5.10 Public Health

This AFC section addresses potential public health issues related to the Blythe Solar Power Project (BSPP or Project). These issues include the potential for health risks from the emissions of toxic air contaminants (TACs). 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 Project operation.

For public health, the term "chemical substances" refer to chemical substances in ambient air that are regulated by either the United States 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 (HAPs), and has currently identified 188 substances as HAPs, all of which are presently included in California's list of TACs. TAC emissions from various operating units of the BSPP including auxiliary boilers, cooling towers, fire water pumps, emergency generators, and heat transfer fluid (HTF) expansion (ullage) tanks are analyzed for public health impacts.

The public health evaluation in this section is intended to support CEC compliance with the requirements of the California Environmental Quality Act (CEQA) and the Bureau of Land Management's (BLM) compliance with the requirements of the National Environmental Policy Act (NEPA). These agencies are conducting a joint review of the Project, and a combined NEPA/CEQA document will be prepared.

Summary

Project public health impacts would be less than significant. The focus of the analysis is human exposure to the TAC emissions associated with Project operation. The nearest residential receptor is located close to the southern boundary, approximately 0.1 mile from the BSPP site, with the next nearest residence located approximately one mile east of the BSPP site. Project emissions of toxic air contaminants (TACs) are expected to be minimal. A health risk assessment (HRA) was performed. It showed estimated cancer risks at all receptors to be very low, with a maximum individual cancer risk (MICR) of 0.38 in-one-million at a residential receptor, which is lower than the Best Available Control Technology for air toxics (T-BACT) threshold of one-in-one million in Mojave Desert Air Quality Management District Rule 1320. Based on the results of the HRA, the Project poses an insignificant incremental cancer and non-cancer health risk.

5.10.1 LORS Compliance

The federal, state, and local public health laws, ordinances, regulations, and standards (LORS) that are applicable to the BSPP are summarized in Table 5.10-1 and briefly discussed below. The BSPP will comply with all applicable public health LORS.

Table 5.10-1 Summary of Applicable Federal, State, and Local Public Health LORS

LORS	Applicability	Where Discussed in AFC
Federal		
None Applicable	Not Applicable	Section 5.10.1
State		
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
Air Toxics "Hot Spots" Information and Assessment Act – AB2588: HSC Sections 44360 to 44366	Regulates public exposure to toxic air contaminants from existing and new sources. 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
Safe Drinking Water and Toxic Enforcement Act of 1986 -- Proposition 65: HSC Sections 25249.5 et seq.	Requires notification related to public exposure to chemicals known to cause cancer or reproductive toxicity.	Section 5.10.1.2
Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines: Title 17 California Code of Regulations (CCR), Section 93115	Establishes emission limits, operating limits, fuel use restrictions, monitoring and recordkeeping requirements for stationary compression ignition engines, including emergency fire water pump engines.	Section 5.10.1.2
Local (Mojave Desert Air Quality Management District [MDAQMD])		
MDAQMD Rule 402 Nuisance	Prohibits the discharge of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to the public or which endanger the comfort, repose, health or safety of the public or which cause injury or damage to business or property.	Section 5.10.1.3
MDAQMD Regulation X Emission Standards for Additional Specific Air Contaminants (ATCM and MACT Notification and adoption of federal 40 CFR Part 61 NESHAPS)	Provides notice to the regulated community that California Air Toxic Control measures (ATCMs) are enforceable by the MDAQMD within its jurisdiction and federal maximum achievable control technology (MACT) and NESHAPS are adopted by reference and enforced by the MDAQMD.	Section 5.10.1.3
MDAQMD Rule 1302 New Source Review of Toxic Air Contaminants	Discusses new source review for air toxics. This rule specifies limits for maximum individual cancer risk, cancer burden, and noncancer acute and chronic hazard index from new permit units, relocations, or modifications to existing permit units which emit toxic air contaminants listed in Table I of the rule.	Sections 5.10.1 and 5.10.3

Table 5.10-1 Summary of Applicable Federal, State, and Local Public Health LORS

LORS	Applicability	Where Discussed in AFC
MDAQMD Rule 1520 Control of Toxic Air Contaminants from Existing Sources	MDAQMD implementation of HSC Section 44300 et seq., the Air Toxics "Hot Spots" Information and Assessment Act.	Section 5.10.1.3

* 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 Emissions Standards for Hazardous Air Pollutants (NESHAPS) 40 CFR Parts 61 and 63

EPA regulations related to HAPs will not have applicability to the Project. None of the 40 CFR Part 61 NESHAPS regulations address activities that apply to the Project. In addition, the Project is not a major source of HAP emissions, thus none of the 40 CFCR Part 63 Maximum Achievable Control Technology (MACT) standards will apply.

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 Project will meet all applicable measures to control and minimize TAC emissions. As shown in the HRA (Section 5.10.3), the TAC emissions from the project will not have any significant public health impacts.

HSC Section 39666

This section of the HSC delegates the enforceability of California Air Toxics Control Measures (ATCMs) to local air districts. The ATCMs have been adopted to reduce emissions of TACs from non-vehicular sources with the goal to limit the TAC emissions to the maximum extent possible. As discussed below, the Project will not be a major source of HAP emissions. Further, the Project will employ four diesel-fueled fire water pumps and four emergency generators, and an ATCM has been adopted to control diesel particulate matter (DPM) emissions from new stationary compression ignition (CI) engines. The fire water pumps and emergency generators at the Project will be limited to an annual non-emergency (e.g., testing and maintenance) operating time of 50 hours per year for each unit to minimize DPM emissions.

HSC Section 41700

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

HSC Sections 44360-44366 – Air Toxic "Hot Spots" Information and Assessment Act – AB2588

HSC Sections 44360-44366 regulate public exposure to TACs from existing and new sources and require submission of a HRA for facilities that are determined to be high risk by the local administering

agency. The BSPP 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 BSPP will have insignificant impacts from TAC emissions. The administering agency for the Air Toxics "Hot Spots" program is the MDAQMD.

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

Under this Act, also known as Proposition 65, facilities that expose persons to listed carcinogenic substances and reproductive toxins are required to notify the public and provide warnings. The Project's TAC emission rates and resulting cancer risks do not exceed significance thresholds that require Proposition 65 warnings (see HRA results).

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

The California ATCM for CI engines specifies operating requirements and exhaust emission standards for stationary CI engines. Although this is an ATCM, 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 Project will install new stationary CI engines that will meet the Tier 3 emissions standards for off-road engines and will limit the non-emergency hours of operation to the number of hours necessary to comply with the testing requirements of National Fire Protection Agency (NFPA) 25 "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 2002 edition as required by the ATCM (California Code of Regulations [CCR] §93115.6(a)(4)(A)(1)). The facility will limit the hours of operation of the fire pump engines and emergency generators to one hour per week for each unit, not to exceed 50 hours per year for each unit, as recommended by NFPA 25, and will install totalizing hour meters to substantiate compliance with the use limitation.

The facility will only use ARB diesel fuel in the fire pump engines and emergency generators and retain purchase records and Material Safety Data Sheets (MSDS) to substantiate compliance with the fuel sulfur requirement.

5.10.1.3 Local LORS

The local LORS are administered by the Mojave Desert Air Quality Management District (MDAQMD).

MDAQMD Rule 401 Nuisance

Under this local implementation of HSC Section 41700 (see above), the MDAQMD does not permit the discharge from any source quantities of air contaminants or other material that may cause injury, detriment, nuisance or annoyance to a considerable number of persons or to the public. The provisions of this rule will be met through air pollution emission controls and operational limits established for the Project.

MDAQMD Regulation X Emission Standards for Additional Specific Air Contaminants (ATCM and MACT Notification and adoption of federal 40 CFR Part 61 NESHAPS)

This regulation provides notice to the regulated community that California ATCM and federal MACT rules (40 CFR Part 63) are enforceable by the MDAQMD within its jurisdiction. It also, under Rule 1000, adopts the federal 40 CFR part 61 NESHAPS rules. No federal NESHAPS and MACT rules apply to the Project, thus this portion of the rule is not applicable. The BSPP will not be a major source of HAPs

(less than ten tons per year of any single HAP and 25 tons per year for all HAPs combined). The California ATCM for CI engines will apply to the Project, as discussed above, and is implemented by the MDAQMD through MDAQMD Regulation X.

Rule 1320 New Source Review of Toxic Air Contaminants

This rule requires that a HRA be performed if facilities with emissions of TACs result in high "prioritization" score (greater than ten). Toxics Best Available Control Technology (T-BACT) must be installed if the HRA shows a theoretical cancer risk greater than one-in-one million ("moderate risk"). Further, the District can deny the permit application for any project with a cancer burden greater than 0.5 in the population subject to a risk of greater than one-in-one million (moderate risk). MDAQMD will also require public notification for all projects with a "significant health risk" (defined as a MICR or HI greater than or equal to ten-in-one-million or one, respectively). Permit applications for projects deemed "significant risk" (defined as a MICR greater than 100 or HI greater than or equal to ten) will be denied unless the risks are reduced to below the "significant risk" threshold. Regardless of a calculated prioritization score, an HRA was performed for the BSPP. As shown in the HRA (Section 5.10.3), the MICR was 0.38 in one million, well below the T-BACT threshold of one-in-one-million. The chronic and acute HIs are also well below values of one. Furthermore, the MICR is less than one-in-one-million, thus no cancer burden calculation is required. No public notification will be required since the MICR and HIs are well below the notification criteria on ten-in-one-million and one, respectively. TAC emissions from the project will not have any significant public health impacts

Rule 1520 Control of Toxic Air Contaminants from Existing Sources

This rule implements HSC Section 44300 et seq., the California Air Toxic "Hot Spots" Information and Assessment Act (AB2588), which regulates health risk associated with TAC emissions from existing facilities. The rule requires TAC inventorying and HRA requirements similar to MDAQMD Rule 1320 for new facilities. This rule is currently not applicable to the BSPP since the BSPP will be complying with Rule 1302 as a proposed new facility. Upon facility operation, Rule 1520 requires the submittal of a Toxics Emissions Inventory every four years. Based on the MDAQMD's review the TEI, an HRA may be required. The BSPP will comply with Rule 1520 upon operation. As shown in Section 5.10.3, the HRA submitted for the BSPP facility indicates the facility will have insignificant impacts from TAC emissions.

MDAQMD CEQA and Federal Conformity Guidelines

Under the California Environmental Quality Act (CEQA), the MDAQMD is the responsible agency on air quality and related matters within its jurisdiction or impacting on its jurisdiction. The MDAQMD has developed its own CEQA guidelines dated February 2009 for evaluating projects within its jurisdiction. Industrial projects within 1000 feet of any sensitive receptor are required to evaluate the health risks against significance thresholds adopted by the District. Sensitive receptors defined by the MDAQMD include residences, schools, daycare centers, playgrounds, and medical facilities. The MDAQMD CEQA Guidelines set public health risk significance thresholds for project operations under CEQA and limits exposure of sensitive receptors to substantial pollutant concentrations, including those resulting in a cancer risk greater than or equal to ten-in-one million and/or a non-cancer Hazard Index greater than or equal to one. Significant projects must incorporate all feasible mitigation measures to reduce the impact. Based on the results of the HRA (Section 5.10.3), the BSPP will not exceed the significance thresholds adopted by the MDAQMD.

5.10.1.4 Involved Agencies

The primary agency responsible for public health in the vicinity of the Project site is the MDAQMD. 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 Agency and Agency Contacts

Agency Contact	Phone/E-mail	Permits/Issue
Alan De Salvio Supervising Air Quality Engineer, Stationary Sources Mojave Desert AQMD 14306 Park Avenue Victorville, CA 92392	(760) 245-6726 adesalvio@mdaqmd.ca.gov	Implementation of AB2588, ATCMs, review of HRAs

5.10.1.5 Required Permits and Permit Schedule

No permits are specifically required to address regulatory 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 MDAQMD will be required to issue a Determination of Compliance (DOC) for the BSPP. The analysis prepared for this AFC will serve as the basis for the DOC application. The DOC will include requirements related to the control of TAC emissions from this facility.

5.10.2 Affected Environment

The Project site is located in the Riverside County portion of the Colorado Desert on lands administered by the BLM. The site is located about eight miles west of Blythe, California and two miles north of Interstate-10 (I-10), slightly northwest of the Blythe Airport. Access to the site is from the Airport/Mesa Drive exit on I-10 via Black Rock Road.

The Project will be located on public land within BLM right-of-way consisting of 9,400 acres of flat, desert terrain. The area immediately around the Site is undeveloped, except for the Blythe airport to the south. Figure 5.10-1 presents the distribution of the population (population density) within a three-mile radius of the plant site boundary, which is considered inclusive of the area of potential exposure to TAC emissions from Project 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. Such groups include infants and children, the elderly, the chronically ill, and any other member of the general population who are more susceptible to the effects of the exposure than the population at large. Sensitive receptors typically include facilities where these groups are found, such as schools, day care facilities, convalescent homes and hospitals.

No sensitive receptors were identified within a three-mile radius of the Project site. The nearest sensitive receptor (Palo Verde High School) is approximately 6.7 miles east of the Project. The nearest residential receptor is also located approximately 0.1 mile to the south. The nearest worker receptor is located approximately 0.4 miles to the east (south of the nearest residential receptor). Figure 5.10-2 shows the residential and worker receptors used in the HRA.

The Riverside County Community Health Agency and the MDAQMD 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 BSPP site. Representatives of these organizations indicated that they were not aware of any such studies in the area (Roberts, 2009; Mallory, 2009).

5.10.3 Environmental Impacts (Health Risk Assessment)

Potential environmental impacts addressed in the following pages are limited to human exposure to the TAC emissions associated with Project operation. The method used to assess potential human health risks are consistent with those proposed by the OEHHA Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, 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 a human HRA in California.

A list of the TAC emitted by the Project under normal operating conditions that may cause an adverse public health impact are presented in Table 5.10-3. The human health risks associated with these substances are evaluated in the HRA. No appreciable quantity of TAC is expected to be emitted from the solar field or the 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. Air Quality impacts from construction of the BSPP are discussed in Section 5.2, Air Quality.

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 AB 2588 Air Toxic Hot Spots Program and California's Proposition 65, for example, have developed a significance level for incremental cancer risk of ten-in-one-million as the public notification level for TAC emissions from existing sources. The MDAQMD has also established cancer risk significance thresholds for permitting new stationary sources. MDAQMD Rule 1320 allows for an incremental cancer risk of between one-in-one-million (1×10^{-6}) and ten-in-one-million (1×10^{-5}), provided T-BACT is employed. The rule also discusses public notification requirements prior to granting an Authority to Construct (ATC) for projects with an individual cancer risk or non-cancer HI greater than or equal to ten-in-one million or one respectively ("significant health risk").

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, as updated by the OEHHA in the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values*.

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 is considered significant.

Table 5.10-3 TACs Potentially Emitted from the Project

Benzene Biphenyl Chloroform Dichlorobenzene Diesel Particulate Matter Formaldehyde Hexane Naphthalene Toluene	Polycyclic aromatic hydrocarbons (PAHs) 7, 12-DimethylBenz(a)anthracene Acenapthene Acenapthylene Anthracene Benzo(a)anthracene Benzo(a)pyrene [B(a)P] Benzo(b)fluoranthene Benzo(g,h,i)perylene Benzo(k)fluoranthene Chrysene Dibenz(a,h)anthracene Fluoranthene Indeno(1,2,3-cd)pyrene Phenanthrene Pyrene

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 such so-called diesel particulate matter (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*.

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.

Significance Thresholds 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 for project proponents. The MDAQMD allows for an incremental cancer risk of ten-in-one million (1×10^{-5}), above which public notification is required. The threshold for non-cancer impacts is a hazard index greater than one.

5.10.3.2 Health Risk Assessment

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 1.4a) developed by the ARB for conducting health risk assessments in California under the Air Toxics Hot Spots Program. Dispersion modeling was performed using the EPA guideline model AERMOD (version 07026). 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 Project. The multi-pathway assessment also includes an evaluation of soil ingestion, dermal absorption, and mother's milk ingestion.

Health Risk Factors

Chemical substances 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. 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 OEHHA Risk Assessment Health Values for TACs 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 $(\mu g/m^3)$
Benzene	2.90E-05	1.0E-01	--	6.0E+01	1.3E+03
Biphenyl	--	--	--	--	--
Chloroform	5.3E-06	1.9E-02	--	3.0E+02	1.5E+02
Dichlorobenzene	1.1E-05	4.0E-02	--	8.0E+02	--
Diesel Particulate Matter	3.0E-04	1.1E+00	--	5.0 E+00	--

Table 5.10-4 OEHHA Risk Assessment Health Values for TACs 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 $(\mu g/m^3)$
Formaldehyde	6.00E-06	2.1E-02	--	9.0E+00	5.5E+01
Hexane	--	--	--	7.0E+03	--
Naphthalene	3.40E-05	1.2E-01	--	9.0E+00	--
PAHs (Total) (treated as B(a)P)	1.10E-03	3.9E+00	1.2E+01	--	--
7,12-DimethylBenz(a)anthracene	7.1E-02	2.5E+02	2.5E+02	--	--
Acenapthene	--	--	--	--	--
Acenapthylene	--	--	--	--	--
Anthracene	--	--	--	--	--
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(g,h,i)perylene	--	--	--	--	--
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	--	--
Fluoranthene	--	--	--	--	--
Indeno(1,2,3-cd) pyrene	1.1E-04	3.9E-01	1.2E+00	--	--
Phenanthrene	--	--	--	--	--
Pyrene	--	--	--	--	--
Toluene	--	--	--	3.0E+02	3.7E+04
Xylenes	--	--	--	7.0E+02	2.2E+04

Biphenyl and some individual PAH species are recognized TACs but do not have quantified health values. Total PAH emissions were modeled in the HRA using health values for B(a)P per OEHHA guidance.
Source: Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, OEHHA 2009.

Project-Related TAC Emissions

Emission sources of TAC that may be associated with the Project include auxiliary boilers, HTF heaters, cooling towers, diesel-fueled emergency generators and emergency fire-water pump engines, and ullage tank vents. No appreciable quantities of TACs are expected to be emitted from operation of the solar field array or diesel fuel tanks. Detailed calculations in support of TAC emissions discussed below and are provided in Appendix E.

The Project will not be a major source of federal HAP emissions. The emissions inventory shows total federal HAP emissions of 1.16 tons per year (tpy). The primary contributor to the total HAP emissions is benzene at 51 percent (0.60 tpy), followed by chloroform at 24 percent (0.28 tpy) and hexane at 22 percent (0.26 tpy). Regulatory major source thresholds are 10 tpy for any single HAP and 25 tpy for total HAP emissions. The Project therefore accounts for only six percent of the major source threshold for any single HAP, and approximately five percent of the major source threshold for total HAP emissions. The total HAP emissions from the Project are summarized in Appendix E.

Auxiliary Boilers and HTF Heaters. The Project will operate four natural-gas-fired fired auxiliary boilers and four HTF heaters (one at each power plant). The auxiliary boilers will be used to provide sealing steam earlier in the start process and the HTF heaters will be used 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 each boiler were based on an assumed maximum operation of 5,000 hours per year, with a duty cycle of 10 percent at full load and 90 percent at one quarter load. The emissions from the HTF heaters were based on 500 hours per year of operation for each heater. Table 5.10-5 summarizes TACs potentially emitted from one 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 for a conservative health risk estimate, in accordance with OEHHA guidance. Since the surrogate for total PAH is the most or nearly-the-most potent carcinogen in the class, applying this cancer potency factor to total PAH emissions will overestimate the risk.

Table 5.10-5 TAC Emissions for One Auxiliary Boiler and One HTF Heater

Toxic Air Contaminant	Emission Factor (lb/MMscf)	Auxiliary Boiler		HTF Heater	
		Max Hourly (lb/hr)	Annual (lb/yr)	Max Hourly (lb/hr)	Annual (lb/yr)
Benzene	2.10E-03	7.00E-05	1.14E-01	7.00E-05	3.50E-02
Dichlorobenzene	1.20E-03	4.00E-05	6.50E-02	4.00E-05	2.00E-02
Formaldehyde	7.50E-02	2.50E-03	4.06E+00	2.50E-03	1.25E+00
Hexane	1.80E+00	6.00E-02	9.75E+01	6.00E-02	3.00E+01
Naphthalene	6.10E-04	2.03E-05	3.30E-02	2.03E-05	1.02E-02
PAHs (Total)	--	1.99E-06	3.23E-03	1.99E-06	9.91E-04
Acenapthene	1.80E-06	6.00E-08	9.75E-05	6.00E-08	3.00E-05
Acenapthylene	1.80E-06	6.00E-08	9.75E-05	6.00E-08	3.00E-05
Anthracene	2.40E-06	8.00E-08	1.30E-04	8.00E-08	4.00E-05
Benzo(a)anthracene	1.80E-06	6.00E-08	9.75E-05	6.00E-08	3.00E-05
Benzo(a)pyrene [B(a)P]	1.20E-06	4.00E-08	6.50E-05	4.00E-08	2.00E-05
Benzo(b)fluoranthene	1.80E-06	6.00E-08	9.75E-05	6.00E-08	3.00E-05
Benzo(g,h,i)perylene	1.20E-06	4.00E-08	6.50E-05	4.00E-08	2.00E-05
Benzo(k)fluoranthene	1.80E-06	6.00E-08	9.75E-05	6.00E-08	3.00E-05
Chrysene	1.80E-06	6.00E-08	9.75E-05	6.00E-08	3.00E-05
Dibenz(a,h)anthracene	1.20E-06	4.00E-08	6.50E-05	4.00E-08	2.00E-05

Table 5.10-5 TAC Emissions for One Auxiliary Boiler and One HTF Heater					
Toxic Air Contaminant	Emission Factor (lb/MMscf)	Auxiliary Boiler		HTF Heater	
		Max Hourly (lb/hr)	Annual (lb/yr)	Max Hourly (lb/hr)	Annual (lb/yr)
Fluoranthene	3.00E-06	1.00E-07	1.63E-04	1.00E-07	5.00E-05
Indeno(1,2,3-cd) pyrene	1.80E-06	6.00E-08	9.75E-05	6.00E-08	3.00E-05
Phenanthrene	1.70E-05	5.67E-07	9.21E-04	5.67E-07	2.83E-04
Pyrene	0.0046	1.67E-07	2.71E-04	1.67E-07	8.33E-05
Toulene	3.40E-03	1.13E-04	1.84E-01	1.13E-04	5.67E-02
Total PAH emissions are considered in the HRA. Benzo(a)pyrene or B(a)P was modeled as the surrogate carcinogen for all PAH emissions.					

Cooling Towers. The Project will utilize dry cooling towers; however small auxiliary wet cooling towers will also be employed to remove residual heat. Water for cooling tower makeup will be supplied from onsite groundwater wells. The cooling tower will be a source for chloroform emissions from the application of sodium hypochlorite as a biocide for cooling tower maintenance. The chloroform emissions were estimated for an annual cooling tower operation of 3,700 hours and a biocide usage of 2,865 gallons per month (see Table 5.10-6).

Table 5.10-6 TAC Emissions from a Two-Cell Auxiliary Cooling Tower

Toxic Air Contaminant	Emission Factor [1] (lb chloroform/lb chlorine)	Maximum Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)
Chloroform	0.0034	0.038	138.8
[1] Rogozen, M. B., et al, 1988			

Emergency Generator and Fire Water Pump Engines. Other Project combustion sources include emergency power generators and emergency fire-water pump engines (one of each for each of the four power blocks). 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 four diesel-fired emergency generator engines (300 bhp each) and four diesel-fired firewater pumps (300 bhp each). TAC emissions were characterized as aggregate particulate emissions from diesel-fired engines and DPM is assumed to be equal to the PM_{10} emissions (Table 5.10-7).

Table 5.10-7 TAC Emissions from Emergency Internal Combustion Engines

Source	Emission Factor (g/kW-hr) [1]	Maximum Emissions	
		(lb/hr)	(lb/yr)[2]
Emergency Generator	0.15	9.91E-02	4.96
Fire-water Pump	0.15	9.91E-02	4.96

[1]Emission Factor based on Tier 3 certified engines.
[2]Annual estimates based on 50 hours of engine operation and do not include emergency operation.

HTF Expansion Tank Vent and Waste Loadout. The total uncontrolled emissions from the HTF expansion tank vents were estimated based on data provided by an existing solar plant (Kramer Junction Solar Energy Generating System Facility), extrapolated to account for HTF system size. Controlled emissions were calculated based on the use of two carbon adsorption canisters in series, with an overall control efficiency of 98 percent. Waste loadout of spent HTF will not generate any appreciable level of TAC emissions because virtually all the organic components will have been removed during the process and vented from the HTF tank through the carbon units. The total TAC emissions from the HTF vent were calculated as 99.99 percent of the total emissions for benzene, and 0.01 percent of the total emissions for biphenyl (Table 5.10-8). Phenol emissions were considered negligible. Biphenyl is a recognized TAC, but has not been assigned risk factors to allow calculation of the health risk impacts and hence was not included in the HRA study.

Table 5.10-8 TAC Emissions from One Ullage Vent

Toxic Air Contaminant	Maximum Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)
Benzene	0.75	299.7
Biphenyl	0.0001	0.03
Benzene is 99.99% of total VOC emissions and Biphenyl is 0.01 % of total VOC emissions.		

Dispersion Modeling Methodology

The methods and requirements used to conduct the air dispersion modeling analysis for estimating concentrations of TAC are presented below.

Air Dispersion Model. The dispersion analysis was performed outside the HARP modeling system using EPA regulatory model AERMOD (version 07026), which estimates both short-term and long-term average ambient concentrations at receptor locations to produce exposure estimates. AERMOD was used in the rural mode with all model option switches set to regulatory-default settings. Modeling was performed using a Universal Transverse Mercator (UTM), zone 11, North American Datum 83 coordinate system. AERMOD accounts for site-specific terrain, meteorological conditions, and emissions parameters such as stack exit velocities and temperatures in order to estimate ambient concentrations. The emissions from the Project sources were modeled in AERMOD using a normalized ("unit") emission rate to later use with the actual emission rates for risk characterization in HARP. HARP On-Ramp (version 1) which allows use of AERMOD modeling files with HARP was used to develop HARP required files from AERMOD dispersion modeling files to conduct risk analysis in HARP.

Meteorological Data. Air dispersion analysis was conducted using three consecutive years (2002-2004) of sequential hourly meteorological data. The surface data were obtained from the nearby meteorological station at the Blythe Airport. Concurrent upper air data were obtained from Mercury Desert Rock Airport in Mercury, Nevada. The surface and upper air data were processed with the AERMOD meteorological processor, AERMET (06341). Meteorological data for the year 2003 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 the operation of the auxiliary boilers, cooling towers, fire-water pumps, emergency generators, HTF heaters, and ullage tank vents were modeled as point sources with release parameters consistent with those used for modeling air quality impact analysis of criteria pollutants (see Section 5.2, Air Quality).

Building Downwash. The latest version of the EPA Building Profile Input Program (BPIP-PRIME) was run to determine dominant structures for building downwash in AERMOD for the point sources. Direction specific building heights and widths of the dominant downwash structure(s) were included in the AERMOD model data input file directly from BPIP-PRIME 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. Terrain elevations from the United States Geological Service (USGS) National Elevation Dataset (NED) were processed with AERMAP (version 09040) to develop the terrain elevations and corresponding hill height scale required by AERMOD.

Receptors. 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). No sensitive receptors, i.e., locations where a sensitive population segment such as children, elderly, or the infirmed may be exposed to TACs from the Project, were identified within a three-mile radius of the Project. Figure 5.10-2 shows the residential and worker receptor locations within a three-mile radius of the Project. A list of these receptors is provided in Appendix E.

Health Risk Characterization

The Project HRA evaluated the facility for cancer risk and non-cancer health hazards. The health risk methodology is based on the OEHHA Guidance Manual. Carcinogenic risks and potential non-carcinogenic chronic health effects were calculated using the annual ground level concentrations while the acute non-cancer health hazards were determined using the predicted maximum 1-hour ground level concentrations. The latest OEHHA cancer potency factors, and chronic and acute reference exposure levels (RELs) for each TAC were used. The approved health values are incorporated into HARP Version 1.4a. The HARP software performs the necessary risk calculations following the OEHHA risk assessment guidelines and the ARB Interim Risk Management Policy for risk management decisions.

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
- 40-year 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 (resident receptors). The point-estimate analysis uses a single value rather than a distribution of values in the dose equation for each exposure pathway. The off-site worker exposure duration assumed a standard work schedule since the facility will operate full time, per OEHHA guidance. For the cancer and chronic HI impacts at the MEIW, the HARP modeling option "modeled GLC and default exposure assumptions" was used. This includes the highly conservative 40-year exposure duration for the worker receptors along with an OEHHA-defined 95th percentile breathing rate of 393 liters of air/kg-day. Child cancer risk was evaluated for a nine-year exposure scenario. 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 modeled exposure pathways consisted of all pathways recommended for a health risk assessment. Exposure pathways that were enabled include homegrown produce (using urban default ingestion fractions), dermal absorption, soil ingestion, and mother's milk in addition to the inhalation pathway. Exposure routes for the ingestion of local fish, poultry, or livestock, and drinking water were not considered in this risk analysis because there are no such areas within the Project's area of influence. Long-term risks (i.e., cancer and chronic non-carcinogenic hazard index) and short-term risk (acute hazard index) were calculated at the identified offsite receptors.

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.

5.10.3.3 Health 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.

Air Dispersion Modeling

In general, EPA-dispersion models such as AERMOD (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" MEIR 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 over 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 studies reviewed by the SRP are occupational studies of DPM exposure 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, 2004).

5.10.3.4 Health Risk Assessment Results

As noted above, the HRA provides results for the maximum exposed residential and worker receptors. No sensitive receptors were identified within a three-mile radius of the project. 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 the MEIR and the MEIW from the operation of the Project is presented in Table 5.10-9.

The MEIR was the nearest residential receptor located about 0.1 mile south of the BSPP site. Cancer risk at the MEIR was determined to be 0.38-in-one-million and non-cancer chronic and acute health impacts were negligible. The MEIW was the nearest worker receptor located about 0.4 miles to the east. Cancer risk at the MEIW, based on a worker exposure, was determined to be 0.03-in-one million. Non-cancer chronic and acute health impacts at the MEIW were also determined to be very negligible.

Table 5.10-9 Summary of Maximum Impacts

Receptor Type		Maximum Cancer Risk (per million)	Maximum Acute Hazard Index	Maximum Chronic Hazard Index
MEIR[1]	Adult	0.38	0.042	0.00013
	Child	0.06	--	--
MEIW[2]		0.03	0.019	0.00006
Significance Criteria		**10**	**1**	**1**

[1] MEIR: Maximum exposed individual at an existing residential receptor; 70-year adult exposure scenario and 9-year child exposure scenario for cancer risk
[2] MEIW: Maximum exposed individual at existing occupational worker receptor; 40-year adult worker exposure scenario

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 the source and pollutant contribution to the 70-year cancer risk at this residential receptor. As seen in Table 5.10-10, benzene emissions from ullage vents are the primary contributor to cancer risk impacts, accounting for approximately 69 percent of the total cancer risk at the MEIR. Risk analysis by individual TAC supports this conclusion, showing that approximately 69 percent of the cancer risk at the MEIR is due to benzene emissions, which are primarily emitted from the ullage tank vents (Table 5.10-11). PAHs from natural gas combustion were estimated with the conservative methods used to account for approximately 14 percent of the total risk at the MEIR, and DPM emissions from the IC engines accounted for another 14 percent. 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 E.

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

Emission Source	Inhalation Pathway	Non-Inhalation Pathway					Total	Source Contribution
		Dermal	Soil	Mother's Milk	Home-grown Produce	Oral		
Ullage Tank Vent 3	1.50E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-07	47.17%
Ullage Tank Vent 2	4.12E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.12E-08	12.96%
Auxiliary Boiler 3	8.35E-10	8.86E-09	1.33E-09	0.00E+00	1.12E-08	2.14E-08	2.23E-08	7.01%
Ullage Tank Vent 4	1.54E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-08	4.84%
Emergency Generator 3	1.37E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-08	4.31%
Ullage Tank Vent 1	1.34E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-08	4.21%
Fire Water Pump 3	1.28E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-08	4.03%
Auxiliary Boiler 2	3.33E-10	3.54E-09	5.30E-10	0.00E+00	4.49E-09	8.56E-09	8.89E-09	2.80%
HTF Heater 3	2.82E-10	2.99E-09	4.49E-10	0.00E+00	3.80E-09	7.24E-09	7.52E-09	2.36%
Emergency Generator 2	5.76E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.76E-09	1.81%

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

Emission Source	Inhalation Pathway	Non-Inhalation Pathway					Total	Source Contribution
		Dermal	Soil	Mother's Milk	Home-grown Produce	Oral		
Fire Water Pump 2	5.73E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.73E-09	1.80%
Auxiliary Boiler 1	9.97E-11	1.06E-09	1.59E-10	0.00E+00	1.34E-09	2.56E-09	2.66E-09	0.84%
Auxiliary Boiler 4	9.81E-11	1.04E-09	1.56E-10	0.00E+00	1.32E-09	2.52E-09	2.62E-09	0.82%
Cooling Tower 2_3	2.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E-09	0.69%
Cooling Tower 1_3	2.16E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-09	0.68%
Fire Water Pump 1	1.90E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-09	0.60%
Emergency Generator 1	1.74E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-09	0.55%
Emergency Generator 4	1.65E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-09	0.52%
Fire Water Pump 4	1.55E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-09	0.49%
HTF Heater 2	5.67E-11	6.02E-10	9.02E-11	0.00E+00	7.64E-10	1.46E-09	1.51E-09	0.47%

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

Emission Source	Inhalation Pathway	Non-Inhalation Pathway					Total	Source Contribution
		Dermal	Soil	Mother's Milk	Home-grown Produce	Oral		
Cooling Tower 1_2	8.61E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.61E-10	0.27%
Cooling Tower 2_2	8.52E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.52E-10	0.27%
HTF Heater 4	1.70E-11	1.81E-10	2.71E-11	0.00E+00	2.29E-10	4.37E-10	4.54E-10	0.14%
HTF Heater 1	1.40E-11	1.49E-10	2.23E-11	0.00E+00	1.89E-10	3.60E-10	3.74E-10	0.12%
Cooling Tower 1_4	2.74E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-10	0.09%
Cooling Tower 2_4	2.64E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.64E-10	0.08%
Cooling Tower 2_1	2.57E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E-10	0.08%
Cooling Tower 1_1	2.54E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-10	0.08%
Total	**2.73E-07**	**1.84E-08**	**2.76E-09**	**0.00E+00**	**2.34E-08**	**4.46E-08**	**3.18E-07**	

Table 5.10-11 Summary of Cancer Risk at MEIR by TAC and Pathway

Emission Source	Inhalation Pathway	Non-Inhalation Pathway					Total	Source Contribution
		Dermal	Soil	Mother's Milk	Home-grown Produce	Oral		
Benzene	2.20E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-07	69.18%
PAHs (Total)	1.39E-09	1.84E-08	2.76E-09	0.00E+00	2.34E-08	4.46E-08	4.59E-08	14.43%
Diesel	4.49E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.49E-08	14.12%
Chloroform	7.10E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E-09	2.23%
Formaldehyde	2.89E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.89E-10	0.09%
Naphthalene	1.34E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-11	0.00%
Dichlorobenzene	8.80E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.80E-12	0.00%
Hexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%
Toluene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%
Biphenyl	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%

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 maximum individual cancer risk 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 0.38 in-one-million at the MEIR, which is lower than the T-BACT threshold of one-in-one million. All estimated health impacts were below the MDAQMD significance criterion of ten-in-one-million for cancer risk and HI of one for non-cancer chronic and acute health impacts. Based on results of the risk assessment, the operation of the Project poses insignificant incremental cancer risk and non-cancer health risk impacts, according to established regulatory guidelines.

5.10.3.5 Non Chemical Substances of Potential Concern

Along with the 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 in Texas and Wisconsin. The EPA has investigated and published about the presence of Legionella in cooling water systems and its possible transmission in air. 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. 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, 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 Title 22 California Code of Regulations 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. The Project currently does not propose to use reclaimed water and thus is not a Title 22-applicable facility. However, the Section provides guidance on the operation and maintenance of cooling water systems that may be used in the development of a cooling water management plan.

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 Project 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

Cumulative public health impacts are typically (e.g., CEC requirement) evaluated within a six-mile radius of the Project site. The cumulative project list includes six solar projects (two solar thermal and four photovoltaic) and the Blythe Energy II combined-cycle power project (approved but not built) within a six-mile radius of the BSPP. As shown by the HRA results, BSPP public health impacts are negligible and occur close to the facility. The cumulative public health risks of the Project considered together with other projects would be less than significant. Further, the significance thresholds developed for TACs are sufficiently stringent to preclude the potential for significant cumulative impacts.

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 auxiliary boilers and HTF heaters, 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 Project. 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 from the auxiliary cooling towers, 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, 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 reduce 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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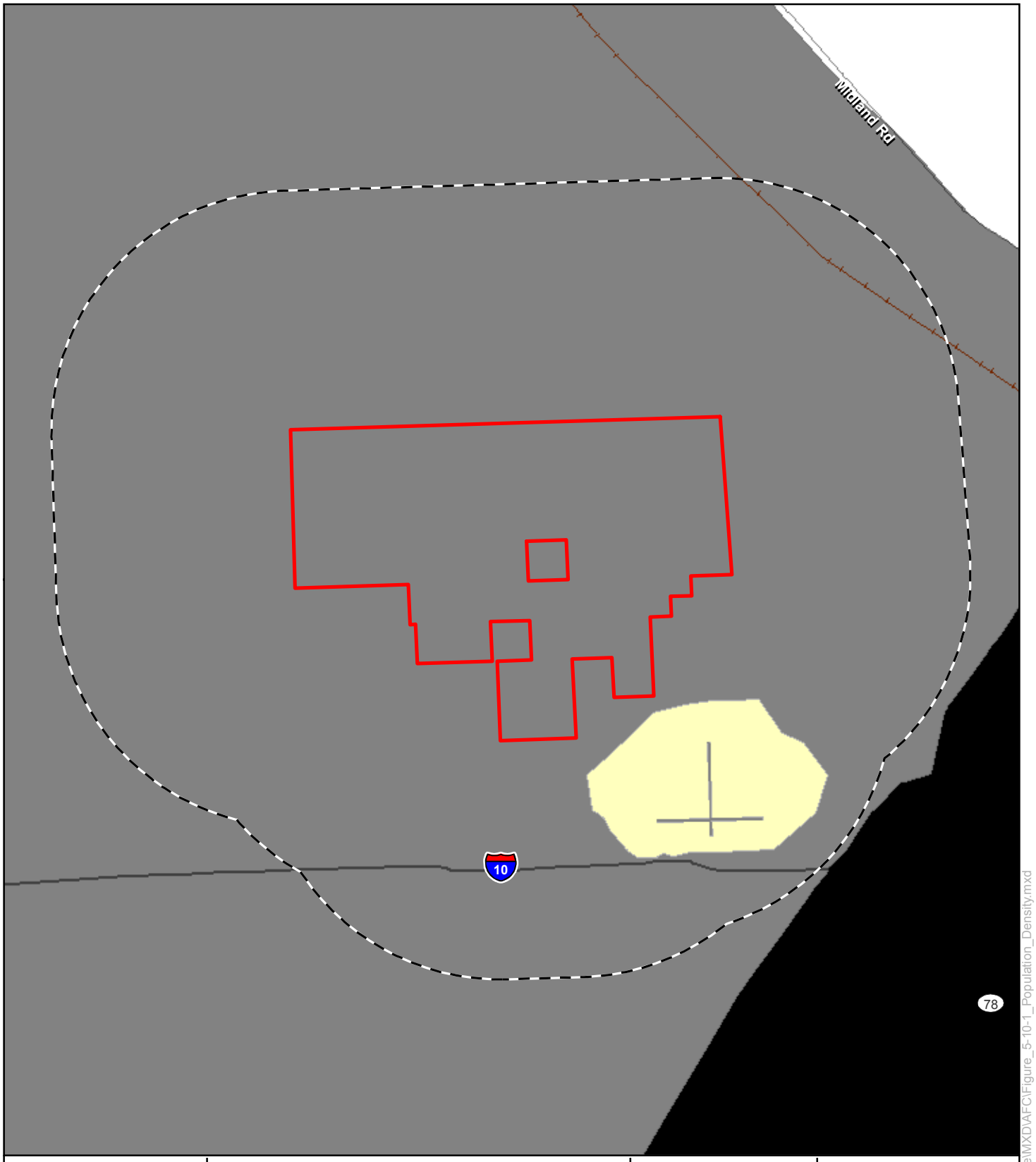

Map Location

Legend

Plant Site

3 Mile Study Area

Population Density

0.4

1.8

26.7

State of CA - 214

1 inch = 1.7 miles

0 1.7 3.4 Miles

N E S W

Blythe Solar Power Project

Figure 5.10-1 Population Density Within 3 Miles of the Plant Site

Solar Millennium

AECOM

Date: September 2009

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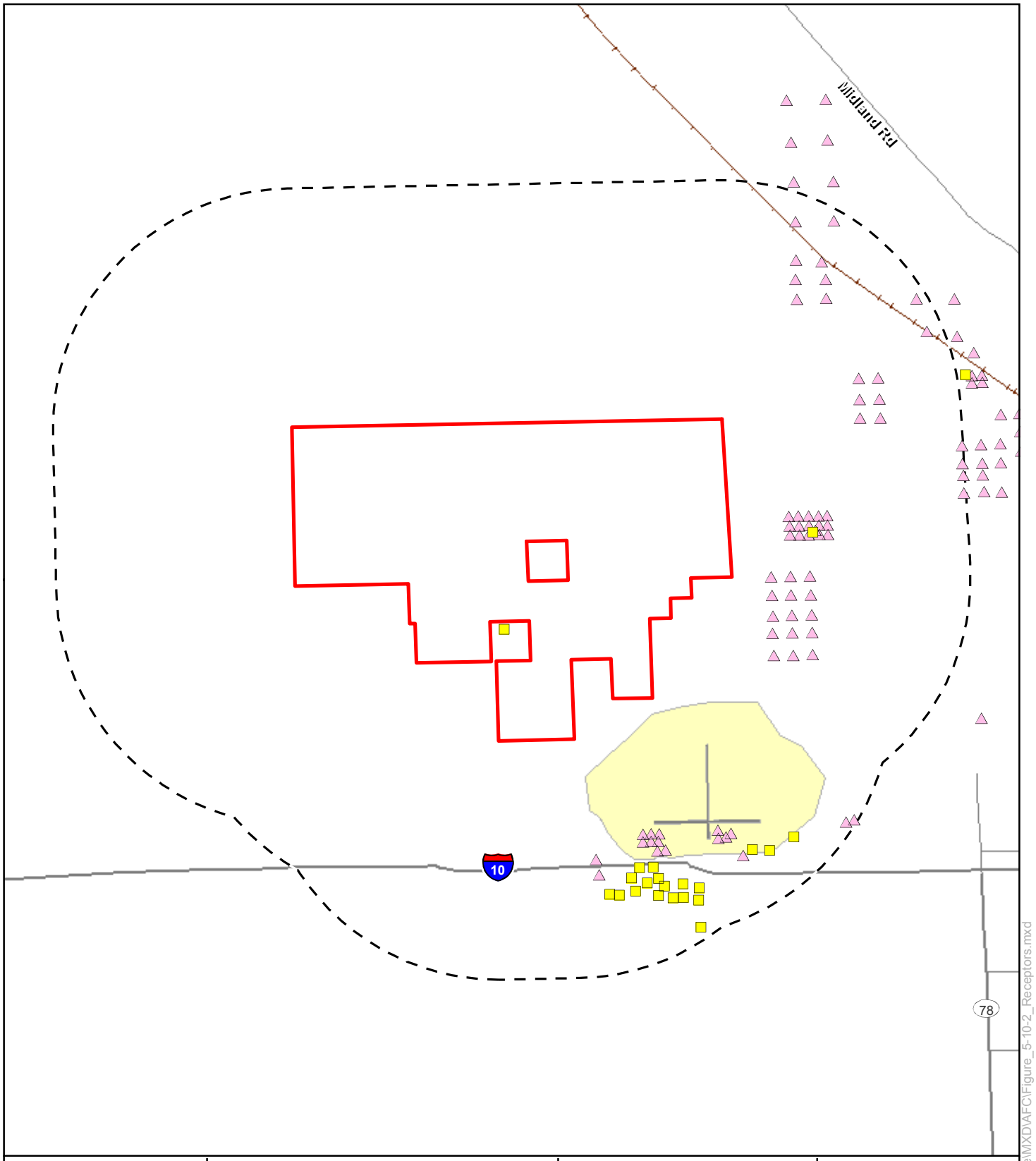

Map Location

Legend

- Project Right-of-Way
- 3 Mile Study Area
- Sensitive
- Residential
- Worker

N W E S

1 inch = 1.7 miles

0 1.7 3.4 Miles

Blythe Solar Power Project

Figure 5.10-2
Residential, Worker and Sensitive Receptors Within 3 Miles of the Plant Site

Solar Millennium

AECOM

Date: September 2009

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