eight-hour RELs were also adopted for arsenic, manganese, and mercury. However, those chemicals are not emitted in any significant amount from natural gas-fired gas boilers, so are not included in this screening HRA.

CARB's Hotspots Analysis and Reporting Program (HARP) software, they have been evaluated manually in this screening HRA.

5.9.4.2 Construction Impacts

Construction of HHSEGS, from perimeter fencing to site preparation and grading to commercial operation, is expected to take place from the third quarter of 2012 to the second quarter of 2015 (29 months total). Construction of the common area facilities would occur concurrently with the construction of Solar Plant 1; Solar Plant 2 construction will be staggered 3 months behind Solar Plant 1.

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, Air Quality.

Temporary air emissions from construction are presented in detail in Appendix 5.1F, 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 on-site construction are summarized in Table 5.9-3.

TABLE 5.9-3
Maximum Onsite DPM Emissions During Construction

Emitting Activity	Pounds per Day	Tons per Year
Construction Equipment	4.4	0.1

The detailed HRA calculations in Appendix 5.1E demonstrate that the potential cancer risk of DPM emissions during project construction will not exceed the significance threshold of 10 in one million. This HRA was performed in accordance with OEHHA (2003) guidance, which requires adjusting the 70-year lifetime exposure risk for an exposure period of 9 years (despite the fact that project construction will only last 29 months). The resulting maximum off-property cancer risk would be approximately 7.4 in one million.

Ambient air modeling for PM_{10}, carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) was performed as described in Section 5.1.4.5 and Appendix 5.1D. Construction-related criteria pollutant emission impacts are temporary and localized, resulting in no long-term significant health impacts to the public.

Small quantities of hazardous waste may be generated during construction 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 onsite during construction (see Section 5.5, Hazardous Materials Handling). To ensure 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 the project result from exposure to air emissions from operation of the natural-gas-fired boilers and diesel-fueled emergency equipment. The non-criteria pollutants emitted from the project include certain volatile organic compounds and polycyclic aromatic hydrocarbons (PAHs) from the combustion of natural gas. These pollutants are listed in Table 5.9-4, and the detailed emission summaries and calculations are presented in Appendix 5.1B.

TABLE 5.9-4
Pollutants Emitted to the Air from the Project

Criteria Pollutants	Non-criteria Pollutants
Carbon monoxide	Acetaldehyde
Oxides of nitrogen	Acrolein
Particulate matter	Benzene
Oxides of sulfur	Ethylbenzene
Volatile organic compounds	Formaldehyde
	Hexane
	Naphthalene
	PAHs
	Propylene
	Toluene
	Xylene
	Diesel Particulate Matter

Emissions of criteria pollutants will not cause or contribute significantly to violations of the national or California ambient air quality standards as discussed in Section 5.1, Air Quality.

Air dispersion modeling results (see Section 5.1.4.5) show that emissions will not result in ambient concentrations of criteria pollutants that exceed the ambient air quality standards, with the exception of the state PM_{10} standard. For this pollutant, existing 24-hour average PM_{10} background concentrations already exceed ambient standards. 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 screening HRA containing potential impacts associated with emissions of non-criteria pollutants to the air from the project is presented in Appendix 5.1E. The HRA was prepared using the latest version (1.4d) of the CARB's HARP model (CARB, 2009b), the CARB February 2011 health database (CARB, 2011), and the OEHHA Hot Spots Program Guidance Manual (OEHHA, 2003).

5.9.4.4 Public Health Impact Study Methods

Emissions of non-criteria pollutants from the project were analyzed using emission factors previously approved by CARB and the U.S. Environmental Protection Agency (EPA). Air dispersion modeling combined the emissions with site-specific terrain and meteorological conditions to analyze short-term and long-term arithmetic mean concentrations in air for use in the HRA. The EPA-recommended air dispersion model, AERMOD, was used along

with 5 years (2006–2010) of compatible meteorological data from the Pahrump and Henderson, Nevada, meteorological stations. The meteorological data combined surface measurements made at Pahrump and Henderson with upper air data from Elko, Nevada. Because HARP is built on a previous EPA-approved air dispersion model, Industrial Source Complex Short Term, Version 3 (ISCST3), the HARP On-Ramp (CARB, n.d.) 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

5.9.4.4.1 Risk Analysis Method

The criteria pollutant modeling analysis was performed using the AERMOD model, the 5-year meteorological data set described above, specific receptor grids, and the stack parameters for the combustion equipment (see Section 5.1, Air Quality). The highest annual, 8-hour and 1-hour average concentrations were used to determine cancer risk and chronic health hazard index, and acute 8-hour and 1-hour health hazard indices, as appropriate. 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) as well as risks to the MEI at residential locations (MEIR). The cancer risk to the MEI at the PMI is referred to as the Maximum Incremental Cancer Risk, or MICR. 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. Health risks were also evaluated at the nearest residence. The PMI (and thus the MICR) is not necessarily associated with actual exposure because in many cases the PMI is in an uninhabited area. Therefore, the MICR is generally higher than the cancer risk to the nearest resident. Both risks are based on 24 hours per day, 365 days per year, 70 year lifetime exposure.

Health risks are also assessed for the hypothetical Maximally Exposed Individual Worker, or MEIW, at the PMI. This assessment reflects potential workplace risks, which have a shorter duration than residential risks. Workplace risks reflect 8 hour per day, 245 days per year, 40 year exposure.

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

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/ARB Approved Risk Assessment Health Values* (CARB, 2011) 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 REL($\mu g/m^3$)	Acute REL ($\mu g/m^3$)
Acetaldehyde	0.010	140	470 (1-hr) 300 (8-hr)
Acrolein	—	0.35	2.5 (1-hr) 0.7 (8-hr)
Ammonia	—	200	3,200
Benzene	0.10	60	1,300
1,3-Butadiene	0.60	20	—
Ethylbenzene	0.0087	2,000	—
Formaldehyde	0.021	9	55 (1-hr) 9 (8-hr)
Hexane	—	7,000	—
Naphthalene	0.12	9.0	—
PAHs (as BaP)	3.9	—	—
Propylene	—	3,000	—
Toluene	—	300	37,000
Xylene	—	700	22,000
Diesel particulate matter	1.1	5	—

Source: CARB, 2011.

5.9.4.5 Characterization of Risks from Toxic Air Pollutants

The estimated potential maximum cancer risks for the MICR and the MEIW at the location of maximum impact (PMI), and for the MEIR, are shown in Table 5.9-6. The maximum carcinogenic risk is below the GBUAPCD's 1-in-one-million threshold triggering additional analysis and well below the CEC's 10–in-one-million threshold of significance.

Cancer risks potentially associated with the project 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 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.

TABLE 5.9-6
Summary of Estimated Maximum Potential Health Risks

Receptor	Carcinogenic Risk[a] (per million)	Cancer Burden	Acute Health Hazard Index		Chronic Health Hazard Index
			1-hour	8-hour	
MICR and HHIs at PMI	0.39 in one million	0	0.004	0.004	0.0002
MICR and HHIs at Residential Receptors	0.15 in one million	0	0.002	0.002	<0.0001
MEIW at PMI	0.06 in one million	0	n/a[b]	n/a[b]	n/a[c]
Significance Level	10	1.0	1.0	1.0	1.0

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

[b]Acute analysis is always done as a single point exposure and is not affected by the type of analysis or exposure duration.

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

HHI = Health Hazard Index

The maximum potential acute non-cancer health hazard indexes for 1-hour and 8-hour exposures associated with concentrations in air are shown in Table 5.9-6. As indicated in Table 5.9-6, the acute non-cancer health hazard indexes for all target organs fall well below 1.0, the threshold of significance. Further description of the methodology used to calculate health risks associated with emissions to the air is presented in Appendix 5.1E.

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

The estimates of cancer and non-cancer risks associated with chronic or acute exposures 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. 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 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, 1991).

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, this analysis uses highly conservative methods and assumptions, meaning they tend to over-predict the potential for adverse effects. Conservative methodology and assumptions include the following:

- The analysis includes representative weather data over a period of 5 years to ensure that the least favorable conditions producing the highest ground-level concentration of power plant emissions are included. The analysis then assumes that these worst-case weather conditions, which in reality occurred only once in 5 years, will occur continuously for 70 years.
- The project 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 project emissions is identified and the analysis then assumes that a sensitive individual resides at this location 24 hours a day, 7 days a week over the entire 70-year period, even though these assumptions are physically impossible.

Taken together, these methods and assumptions create a scenario that is more potentially adverse to human health than conditions that exist in the real world. For example, if the worst-case weather conditions could only occur on a winter evening but the worst-case emission rates could only occur on a summer afternoon, the analysis nonetheless assumes that these events occur at the same time. The point of using these conservative assumptions is to consciously overstate the potential impacts of the project. 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 provides 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 ensures that there will not be any significant public health impacts at any location, under any weather condition, under any operating condition.

5.9.4.6 Hazardous Materials

Hazardous materials will be used and stored at the facility. The hazardous materials stored in significant quantities onsite and descriptions of their uses are presented in Section 5.5, Hazardous Materials Handling. 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 result in significant impacts on public health. Best management practices will be used and mitigation measures will be in place to prevent releases. However, if an accidental release migrated offsite, potential impacts to the public could result.

The California Accidental Release Prevention (CalARP) Program regulations and 40 CFR Part 68 under the Clean Air Act establish emergency response planning requirements for acutely hazardous materials. These regulations require, among other things, preparation of a Risk Management Program (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.

An RMP is not required for this facility. No regulated substance will be present in quantities exceeding the applicability thresholds.

5.9.4.7 Operation Odors

The fuels used at the HHSEGS will include natural gas and very-low-sulfur diesel fuel. Combustion contaminants will not be present at concentrations that could produce a significant odor.

5.9.4.8 Electromagnetic Field Exposure

HHSEGS will include onsite electric power-handling transformers and associated equipment, which are discussed in more detail in Section 3.0, Transmission System Engineering. Based on findings of the National Institute of Environmental Health Sciences (NIEHS, 1999), electromagnetic field exposures from the electric power generating and handling equipment and associated transmission lines 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." (NIEHS, 1999).

5.9.4.9 Summary of Impacts

Results from the HRA based on emissions modeling indicate that there will be no significant incremental public health risks from construction or operation of the HHSEGS 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 24-hour average PM_{10} standard. For this pollutant, existing 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 project and other past, present, and reasonably foreseeable projects is required by the CEQA. The Applicant submitted letters to GBVAPCD, Clark County and Nevada Bureau of Air Pollution Control requesting the following information regarding other projects that qualify for review under the cumulative air quality impact analysis:[7]

- Projects located within a 6-mile radius of the HHSEGS project site; and
- Projects issued a new Authority to Construct permit after January 1, 2010.

GBUAPCD has responded that no projects meeting these criteria have been identified, with the exception of the St. Therese Mission project (which will not be a source of TACs). Potential cumulative impacts of other development projects within 10 miles of the project site are discussed in Appendix 5.1G.

A procedure for performing the cumulative criteria pollutant impacts analysis is discussed in Appendix 5.1G. The analysis will be supplemented if additional information is received from the adjacent Nevada agencies. The cumulative criteria pollutant impact analysis

[7] Copies of the correspondence are provided in Appendix 5.1G.

determines if HHSEGS, in combination with other nearby, foreseeable projects, will cause a combined air quality impact that exceeds significance thresholds.

In contrast with the approach used to estimate impacts for criteria pollutants, the significance thresholds developed for TACs are set sufficiently stringently so as to preclude the potential for any significant cumulative impacts. Thus, a separate cumulative impacts analysis for TACs is not required.

5.9.6 Mitigation Measures

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

5.9.7 Agencies and Agency Contacts

Table 5.9-7 provides contact information for agencies involved with public health.

TABLE 5.9-7
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 (415) 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
Public exposure to air pollutants	Great Basin Unified Air Pollution Control District	Duane Ono Deputy Air Pollution Control Officer GBUAPCD 157 Short Street Bishop, CA 93514 (760) 872-8211
Public exposure to chemicals known to cause cancer or reproductive toxicity	Cal-EPA, Office of Environmental Health and Hazard Assessment	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

TABLE 5.9-7
Agency Contacts for Public Health

Issue	Agency	Contact
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
Public exposure to accidental releases of hazardous materials	Inyo County Sheriff's Department	Lt. Jeff Hollowell Inyo County Sheriff's Department 550 South Clay Street Independence, CA 93526 (760) 878-0395

5.9.8 Permits Required and Permit Schedule

Agency-required permits related to public health are listed in Table 5.9-8, and include the GBVAPCD Final Determination of Compliance. Upon approval of the project by the CEC, GBVAPCD will issue an Authority to Construct. A Permit to Operate will be issued by the GBVAPCD after construction and commencement of operation. These requirements are discussed in detail in Section 5.1, Air Quality.

TABLE 5.9-8
Permits Required and Permit Schedule for Public Health

Permit	Agency Contact	Schedule
Determination of Compliance/ Authority to Construct/ Permit to Operate	Duane Ono Deputy Air Pollution Control Officer GBUAPCD 157 Short Street Bishop, CA 93514 (760) 872-8211	District will issue a Preliminary Determination of Compliance within 180 days after issuing the Application Completeness Determination Letter.

5.9.9 References

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U.S. Environmental Protection Agency (EPA). 1991. Risk Assessment for Toxic Air Pollutants: A Citizen's Guide. EPA 450/3-90-024. March 1991. http://www.epa.gov/ttn/atw/3_90_024.html

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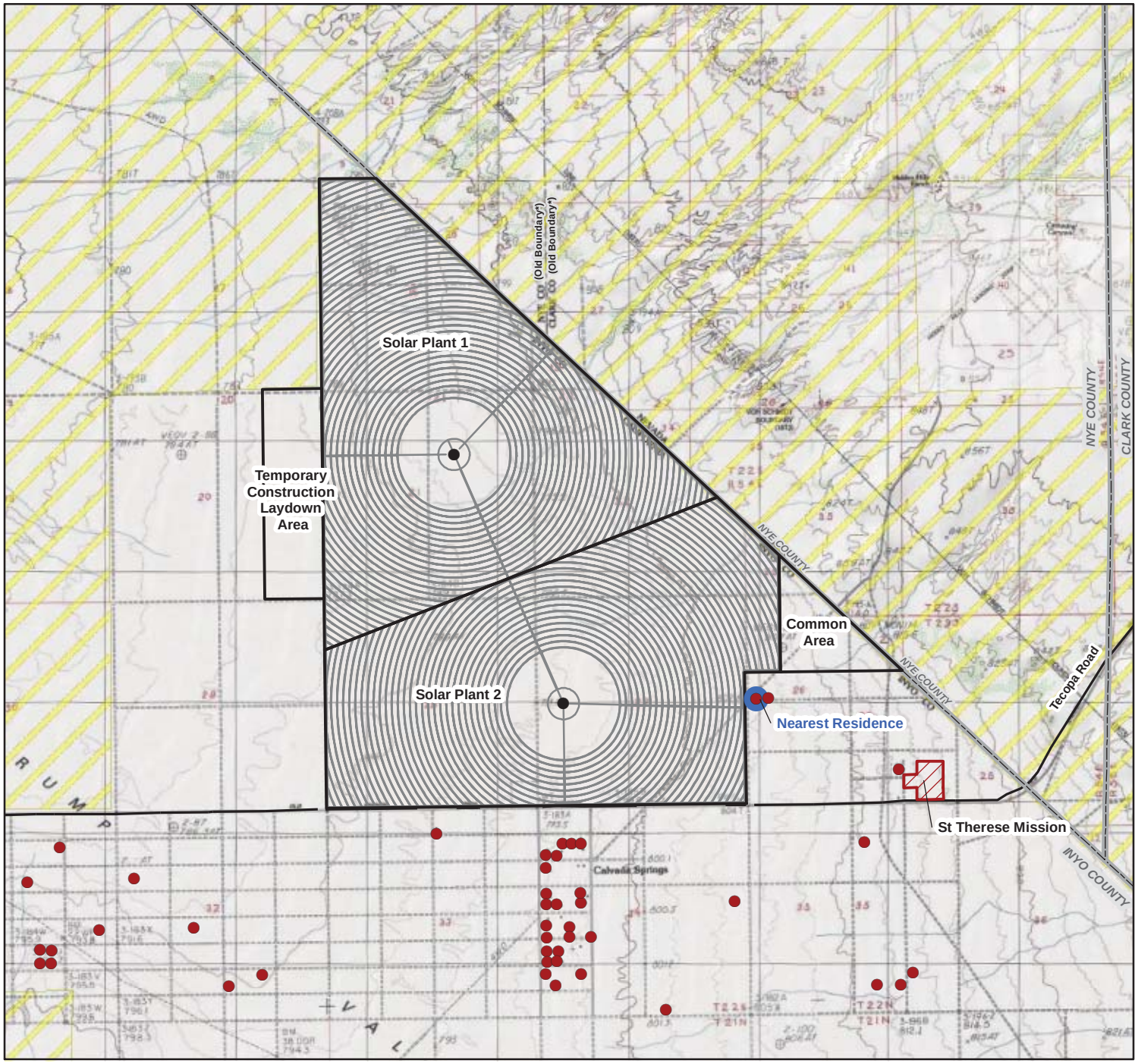

LEGEND

- Solar Power Tower
- Residence
- Nearest Residence to Project Site
- BLM Lands
- HHSEGS Boundary
- St. Therese Mission, a commercial facility

*County boundary moved due to annexation, 2001

N

0 1,800 3,600
Feet

Figure 5.9-1
Sensitive Receptors Location Map
Hidden Hills Solar Electric Generating System

SAC \\ZION\SACGIS\PROJ\SOLARPROJECTS\HIDDENHILLS\MAPFILES\2011_HIDDENHILLS\AFC_MAPS\PUBLIC_HEALTH_AIR\SENSITIVE_RECEPTORS_PH_8X11.MXD SSCOPES 7/28/2011 9:47:54 AM

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