Volume III: Appendices A-G

United States Department of the Interior
Bureau of Land Management

Desert Sunlight Solar Farm Project
California Desert Conservation Area Plan Amendment and Final Environmental Impact Statement

For the
Palm Springs – South Coast Field Office
Palm Springs, California

April 2011
CACA #48649

BLM

Appendix A

Public Scoping

Plan require that the NPS develop goals to improve program effectiveness and public accountability. This collection will encourage the public to collect data relevant to goal 1b: "The National Park Service contributes to knowledge about natural and cultural resources and associated values; management decisions about resources and visitors are based on adequate scholarly and scientific information". This collection is also consistent with the NPS Management Policies (2006), which emphasize the "use of qualitative and quantitative techniques to monitor key aspects of resources and processes at regular intervals" and furthermore state that "studies, research, and collection activities by non-NPS personnel involving natural and cultural resources will be encouraged and facilitated when they otherwise comport with NPS policies." More specifically, the goal of this collection is to engage the public in documenting the timing of biological events ("phenology") for a variety of species at numerous different locations. The data collected will help the NPS document how climate change is affecting the timing of biological events such as migration, flowering, and autumn foliage.

The proposed Internet- and paper-based surveys will ask the public to participate in the collection of these data on NPS lands. With sufficient participation, NPS will obtain critical information for determining trends in the timing of biological events for many species. In addition to documenting changes in timing of events, the data set will facilitate the identification of species most at risk from climate change and anthropogenic influences. Survey participants will provide their contact information and multiple observations of species at one or more sites. The contact information will be used for quality control and (at the request of the participant) to provide data summaries or reports and information about additional opportunities for assisting with NPS research and monitoring activities. The obligation to respond is voluntary.

Automated Data Collection: The information will be collected through an Internet site, as well as through paper forms available at public locations.

Description of respondents: Respondents are members of the public with an interest in contributing to climate change research in the National Parks.

Estimated average number of responses: 1,000 per year.

Frequency of Response: 5 per respondent.

Estimated average time burden per respondent: 30 minutes.

Estimated total annual reporting burden: 100 hours per year.

Comments are invited on: (1) The practical utility of the information being gathered; (2) the accuracy of the burden hour estimate; (3) ways to enhance the quality, utility, and clarity of the information being collected; and (4) ways to minimize the burden to respondents, including use of automated information collection techniques or other forms of information technology. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

December 23, 2009.

Cartina A. Miller,

Information Collection Clearance Officer, National Park Service.

[FR Doc. 2010–446 Filed 1–12–10; 8:45 am]

BILLING CODE P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[F–14909–B, F–14909–B2, F–19148–38; LLAK964000–L14100000–KC0000–P]

Alaska Native Claims Selection

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of decision approving lands for conveyance.

SUMMARY: As required by 43 CFR 2650.7(d), notice is hereby given that an appealable decision approving the surface estate in certain lands for conveyance pursuant to the Alaska Native Claims Settlement Act will be issued to Kuukpik Corporation. The lands are in the vicinity of Nuiqsut, Alaska, and are located in:

Umiat Meridian, Alaska

T. 10 N., R. 2 E.,
Secs. 1, 2, and 3;
Secs. 5 to 10, inclusive;
Secs. 16, 17, and 18;
Secs. 20, 21, and 29.
Containing approximately 8,751 acres.

T. 11 N., R. 2 E.,
Secs. 24, 25, and 26;
Secs. 34, 35, and 36.
Containing approximately 3,545 acres.

T. 11 N., R. 3 E.,
Secs. 7, 11, 13, and 18;
Secs. 19, 24, and 25.
Containing approximately 3,616 acres.

T. 11 N., R. 4 E.,
Secs. 19, 20, and 30.
Containing approximately 1,376 acres.
Aggregating approximately 17,288 acres.

The subsurface estate in these lands will be conveyed to Arctic Slope Regional Corporation when the surface estate is conveyed to Kuukpik Corporation. Notice of the decision will also be published four times in the Arctic Sounder.

DATES: The time limits for filing an appeal are:

1. Any party claiming a property interest which is adversely affected by the decision shall have until February 12, 2010 to file an appeal.

2. Parties receiving service of the decision by certified mail shall have 30 days from the date of receipt to file an appeal.

Parties who do not file an appeal in accordance with the requirements of 43 CFR part 4, Subpart E, shall be deemed to have waived their rights.

ADDRESSES: A copy of the decision may be obtained from: Bureau of Land Management, Alaska State Office, 222 West Seventh Avenue, #13, Anchorage, Alaska 99513–7504.

FOR FURTHER INFORMATION CONTACT: The Bureau of Land Management by phone at 907–271–5960, or by e-mail at *ak.blm.conveyance@ak.blm.gov.* Persons who use a telecommunication device (TTD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339, 24 hours a day, seven days a week, to contact the Bureau of Land Management.

Michael Bilancione,

Land Transfer Resolution Specialist, Land Transfer Adjudication I Branch.

[FR Doc. 2010–449 Filed 1–12–10; 8:45 am]

BILLING CODE 4310–JA–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[CACA 048649, LLCAD06000 L51010000 FX0000 LVRWB09B2520]

Notice of Intent To Prepare an Environmental Impact Statement for the Proposed First Solar Desert Sunlight Solar Farm Project, Riverside County, CA and Possible Land Use Plan Amendment

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of intent.

SUMMARY: In compliance with the National Environmental Policy Act (NEPA) of 1969, as amended, and the Federal Land Policy and Management Act of 1976, as amended, the Bureau of Land Management (BLM) Palm Springs South Coast Field Office, Palm Springs, California, intends to prepare an Environmental Impact Statement (EIS) for First Solar Inc.'s application for a right-of-way authorization to develop a solar photovoltaic generating facility. The EIS may also support an amendment to the California Desert Conservation Area (CDCA) Plan (1980), as amended; by this notice the BLM is announcing the beginning of the scoping process to solicit public comments and identify issues.

DATES: This notice initiates the public scoping process for the EIS and possible plan amendment. Comments on issues may be submitted in writing until February 12, 2010. The date(s) and location(s) of any scoping meetings will be announced at least 15 days in advance through the local media, and the BLM Web site at: *http://www.blm.gov/ca/st/en/fo/palmsprings.html.* In order to be considered in the Draft EIS, all comments must be received prior to the close of the scoping period or 15 days after the last public meeting, whichever is later. The BLM will provide additional opportunities for public participation upon publication of the Draft EIS.

ADDRESSES: You may submit comments on issues and planning criteria related to the First Solar Desert Sunlight Solar Farm Draft EIS/Plan Amendment by any of the following methods:

- Web site: *http://www.blm.gov/ca/st/en/fo/palmsprings.html;*
- E-mail: *CAPSSolarFirstSolarDesertSunlight@blm.gov;*
- Fax: (760) 833–7199; or
- Mail: Allison Shaffer, Project Manager, Palm Springs South Coast Field Office, BLM, 1201 Bird Center Drive, Palm Springs, California 92262.

Documents pertinent to this proposal may be examined at the Palm Springs South Coast Field Office.

FOR FURTHER INFORMATION CONTACT: For further information or to have your name added to our mailing list, contact Allison Shaffer, BLM Project Manager, telephone (760) 833–7100; address Palm Springs South Coast Field Office, BLM, 1201 Bird Center Drive, Palm Springs, California 92262; e-mail *CAPSSolarFirstSolarDesertSunlight@blm.gov.*

SUPPLEMENTARY INFORMATION: The applicant, First Solar Inc., has requested a right-of-way authorization to develop a solar photovoltaic generating facility with a proposed output of 550 megawatts and a project footprint of approximately 4,410 acres. The proposed project would be located on BLM-administered lands in Riverside County approximately 6 miles north of the rural community of Desert Center, California. The overall site layout and generalized land uses would include a substation, an administration building, operations and maintenance facilities, a transmission line, and temporary construction lay down areas. The project's 230-kilovolt (kV) generation interconnection transmission line also would be located on BLM-administered lands and would utilize a planned 230- to 500-kV substation (referred to as the Red Bluff substation). The Red Bluff substation would connect the project to the Southern California Edison regional transmission grid. Should the project be approved, the interconnection transmission line would be about 9 miles to about 13 miles long, depending on the alternative selected. If approved, construction would begin in late 2010 and would take approximately 41 months to complete.

The purpose of the public scoping process is to determine relevant issues that will influence the scope of the environmental analysis, including alternatives, and guide the process for developing the EIS. At present, the BLM has identified the following preliminary issues: Air quality, biological resources, recreation, cultural resources, water resources, geological resources, special management areas, land use, noise, paleontological resources, public health, socioeconomic, soils, traffic and transportation, visual resources, and other issues. Authorization of this proposal may require amendment of the CDCA Plan. By this notice, the BLM is complying with requirements in 43 CFR 1610.2(c) to notify the public of potential amendments to land use plans, based on the findings of the EIS. If a land use plan amendment is necessary, the BLM will integrate the land use planning process with the NEPA process for this project.

The BLM will use and coordinate the NEPA commenting process to satisfy the public involvement process for Section 106 of the National Historic Preservation Act (16 U.S.C. 470f) as provided for in 36 CFR 800.2(d)(3). Native American tribal consultations will be conducted and tribal concerns, including impacts on Indian trust assets, will be given appropriate consideration. Federal, State, and local agencies—along with other stakeholders who may be interested or affected by the BLM's decision on this project—are invited to participate in the scoping process and, if eligible, may request or be requested by the BLM to participate as a cooperating agency.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Thomas Pogacnik,

Deputy State Director, California.

Authority: 40 CFR 1501.7 and 43 CFR 1610.2.

[FR Doc. 2010–403 Filed 1–12–10; 8:45 am]

BILLING CODE 4310–40–P

DEPARTMENT OF THE INTERIOR

National Park Service

Termination of the Environmental Impact Statement for the General Management Plan, Gila Cliff Dwellings National Monument

AGENCY: National Park Service, Department of the Interior.

ACTION: Notice of termination of the Environmental Impact Statement for the General Management Plan, Gila Cliff Dwellings National Monument, New Mexico.

SUMMARY: The National Park Service (NPS) is terminating the Environmental Impact Statement (EIS) for the Gila Cliff Dwellings General Management Plan because it has determined that an Environmental Assessment (EA) is the more appropriate National Environmental Policy Act compliance document. A Notice of Intent to prepare the EIS for the Gila Cliff Dwellings General Management Plan was published on April 16, 2008 (**Federal Register** Vol. 73, No. 74). Scoping conducted for the plan indicated that there were no significant impacts or controversy identified by the public. A preliminary impact analysis indicated that the alternatives have limited potential to result in significant/major effects on the human environment as they focus on different ways of protecting resources, providing appropriate visitor experiences, and addressing joint NPS/Forest Service operations. For these reasons the NPS determined the proposal would not require an EIS.

Notice of BLM's Intent to Prepare an Environmental Impact Statement

Date: January 20, 2010

To: Responsible and Trustee Agencies
Interested Parties

Subject: Notice of BLM's Intent to Prepare an Environmental Impact Statement for the First Solar Desert Sunlight Solar Farm Project

The Bureau of Land Management (BLM) Palm Springs South Coast Field Office, Palm Springs, California, intends to prepare an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) of 1969, as amended, for First Solar Inc.'s application for a right-of-way authorization to develop a solar photovoltaic generating facility. The EIS may also support an amendment to the California Desert Conservation Area Plan (1980), as amended. The BLM published a Notice of Intent for the First Solar Desert Sunlight Solar Farm Project in the Federal Register Volume 75, Number 8, on January 13, 2010.

The Council on Environmental Quality (CEQ) regulations (40 CFR 1506.2) direct federal agencies to cooperate with State and local agencies to the fullest extent possible to reduce duplication between NEPA and State and local requirements, including joint planning processes, environmental research and studies, public hearings, and environmental documents. In addition, the California Environmental Quality Act (CEQA) Guidelines, Sections 15221 and 15226 encourage similar cooperation by State and local agencies with federal agencies when environmental review is required under both CEQA and NEPA.

The California Public Utilities Commission (CPUC) intends to use the EIS prepared by the BLM in making a discretionary decision to determine if Southern California Edison (SCE) can construct a 500/230 kV interconnection substation, in accordance with CEQA. The CPUC will work as a cooperating agency with the BLM to provide information within the CPUC's area of expertise. Following preparation of the EIS by BLM, the CPUC will determine whether the EIS meets the requirements of CEQA and will comply with CEQA prior to making any discretionary decision on the aforementioned substation.

If you wish to comment on the scope and content of BLM's Draft EIS, including the portion related to the SCE interconnection substation under CPUC's jurisdiction, please review the BLM's Notice of Intent, available in the Federal Register Volume 75, Number 8 at the website listed below and provide comments to the following address no later than **February 12, 2010**:

Address: Allison Shaffer, Project Manager
Palm Springs South Coast Field Office
Bureau of Land Management
1201 Bird Center Drive
Palm Springs, California 92262

Telephone: 760-833-7100
E-mail: CAPSSolarFirstSolarDesertSunlight@blm.gov

Information on the project can be found at: **http://www.blm.gov/ca/st/en/fo/palmsprings.html**
Federal Register homepage: **http://www.gpoaccess.gov/fr/**

When and if the CPUC decides to use the EIS prepared by the BLM in making a discretionary decision to determine if Southern California Edison can construct a 500/230 kV interconnection substation, it will provide additional notice and opportunity for public comment in accordance with CEQA.

PUBLIC INFORMATION / SCOPING MEETING

A public information/scoping meeting will be held at the following time and location:

January 28, 2010 from 5 p.m. to 9 p.m.
University of California Riverside-Palm Desert Campus
75080 Frank Sinatra Drive
Palm Desert, CA 92211

The public is invited to learn about the project, and comment on issues of concern, potential impacts, alternatives, and mitigation measures that should be considered in the analysis of the proposed action. The BLM and CPUC will use public scoping comments to prepare the draft environmental documents that will be available for public review.

SUPPLEMENTAL INFORMATION

A. Project Description

The applicant, First Solar Inc., has requested authorization to develop a solar photovoltaic generating facility with a proposed output of 550 megawatts and a preferred project footprint of 4,410 acres. The proposed project would be located on BLM-administered lands in Riverside County, approximately six miles north of the rural community of Desert Center, California (see location map). The overall site layout and generalized land uses would include a solar farm and on-site substation, a 230 kV interconnection transmission line, a 500/230 kV substation (referred to as the Red Bluff Substation), an administration building, operations and maintenance facilities, and temporary construction staging areas. The interconnection transmission line would be nine to 12 miles long, depending on the alternative selected. The Red Bluff Substation would connect the project to the Southern California Edison regional transmission grid. If approved, construction is estimated to begin in late 2010 and would take approximately 41 months to complete.

B. Potential Environmental Effects of the Project

A project level EIS will be prepared and would address a full range of environmental issues associated with the construction and operation of the proposed project. Key issues are anticipated to be air quality, biological resources, recreation, cultural resources, hydrology/water quality, geology and soils, land use and special management areas, noise, public health, socioeconomic, traffic and transportation, and visual resources. Potential impacts to these issues would be examined in the EIS. In addition, the EIS would include a discussion of reasonable alternatives to the proposed project.

Air Quality. Construction and operation of the proposed project may generate emissions from construction equipment exhaust, earth movement, construction workers' commute, material hauling, and maintenance activities. The EIS would evaluate the effects of construction and operation on air quality.

Biological Resources. The proposed project has the potential to impact sensitive wildlife species such as desert tortoise, Palm Spring round-tailed ground squirrel, burrowing owl, migratory birds, Coachella Valley milk-vetch, and foxtail cactus. The EIS would evaluate any potential impacts to biological resources.

Recreation. The EIS would evaluate any impacts of the proposed project on Off-Highway vehicle facilities and BLM-designated "open" off-highway routes.

Cultural. Grading and construction activities may have the potential to impact known or previously unknown archaeological, paleontological, or historic resources. The EIS would evaluate the proposed project's impact on these resources.

Hydrology/Water Quality. Flood hazards may exist within the boundaries of the proposed project that could impact structural elements of the proposed project. Use of groundwater or trucked water may be used to meet water needs during construction for dust control, soil compaction, sanitary uses, etc. Also, grading activities may have an effect on desert washes or other surface water features. The EIS would evaluate all potential impacts on water resources.

Geology and Soils. The proposed project may be subject to seismic activity including ground shaking and surface rupture. Soils would be disturbed during site construction and along access ways which may result in potential impacts to air quality. The EIS would evaluate geologic hazards and soil disturbance impacts.

Land Use and Special Management Areas. Specially designated areas such as Desert Wildlife Management Areas and the Chuckwalla Critical Habitat Unit exist in the vicinity of the proposed project. The EIS would evaluate impacts to any specially designated areas.

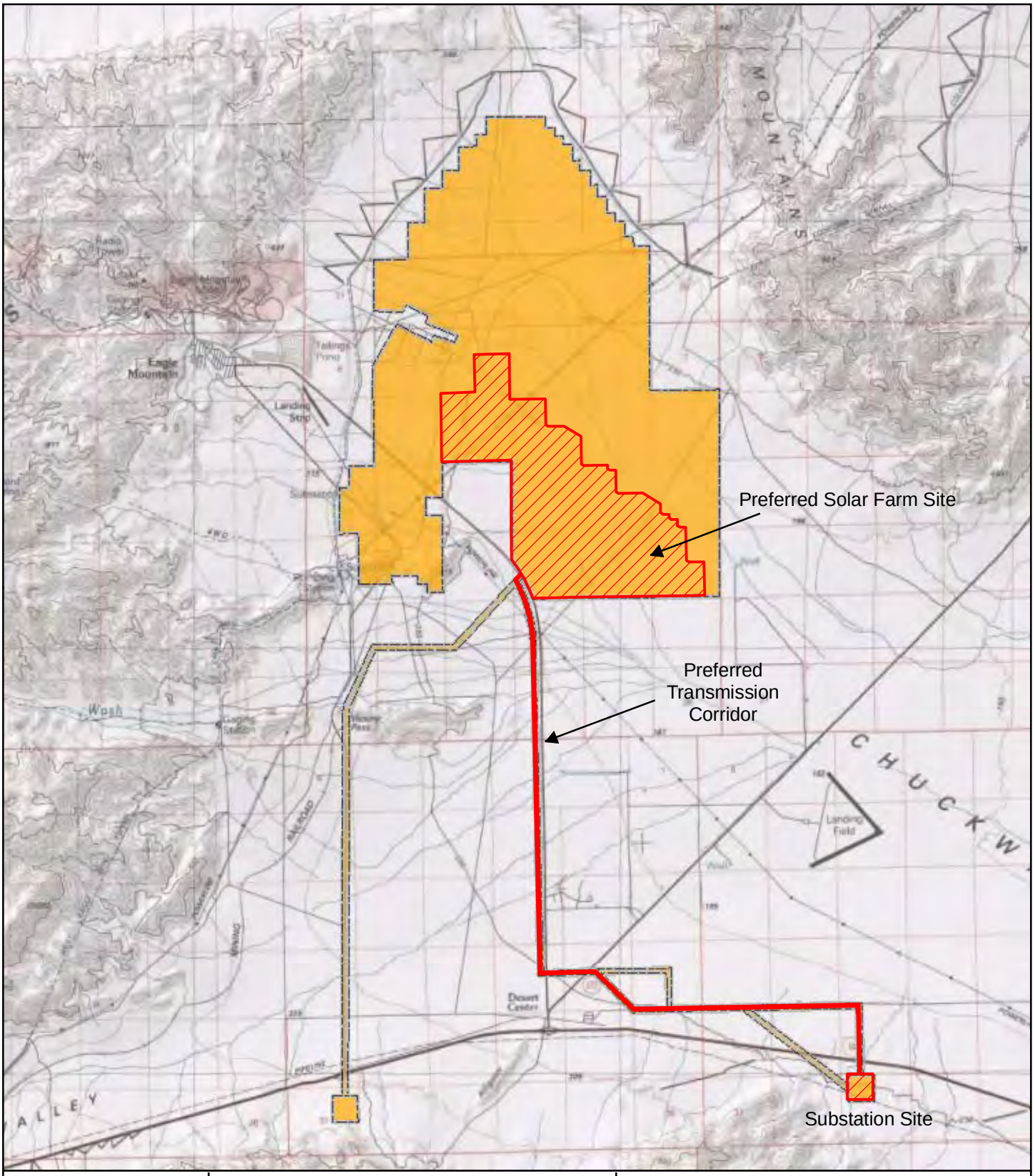
Noise. Scattered residences exist in the vicinity of the proposed project. Construction activities may generate noise that could impact these residences. The EIS will evaluate any noise impacts on sensitive receptors in the area.

Public Health. Hazardous substances may be stored on the project site. The EIS would evaluate the potential for encountering any hazardous materials or waste associated the proposed project.

Socioeconomic. It has been estimated that during construction, the number of on-site employees would average about 255, with a peak on-site workforce of 430 employees. Construction would take place over 41 months. During the operational phase, it has been estimated that 15 workers would be on-site. The EIS would evaluate the impacts to local businesses, employment opportunities, demand for housing, and minority and disadvantaged populations that may be living in the vicinity.

Traffic and Transportation. The proposed project would increase traffic levels to and from the project site. The EIS would discuss potential transportation, circulation and parking impacts.

Visual Resources. The proposed project would require lighting during periods of construction and maintenance operations. In addition, the reflectivity and color of the photovoltaic (PV) panels may have a potential visual impact. The EIS would evaluate the potential impacts from the PV panels and any lighting source.



Map Location

Legend

Study Area Boundary

Preferred Project Site

1 in = 2 miles

0 2 4 Miles

N W E S

Desert Sunlight Solar Farm Project

LOCATION MAP

Date: November 2009

Source: Desert Sunlight Solar Farm Plan of Development, November 2009

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United States Department of the Interior
Bureau of Land Management
Palm Springs-South Coast Field Office

Desert Sunlight Solar Farm Project

BLM Land Use Application
File # CACA-48649

SCOPING REPORT

RESULTS OF SCOPING

February 2010

Palm Springs-South Coast Field Office
1201 Bird Center Drive
Palm Springs, CA 92262

Approved by: _____ _____
John R. Kalish Date
Field Manager

Desert Sunlight Solar Farm Project

I. Introduction

A. Brief Description of the Project

First Solar Development, Inc. proposes the Desert Sunlight Solar Farm Project (DSSF), an alternating current solar photovoltaic (PV) energy generating facility of approximately 550 megawatts (MW). If approved, the DSSF would be located on Bureau of Land Management (BLM) administered land approximately 6 miles north of the rural community of Desert Center, in eastern Riverside County (See Project Location Map below). The project would include a new 230 kV transmission line that would interconnect with Southern California Edison's regional transmission at the planned Red Bluff substation. The project would include approximately 8.4 million PV solar modules; direct conversion of sunlight to electricity; and low-profile, uniform PV arrays approximately five feet tall.

B. Potential Land Use Plan Amendment to the California Desert Conservation Area Plan

The project would be located on land that is subject to the BLM's California Desert Conservation Area (CDCA) Plan. All of the public lands in the CDCA under BLM management, except for a few small and scattered parcels, have been designated geographically as a Multiple Use Class (MUC) as follows: Controlled Use (C), Limited Use (L), Moderate Use (M), and Intensive Use (I). The Project is mostly located in BLM designated M lands. For M lands, wind and solar electric generation facilities may be allowed after National Environmental Policy Act (NEPA) requirements are met. The transmission corridor is located within (L) lands, which are lands managed to provide lower-intensity, carefully controlled multiple use of resources while ensuring that sensitive values are not significantly diminished. The CDCA also states that sites associated with power generation or transmission not identified in the CDCA will be considered through the Plan Amendment process. The project site is currently not identified in the CDCA. Therefore, prior to right-of-way (ROW) grant issuance, the project would require a Land Use Plan Amendment to the CDCA.

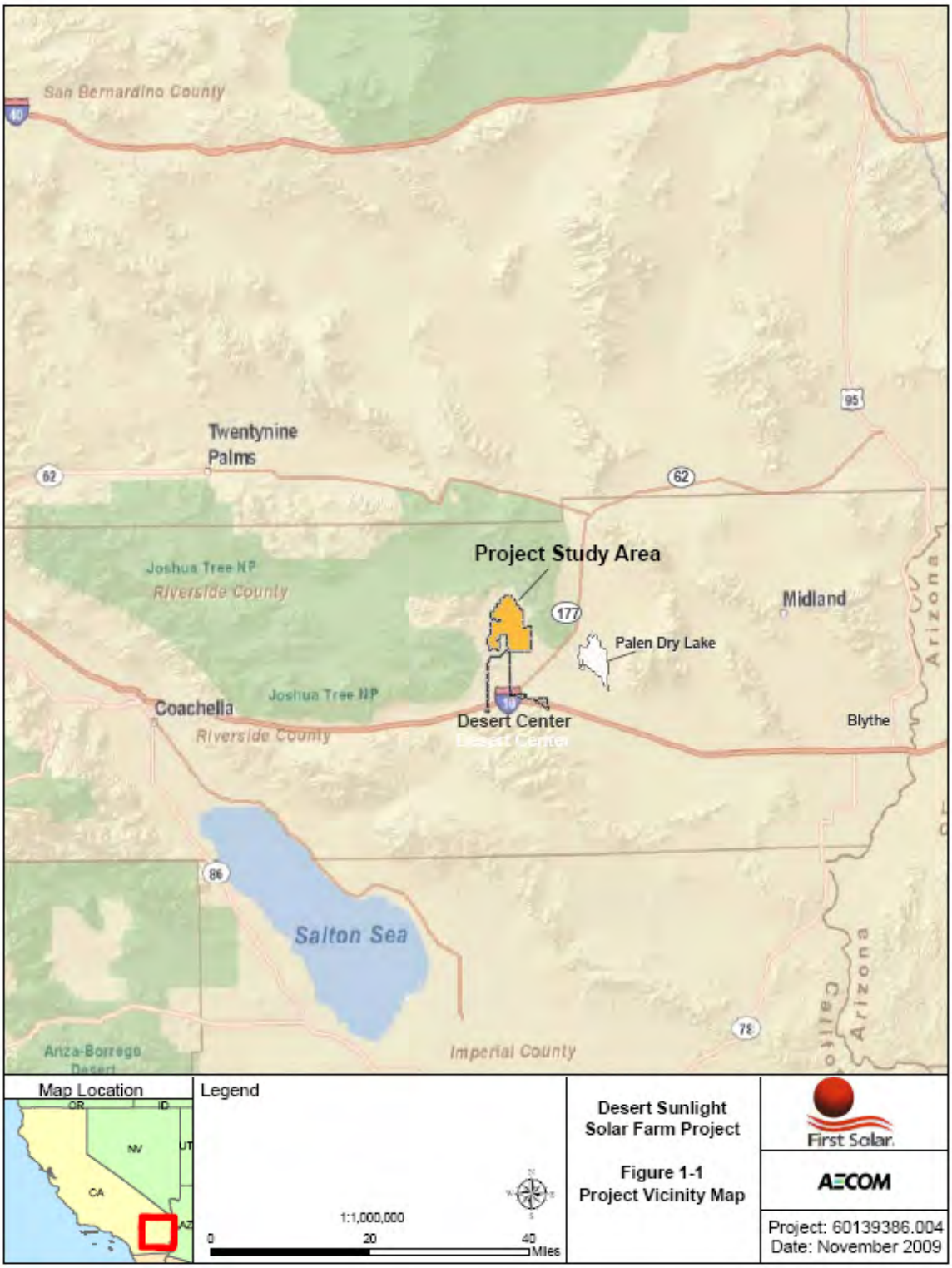


Figure 1: Project Location

C. Purpose and Need for the Project

The proponent proposes to assist the State of California in meeting the State of California Renewable Portfolio Standard Program goals and reduce greenhouse gases by developing an alternating current solar photovoltaic (PV) energy generating facility of approximately 550 MW and related facilities in Riverside County, California on BLM administered lands.

BLM's purpose and need for the solar project is to respond to the proponent's application under Title V of the Federal Land Policy and Management Act of 1976 (43 USC 1761) for a ROW grant to construct, operate and decommission a solar PV facility on BLM lands. BLM will consider alternatives to the proponent's proposed action and will include terms and conditions, as deemed necessary. If BLM decides to approve issuance of a ROW grant to the proponent, BLM's actions would include amending the CDCA, concurrently. BLM will take into consideration the provisions of the Energy Policy Act of 2005 in responding to the proponent's application.

D. Agency Coordination

D.1 Lead Agency

The BLM, acting as federal lead agency, intends to prepare an Environmental Impact Statement (EIS) in compliance with NEPA and the Federal Land Policy and management Act of 1976.

D.2 Cooperating Agency

The Council on Environmental Quality (CEQ) regulations (40 CFR 1506.2) direct federal agencies to cooperate with State and local agencies to the fullest extent possible to reduce duplication between NEPA and State and local requirements, including joint planning processes, environmental research and studies, public hearings, and environmental documents. In addition, the California Environmental Quality Act (CEQA) Guidelines, Sections 15221 and 15226 encourage similar cooperation by State and local agencies with federal agencies when environmental review is required under both CEQA and NEPA.

The California Public Utilities Commission (CPUC), intends to use the EIS prepared by the BLM in making a discretionary decision to determine if Southern California Edison (SCE) can construct a 500/230 kV interconnection substation, in accordance with CEQA. The CPUC will work as a cooperating agency with the BLM to provide information within the CPUC's area of expertise. Following preparation of the EIS by BLM, the CPUC will determine whether the EIS meets the requirements of CEQA and will comply with CEQA prior to making any discretionary decision on the aforementioned substation. There is a Memorandum of Understanding between the BLM and the CPUC to this outlining this cooperation.

II. Scoping Process Summary

A. Notice of Intent

The BLM published a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) on January 13, 2010 in the Federal Register Volume 75, Number 8. Publication of the NOI began a 30-day comment period which ended on February 12, 2010. BLM provided a website with Project information that also described the various methods of providing public comment on the Project including an e-mail address where comments could be sent electronically.

B. Public Notification

Notification for a public Scoping Meeting held on January 28, 2010 was posted on BLM's website and sent via email to the local newspaper, the Desert Sun, on January 13, 2010. In addition, notices were sent certified mail to Responsible and Trustee Agencies under CEQA, all landowners within 300 feet of the project boundary, and other interested parties.

C. Public Scoping Meeting

A public Scoping Meeting was held on January 28, 2010 at the University of Riverside Palm Desert Graduate Center located at 75-080 Frank Sinatra Drive in Palm Desert, California. A presentation describing the project was made by First Solar Development, Inc. with presentations describing the environmental review process presented by members of the BLM. Twenty-two attendees were documented by signing in on a voluntary sign-in sheet.

D. Written Comments

Fourteen comment letters were received within the comment period ending on February 12, 2010.

III. Comment Summary and Analysis

Issues were identified by reviewing the comment documents received. Many of the comments identified similar issues. The following section provides a summary of the issues, concerns, and/or questions raised. For this report, the issues have been grouped into one of the three following categories:

- Issues or concerns that could be addressed by effects analysis;
- Issues or concerns that could develop an alternative and/or a better description or qualification of the alternatives;
- Issues or concerns outside the scope of the EIS.

The comments discussed below are paraphrased from the original comment letters. To a minor degree, some level of interpretation was needed to identify the specific concern to be addressed. Many of the comments identified similar issues; to avoid duplication and redundancy similar comments were grouped together and then summarized. Original comment letters may be reviewed up on request at the BLM Palm Springs-South Coast Field Office at 1201 Bird Center Drive, Palm Springs, California, 92262, during normal business hours, from 8:00 am to 4:30 pm.

A. Effects Analysis

Comments in this category will be described in detail in the affected environment section of the EIS or addressed in the effects analysis for each alternative.

Purpose and Need

- Project description should not be narrowly defined to rule out feasible alternatives
- Project should be discussed in the context of the larger energy market; identify potential purchasers of the power produced; discuss how project will assist in meeting its renewable energy portfolio standards and goals

Air Resources (Air sheds)

- Impacts during construction and operation
- Quantify PM2.5 emissions
- Calculate localized air quality impacts in addition to regional impacts, incorporating dispersion modeling if necessary
- Perform a mobile source health risk assessment if diesel-fueled vehicles are used
- Refer to South Coast Air Quality Management District's CEQA Air Quality Handbook for sample air quality mitigation measures
- Impacts to fine particulate soils below desert pavements and fugitive dust
- Impacts related to ozone concentration near high voltage power lines
- Designated Utility Corridor identified on BLM maps within Joshua Tree National Park boundaries—NPS requests this area continue to be excluded from consideration as a transmission corridor
- Greenhouse gas emissions/climate change impacts on plants, wildlife, and habitat
- Evaluate impact of GHG SF6 used in electricity transmission lines
- Planning for species adaptation due to climate change
- Discussion of how projected impacts could be exacerbated by climate change
- Quantify and disclose anticipated climate change benefits of solar energy
- Discussion of trenching/grading/filling and effects on carbon sequestration of the natural desert

Soils Resources

- Impacts to desert soils
- Increased siltation during flooding and dust
- Impacts to crypto-biotic crust
- Impacts resulting from disturbance of naturally-occurring arsenic in desert soils
- Preparation of a drainage, erosion, and sediment control plan

Water Resources (Surface and Groundwater)

- Identify impacts to jurisdictional waters of the US and California
- Effects of additional groundwater pumping in conjunction with other groundwater issues
- Groundwater and surface water impacts
- Identify water use quantities and sources
- Grading impacts on normal fluvial processes
- Concentrated sheetflow from graded areas may unevenly redistribute water causing erosion, sediment transport and deposition in unintended areas
- Identify potentially-affected groundwater basin and potential for subsidence
- Impacts to down-gradient groundwater, surface water, and wetlands
- Describe basin recharge rates
- Describe water right permitting process and status of water rights within the basin
- Feasibility of using other sources of water, including potable water, wastewater, or deep-aquifer water
- Impacts of project discharges on surface and groundwater quality
- Impacts resulting from septic systems
- Effects of diversion of water from ephemeral streams
- Description of water conservation measures to reduce water demands
- Effects of climate change on water supply
- Determination if project requires a Section 404 permit under the Clean Water Act
- Include a jurisdictional delineation for all Waters of the US, including ephemeral drainages
- Description of natural drainage patterns, project operations, identify whether any component of project is within 50 or 100-year floodplain
- Provide information on CWA Section 303(d) impaired waters, if any, and efforts to develop and revise TMDLs

Biological Resources

- Impacts to plants and animals in Joshua Tree National Park (JTNP)
- If there are threatened or endangered species present, recommend BLM consult with USFWS and prepare a Biological Opinion under Section 7 of the ESA
- Impacts to all known species, not just special status, should be analyzed to assure ecosystem level protection

- Maximize options to protect habitat and minimize habitat loss and fragmentation
- Impacts associated with construction, installation, and maintenance activities (deep trenching, grading, filling, fencing)
- Impacts due to increase of shade from PV panels in the desert environment
- Seasonal surveys should be performed for sensitive plant and animal species
- Impacts to all known species, not just special status, should be analyzed to assure ecosystem level protection
- Acquisition of lands for conservation should be part of mitigation strategy
- Impacts to Desert Dry Wash Woodland and Blue Palo Verde-Ironwood-Smoke Tree habitat

Vegetation Resources (Vegetative communities, priority and special status species)

- Seasonal surveys should be performed for sensitive plant species
- Vegetation maps should be at scale that is useful for evaluating impacts
- Impacts due to non-native invasive species
- Inclusion of an invasive plant management plan
- Avoidance of rare plants preferable due to transplanting issues
- Impacts to the following (but not limited to) species:
  - Las Animas colubrine
  - Harwood's milkvetch
  - Coves' cassia
  - Coachella Valley milkvetch
  - California ayenia
  - Alverson's foxtail cactus
  - California ditaxis
  - California barrel cactus

Wildlife Resources (Priority species, special status species)

- Desert tortoise; especially impacts to existing movement corridor connection from the Chuckwalla DWMA to Joshua Tree National Park; translocation results in high mortality; include an aggressive raven prevention plan
- Impacts to the following (but not limited to) species:
  - Burrowing owl
  - Desert bighorn sheep
  - Mojave fringe-toed lizard
  - LeConte's thrasher
  - Bendire's thrasher
  - Loggerhead shrike
  - Prairie falcon
  - Migratory birds
- Impacts to wildlife movement corridors

Cultural Resources

- Recommends a Class III inventory for cultural resources
- Determinations of Eligibility for the National Register of Historic Places should be conducted prior to project design and implementation

- Discussion of prehistoric and historic transportation corridors that might lead into Joshua Tree National Park (JTNP); information on prehistoric lithic quarries; information on rock art; habitation sites with midden deposits; early Holocene Pinto sites; Patton WWII training sites; California Aqueduct related sites
- Archaeological monitoring in high sensitivity areas during ground disturbing activities
- Impact on paleontological deposits in JTNP
- Describe Native American consultation
- Address existence of sacred sites and Executive Order 13007, distinguished from Section 106 of the NHPA

Visual Resources

- Visibility issues related to fugitive dust
- Impacts to wilderness area of JTNP by adding human activity within landscape view
- Cumulative impacts due to other projects in the vicinity
- Affect of artificial lighting due to security, maintenance on night sky viewing
- Impact on wildlife due to new light sources
- Nighttime lighting views from JTNP and Chuckwalla Wilderness Area
- Impacts resulting from building/facility color
- Undergrounding of transmission lines recommended

Land Use/Special Designations (ACECs, WAs, WSAs, etc.)

- Discuss how project would support or conflict with objectives of federal, state, tribal, or local land use plans, policies, and controls
- Project site located within Eastern Colorado Desert Tortoise Recovery Unit and classified as BLM Category III desert tortoise habitat
- Discuss whether land is classified as disturbed
- Utilize the Renewable Energy Interactive Mapping Tool to locate disturbed sites in proximity to the project that might also be utilized
- Preferred Transmission Corridor follows Kaiser Road and affects 192 acres of the Chuckwalla DWMA

Public Health and Safety

- Identify projected hazardous waste types and volumes, and expected storage, disposal, and management plans
- Address full product life cycle of PV components
- Identify fire prevention BMP
- Evaluate potential risk from cadmium telluride resulting from degradation/breakage of PV panels
- Hazards related to landing strip near project site

- Electromagnetic field impacts

Noise/Vibration

- Impacts of heavy grading equipment and machinery on the natural soundscape environment
- Consider wildlife as sensitive receptors and identify impacts
- Impacts from operation of project buildings

Recreation

- Impacts to local tourism economies
- Will the project have public access corridors to other public lands?

Socioeconomic

- Consider proximity to residences, state parks and federal parks
- Impacts to nearby farming operations

Environmental Justice (minority and low-income communities)

- Evaluate potential for disproportionate adverse impacts to minority and low-income populations and approaches used to foster public participation by these populations

Cumulative Impacts

- Identify impacts from other projects occurring in the vicinity, including solar, wind, geothermal, Eagle Crest Hydro-Pumped Electric Facility, Eagle Mountain Landfill, Eagle Mountain Mine, Shaver's Valley new town, roads, transit, housing, and other development
- Scope of cumulative analysis should encompass Sonoran/transition desert areas
- Groundwater cumulative impacts related to Eagle Crest Hydro-Pumped Electric facility
- Viewshed alterations and subsequent changes to the view from wilderness
- Describe reasonably foreseeable future land use and impacts resulting from additional power supply

B. Alternative Development and/or Alternative Design Criteria

Comments in this category will be considered in the development of alternatives or can be addressed through design criteria in the alternative descriptions.

- Project description should not be narrowly defined to rule out feasible alternatives

- Reasonable alternatives should include, but not necessarily limited to, alternative sites, capacities, and technologies as well as avoidance of environmentally sensitive areas or areas with potential use conflicts
- Identify alternative sites outside of desert tortoise occupied habitat or in disturbed lands; avoid impacts to northwest portion of the site where many desert tortoises were surveyed
- Alternative configurations should avoid Pinto Wash; microphyll washes; and other movement corridors
- Identify alternative located on adjacent fallow farmland
- Identify alternative that would designate environmentally sensitive land outside the Preferred Project Site, but within original ROW, unavailable to other solar projects
- Alternatives should include: sites not under BLM jurisdiction; project extent and electrical power generation that differ from proposal; use of different technology; benefits associated with the proposed technology; power generation sited adjacent to power consumption
- Alternatives should describe rationale used to determine whether impacts of an alternative are significant or not
- Discuss feasibility of using residential and wholesale distributed generation, in conjunction with increased energy efficiency, as an alternative

C. Issues or Concerns Outside the Scope of the EIS

Comments in this category are outside the scope of analysis and will not be addressed in the EIS.

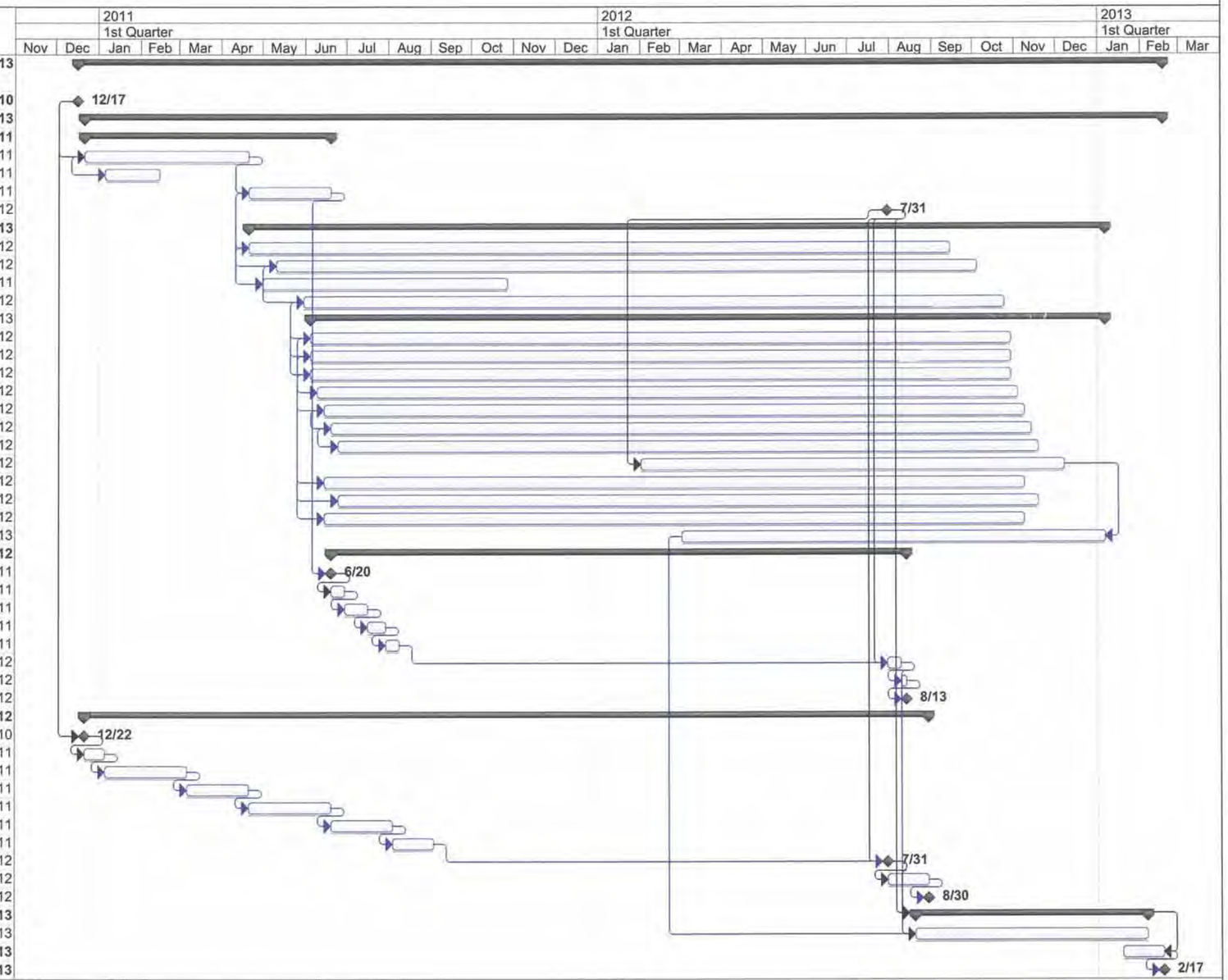
- Agencies must require adequate end of project life planning, including reuse of abandoned sites for future renewable energy projects in lieu of allowing development on other undisturbed lands; and/or returning to public use in original condition
- Include thorough analysis of anticipated costs of decommissioning and restoration of project site
- Identify how siting of large energy projects would impact private property values and quality of life
- Does First Solar have plans to expand their project?
- “Fast tracking” viewed as unwise

Appendix B

Construction Schedule for Solar Farm and Gen-Tie Lines

Desert Sunlight Construction Schedule

ID	Task Name	Duration	Start	Finish
1	**DESERT SUNLIGHT CONSTRUCTION SCHEDULE**	**793.33 days**	**Fri 12/17/10**	**Sun 2/17/13**
2				
3	**All permits received**	**0 days**	**Fri 12/17/10**	**Fri 12/17/10**
4	**Construction Plan**	**788.33 days**	**Wed 12/22/10**	**Sun 2/17/13**
5	**FNTP / Construction Mobilization**	**180 days**	**Wed 12/22/10**	**Mon 6/20/11**
6	Site Prep	120 days	Wed 12/22/10	Thu 4/21/11
7	Install initial access roads	40 days	Thu 1/6/11	Tue 2/15/11
8	Set-up Office & Site Services	60 days	Thu 4/21/11	Mon 6/20/11
9	**Utility Interconnection Available**	0 days	Tue 7/31/12	Tue 7/31/12
10	**Solar Farm Site**	**627 days**	**Thu 4/21/11**	**Mon 1/7/13**
11	Survey	513 days	Thu 4/21/11	Sat 9/15/12
12	Grading	513 days	Wed 5/11/11	Fri 10/5/12
13	Fencing	180 days	Sun 5/1/11	Fri 10/28/11
14	Post Installation	513 days	Tue 5/31/11	Thu 10/25/12
15	BOS Installation	582 days	Sun 6/5/11	Mon 1/7/13
16	DC Feeders & Whips	513 days	Sun 6/5/11	Tue 10/30/12
17	AC Trench & Fiber	513 days	Sun 6/5/11	Tue 10/30/12
18	PCS Vaults & Transformer Pads	513 days	Sun 6/5/11	Tue 10/30/12
19	Apply non-drivable palliative	513 days	Fri 6/10/11	Sun 11/4/12
20	Tilt Brackets	513 days	Wed 6/15/11	Fri 11/9/12
21	Tables	513 days	Mon 6/20/11	Wed 11/14/12
22	Wire Harnesses	513 days	Sat 6/25/11	Mon 11/19/12
23	Modules & Clips	310 days	Thu 2/2/12	Sat 12/8/12
24	PV Combining Switchgear	513 days	Wed 6/15/11	Fri 11/9/12
25	Combiner Boxes	513 days	Sat 6/25/11	Mon 11/19/12
26	PCS Shelters & Transformers	513 days	Wed 6/15/11	Fri 11/9/12
27	Pre-functional Tests	310 days	Sat 3/3/12	Mon 1/7/13
28	**Onsite Substation construction**	**420.33 days**	**Mon 6/20/11**	**Mon 8/13/12**
29	Commence Construction	0 days	Mon 6/20/11	Mon 6/20/11
30	Site Preparation & Grading	0.33 mons	Mon 6/20/11	Thu 6/30/11
31	Below Grade Construction	0.56 mons	Thu 6/30/11	Sat 7/16/11
32	Above Grade Construction	0.44 mons	Sat 7/16/11	Sat 7/30/11
33	Control/Power Cables & Terminations	10 days	Sat 7/30/11	Tue 8/9/11
34	Testing & Commissioning	0.33 mons	Tue 7/31/12	Fri 8/10/12
35	Clean Up & Punch List	0.11 mons	Fri 8/10/12	Mon 8/13/12
36	Demobilization	0 mons	Mon 8/13/12	Mon 8/13/12
37	**220 kV Transmission Line**	**617 days**	**Wed 12/22/10**	**Thu 8/30/12**
38	Mobilization	0 days	Wed 12/22/10	Wed 12/22/10
39	Stake Structures	0.5 mons	Wed 12/22/10	Thu 1/6/11
40	Foundation Installation	2 mons	Thu 1/6/11	Mon 3/7/11
41	Frame Structures	1.5 mons	Mon 3/7/11	Thu 4/21/11
42	Erect Structures	2 mons	Thu 4/21/11	Mon 6/20/11
43	Wire Installation	1.5 mons	Mon 6/20/11	Thu 8/4/11
44	Testing	1 mon	Thu 8/4/11	Sat 9/3/11
45	ENERGIZE TRANSMISSION LINE	0 days	Tue 7/31/12	Tue 7/31/12
46	ROW Restoration and Cleanup	1 mon	Tue 7/31/12	Thu 8/30/12
47	Project Complete	0 days	Thu 8/30/12	Thu 8/30/12
48	**Commissioning**	**170 days**	**Mon 8/20/12**	**Wed 2/6/13**
49	Functional testing	170 days	Mon 8/20/12	Wed 2/6/13
50	**Final Soil Stabilization**	**30 days**	**Fri 1/18/13**	**Sun 2/17/13**
51	**Project Substantial Completion**	**0 days**	**Sun 2/17/13**	**Sun 2/17/13**



Task | Progress | Summary | External Tasks | Split
Split | Milestone | Project Summary | External MileTask

Appendix C

CPUC's CEQA Environmentally Superior Alternative

APPENDIX C – CPUC'S CEQA ENVIRONMENTALLY SUPERIOR ALTERNATIVE

C.1 INTRODUCTION

The California Environmental Quality Act (CEQA) Guidelines Section (§) 15126.6 requires an Environmental Impact Report (EIR) to consider a range of reasonable alternatives to the proposed project, or to the location of the project, that would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. Because this EIS may be used by the California Public Utilities Commission (CPUC) in lieu of an EIR in determining whether to issue a permit for the Red Bluff Substation, this chapter compares the Red Bluff Substation alternatives evaluated in Chapter 4 of this EIS. In addition, because CEQA § 15378 (a) requires the lead agency to consider the whole of an action, not simply its constituent parts, when determining whether it will have a significant environmental effect (*Citizens Assoc. For Sensible Development of Bishop Area v. County of Inyo* (1985) 172 Cal.App.3d 151), this chapter also compares the effects of the Gen-Tie route alternatives and the Solar Farm Site alternatives, identifies the environmentally superior action alternative, and compares this to the CEQA No Project alternative (No Action alternative, identified as Alternative 4 in Chapter 2, Description of the Proposed Action and Alternatives) as required by CEQA § 15126.6 (e) (1).

C.2 COMPARISON OF ALTERNATIVES

The BLM is required to consider in detail a range of alternatives that are considered "reasonable," usually defined as alternatives that are realistic (not speculative), technologically and economically feasible, and that respond to the purpose of and need for the Proposed Action. Similarly, CEQA requires a "reasonable range" of alternatives that are feasible and that satisfy most of the project objectives as listed in Section 2.1 but avoid or substantially lessen any of the significant environmental effects of the proposed project. The alternatives carried forward for analysis satisfy requirements under both NEPA and CEQA.

C.2.1 Alternatives Considered in Detail

As described in Section 2.2.2, Overview of Alternatives Considered in Detail, three full action alternatives and three No Action alternatives are fully analyzed in the EIS. Each action alternative contains three main components: Solar Farm Site, Gen-Tie Line, and Substation (Red Bluff Substation). Two Solar Farm Site layout alternatives were considered in detail: Solar Farm Layout B and Solar Farm Layout C. Three Gen-Tie Line alternatives were considered in detail: GT-A-1 and GT-A-2, both of which exit the Solar Farm and go to Substation A, and GT-B-2, which would exit the Solar Farm and go to Substation B. Two substation alternatives were considered in full detail: Substation A (to the east) and Substation B (to the west). Two access road alternatives were considered for Substation A only: Access Road 1 (via Kaiser Road and Aztec Road) and Access Road 2 (via Chuckwalla Valley Road and Corn Springs Road). Supporting facilities for all substation alternatives include a telecommunications site (the Desert Center Telecommunications Site). Alternatives for each project component are compared by environmental discipline in Tables C-1, C-2, -and C-3. In each table, the key environmental disciplines (wildlife, vegetation, visual resources, cultural resources, and water resources) are listed first.

C.2.2 Alternatives Not Carried Forward for Full Analysis

A number of Alternatives were not carried forward for detailed analysis because they did not meet project purpose and need, project objectives, were deemed to be technically disadvantageous, or had greater environmental impacts than the proposed project.

An additional Solar Farm layout was considered within the Project Study Area, identified as Solar Farm A. However, this alternative is located within a larger area of desert tortoise habitat than is the proposed Solar Farm B layout. Because this layout did not provide any advantage over Solar Farm B and would result in greater impacts on the desert tortoise, it was eliminated from consideration. Various other Solar Farm layouts were considered but eliminated, and are discussed in Section 2.6.1, Alternative Layouts in Project Solar Farm Study Area.

An additional Gen-Tie Line, GT-B-2, was considered for the proposed Project. GT-B-1 would exit the southwest corner of the Solar Farm Site across Kaiser Road, then turn west and southwest until intersecting with Eagle Mountain Road, then running south along the east side of Eagle Mountain Road across I-10 to the western location considered for the Red Bluff Substation (Red Bluff Substation B). The total length of GT-B-1 is approximately 9.3 miles within a 160-foot-wide corridor. This alternative would disturb more acres within the Chuckwalla Desert Wildlife Management Area (DWMA), would require removal of a greater number of foxtail cactus, and has the potential to disturb more significant cultural resources sites than the other Gen-Tie Lines. Since this layout did not provide any advantage over the other Gen-Tie Line that would provide a connection to Red Bluff Substation B and would result in greater impacts on the DWMA and cultural resources, it was eliminated from detailed consideration. Other alternative interconnections were considered and eliminated from detailed environmental review and are described in Section 2.6.7, Alternative Transmission and Interconnection Locations.

Various other system alternatives and technology alternatives were considered but eliminated from detailed review and are described in Section 2.6.

C.2.3 Summary Comparison of All Alternatives

Based on the comparisons presented in Tables C-1, C-2, and C-3 below, the CPUC believes the environmentally superior action alternative under CEQA is a combination of **Substation A** with **Access Road 2**, **Gen-Tie GT-A-2**, and either **Solar Farm B or C**. As described in Chapter 2, three full action alternatives, representing three of seven possible combinations of all Solar Farm Site, Gen-Tie, and Substation alternatives that were considered in full detail in the EIS, were analyzed as follows:

- Alternative 1—Proposed Action Alternative (Solar Farm Layout B, Gen-Tie Line GT-A-1, Red Bluff Substation A, and Access Road 2);
- Alternative 2—Alternate Action Alternative (Solar Farm Layout B, Gen-Tie Line BT-B-2, and Red Bluff Substation B); and
- Alternative 3—Reduced Footprint Alternative (Solar Farm Layout C, Gen-Tie Line GT-A-2, Red Bluff Substation A, and Access Road 1).

The remaining four combinations of project components were not identified nor compared by environmental discipline in Chapter 4. However, the other four combinations are technically feasible. As described in this section, none of the three combinations of alternatives defined in the Project Description (Alternatives 1 through 3) are considered to be the environmentally superior

action alternative. In addition, the No Project alternative is not found to be superior, as described in Section C.2.7. The following sections present details to support these conclusions.

C.2.4 Comparison of Red Bluff Substation Sites

Table C-1 summarizes the impacts of the two substation alternatives, including the two different access road options for Substation A. This comparison shows that overall, **Substation A with Access Road 2** would have the fewest adverse impacts on environmental resources and would be environmentally superior under CEQA. Substation A with Access Road 1 would be located in an area without active desert tortoise sign and would affect fewer cultural resources than with Access Road 2. Although Substation A would affect more CRHR eligible sites than Substation B, as described below for the Gen-Tie Line alternatives and shown in Table C-2 the combination of Substation A and GT-A-2 would affect fewer CRHR eligible sites than the combination of Substation B and GT-B-2.

Table C-1
Comparison of Action Alternatives: Red Bluff Substation

Environmental Discipline	Substation A (eastern)		Substation B (western)
	Access Road 1	Access Road 2	
Wildlife	**Preferred** • Low desert tortoise sign (no individuals, scat, burrows, or carcasses within or immediately surrounding site). • Impacts to chuckwalla and burro deer individuals and habitat, and potential impacts to rosy boa. • Permanent disturbance of 149 acres of Chuckwalla DWMA or critical habitat for desert tortoise. • Wildlife movement impacts less than significant without further mitigation. • No significant unavoidable impacts.	**Less preferred** • Low desert tortoise sign (no individuals, scat, burrows, or carcasses within or immediately surrounding site). • Impacts to chuckwalla and burro deer individuals and habitat, and potential impacts to rosy boa. • Permanent disturbance of 149 acres of Chuckwalla DWMA or critical habitat for desert tortoise. • Wildlife movement impacts less than significant without further mitigation. • No significant unavoidable impacts.	**Least preferred** • High desert tortoise sign (one individual, one carcass, and scat within the site, large amount of scat immediately surrounding site). • No impacts to chuckwalla, burro deer, or rosy boa. Impacts to burrowing owl individuals and habitat. • Permanent disturbance of 114 acres of critical habitat. No impacts to Chuckwalla DWMA (private land). • Wildlife movement impacts significant, at proposed location; mitigated through relocation of Substation (MM-WIL-9). No significant unavoidable impacts.
Vegetation	**Roughly equivalent** • Permanent conversion of creosote desert scrub (124 ac) and desert dry wash woodland (24 ac). • Removal of 1 Las Animas colubrines, and 2 California ditaxis. • Permanent loss of 46 acres of CDFG jurisdictional resources. • No significant unavoidable impacts.	**Roughly equivalent** • Permanent conversion of 143.5 acres of desert creosote scrub (124 ac) and desert dry wash woodland (24 ac). • Removal of 1 Las Animas colubrines, and 2 California ditaxis. • Permanent loss of 46 acres of CDFG jurisdictional resources. • No significant unavoidable impacts.	**Roughly equivalent** • Permanent conversion of desert creosote scrub (101 acres) and desert dry wash woodland (9 ac). • Removal of foxtail cactus (2 acres), and several California ditaxis. • Permanent loss of 24 acres of CDFG jurisdictional resources. • No significant unavoidable impacts.

Table C-1 (continued)
Comparison of Action Alternatives: Red Bluff Substation

Environmental Discipline	Substation A (eastern)		Substation B (western)
	Access Road 1	Access Road 2	
Cultural Resources	**Least preferred** • Most CRHR eligible and potentially eligible sites impacted (1 eligible, 3 potentially eligible, the North Chuckwalla Petroglyph District, the North Chuckwalla Mountains Quarry District, and the landscape and area of the potential DTC-CAMA historic district). • Additional impacts to 18 other archeological resources. • Impacts would be significant and unavoidable.	**Less Preferred** • Fewer CRHR eligible sites impacted than for Access Road 1 (1 eligible, 4 potentially eligible, the North Chuckwalla Petroglyph District, the North Chuckwalla Mountains Quarry District, and the landscape and area of the potential DTC-CAMA historic district). • Additional impacts to 20 other archeological resources. • Impacts would be significant and unavoidable.	**Preferred** • Fewer CRHR eligible sites impacted than for Substation A (2 potentially eligible, the North Chuckwalla Petroglyph District, the North Chuckwalla Mountains Quarry District, and the landscape and area of the potential DTC-CAMA historic district). • Additional impacts to 5 other archeological resources. • Impacts would be significant and unavoidable.
Visual Resources	**Roughly equivalent** • Substation A with Access Road 1 would have a smaller permanent impact than Substation A with Access Road 2, but a larger impact than Substation B. • Significant and unavoidable impacts.	**Roughly equivalent** • Substation A with Access Road 2 would have the largest visual impact of the three alternatives. • Significant and unavoidable impacts.	**Roughly equivalent** • Substation B would have the smallest permanent visual impact of the three alternatives. • Significant and unavoidable impacts.
Water Resources	**Less preferred** • Alteration of three drainages to prevent flooding requiring greater disturbance than Substation B. • Access Road 1 would be less likely to be subjected to flooding. • No significant unavoidable effects.	**Least preferred** • Alteration of three drainages to prevent flooding requiring greater disturbance than Substation B. • Access Road 2 requires improvements to prevent damage from flooding. • No significant unavoidable effects.	**Preferred** • Alteration of one drainage to prevent flooding requiring lesser disturbance than Substation A. • No significant unavoidable effects.
Air Resources	**Less preferred** • More construction emissions than Substation B, equivalent to Access road 2. • No significant unavoidable impacts.	**Less preferred** • More construction emissions than Substation B, equivalent to Access road 1. • No significant unavoidable impacts.	**Preferred** • Fewest construction emissions because of a substantially shorter new access road. • No significant unavoidable impacts.
Climate Change	**Less preferred** • Equivalent greenhouse gas emissions to Access Road 2, greater emissions than Substation B. • No significant unavoidable impacts.	**Less preferred** • Equivalent greenhouse gas emissions to Access Road 1, greater emissions than Substation B. • No significant unavoidable impacts.	**Preferred** • Fewer greenhouse gas emissions than Substation A because of a substantially shorter new access road. • No significant unavoidable impacts.

Table C-1 (continued)
Comparison of Action Alternatives: Red Bluff Substation

Environmental Discipline	Substation A (eastern)		Substation B (western)
	Access Road 1	Access Road 2	
Paleontological Resources	**Equivalent** • Low potential for direct and indirect impacts to resources.	**Equivalent** • Low potential for direct and indirect impacts to resources.	**Equivalent** • Low potential for direct and indirect impacts to resources.
Geology and Soil Resources	**Equivalent** • Exposure of people and/or property to seismic hazards and increased erosion of soils from wind and water. • No significant unavoidable impacts.	**Equivalent** • Exposure of people and/or property to seismic hazards and increased erosion of soils from wind and water. • No significant unavoidable impacts.	**Equivalent** • Exposure of people and/or property to seismic hazards and increased erosion of soils from wind and water. • No significant unavoidable impacts.
Lands and Realty	**Equivalent** • Substation would be built on multiple-use BLM land.	**Equivalent** • Substation would be built on multiple-use BLM land.	**Equivalent** • Substation B would be built on currently undeveloped private land zoned W-2-10 (Controlled Development); there are no existing or known planned uses of this land.
Noise	**Equivalent** • No nearby residences.	**Equivalent** • No nearby residences.	**Equivalent** • No nearby residences.
Public Health and Safety/ Hazardous Materials	**Equivalent** • Safety hazard from the proximity of the communications tower to a private air strip. • No significant unavoidable impacts.	**Equivalent** • Safety hazard from the proximity of the communications tower to a private air strip. • No significant unavoidable impacts.	**Equivalent** • Safety hazard from the proximity of the communications tower to a private air strip. • No significant unavoidable impacts.
Recreation	**Equivalent** • No impact because no OHV routes would be affected.	**Equivalent** • No impact because no OHV routes would be affected.	**Equivalent** • No impact because no OHV routes would be affected.
Socioeconomics and Environmental Justice	**Equivalent** • No impacts.	**Equivalent** • No impacts.	**Equivalent** • No impacts.
Special Designations	**Less preferred** • Indirect impacts to an ACEC and the Chuckwalla Mountains Wilderness.	**Less preferred** • Indirect impacts to an ACEC and the Chuckwalla Mountains Wilderness.	**Preferred** • No impacts expected.
Transportation and Public Access	**Equivalent** • Impacts to traffic closure and road deterioration would be similar among all alternatives.	**Equivalent** • Impacts to traffic closure and road deterioration would be similar among all alternatives.	**Equivalent** • Impacts to traffic closure and road deterioration would be similar among all alternatives.

Another factor considered in the analysis is that cumulative impacts to air resources, visual resources, cultural resources, and biological resources would be greater with development of Substation B than with Substation A due to the requirement for an additional approximately 6 miles

of transmission gen-tie line to interconnect the proposed Palen Solar Power Project. This project is sited in close proximity to Substation A. The Palen Solar Power Project is anticipated to develop a gen-tie along the east-west portion of Gen-Tie Line GT-A-1; therefore, development of Substation B would likely result in future development of the east-west portion of GT-A-1. Impacts of Gen-Tie Line alternatives are compared in Table C-2.

C.2.5 Comparison of Gen-Tie Routes

Table C-2 presents a comparison of the three gen-tie routes. **Gen-Tie Line GT-A-2** would have the potential to affect the least desert tortoise individuals and habitat. In addition, GT-A-2 would have the fewest noise-related impacts and the smallest visual impact due to its collocation with an existing transmission line. Although GT-A-2 would affect the most water resources by requiring 30 percent more water for construction, these impacts would be less than significant with required mitigation. Therefore, GT-A-2 would be the environmentally superior gen-tie alternative under CEQA. In addition, although Substation A would affect the largest number of CRHR eligible sites as described above and in Table C-1, the combination of Substation A and GT-A-2 would affect fewer known CRHR eligible sites than the combination of Substation B and GT-B-2; however, full-coverage surveys for the GT-A-2 corridor were not possible due to access constraints, and additional cultural resources are likely to exist and could be affected by construction of GT-A-2.

As described above for Substation B, cumulative impacts of developing GT-B-2 would likely also include the impacts of development of the east-west portion of GT-A-1 to interconnect the Palen Solar Power Project, including air, cultural, visual, and biological resources impacts. Therefore, GT-B-2 would be the least environmentally preferred Gen-Tie alternative.

Table C-2
Comparison of Action Alternatives: Gen-Tie Line

Environmental Discipline	GT-A-1 (Kaiser Rd to Desert Center, then east: 12.2 mi.)	GT-A-2 (SCE ROW to Substation A: 9.5 mi.)	GT-B-2 (Kaiser Rd to Desert Center, then west: 10 mi.)
Wildlife	**Less preferred** • Disturbance of 42 acres of desert tortoise critical habitat (or DWMA. • No significant unavoidable impacts.	**Preferred** • Disturbance of 17 acres of desert tortoise critical habitat or DWMA. • No significant unavoidable impacts.	**Least preferred** • Disturbance of 55.5 acres of desert tortoise critical habitat and/or DWMA. • No significant unavoidable impacts.
Vegetation	**Roughly equivalent** • Permanent conversion of 65 acres of desert creosote scrub. • Permanent conversion of 37 acres of desert dry wash woodland. • Removal of 2 crucifixion thorns, 1 California ditaxis, and 4 desert unicorn plants. • Permanent removal of 46 acres of CDFG jurisdictional resources. • No significant unavoidable impacts.	**Roughly equivalent** • Permanent conversion of 40 acres of desert creosote scrub. • Permanent conversion of 38 acres of desert dry wash woodland. • Removal of 32 crucifixion thorns and 1 desert unicorn plant. • Permanent removal of 56 acres of CDFG jurisdictional resources. • No significant unavoidable impacts.	**Roughly equivalent** • Permanent conversion of 101 acres of desert creosote scrub. • Permanent conversion of 49 acres of desert dry wash woodland. • Removal of 2 crucifixion thorns, several California ditaxis, and 1 desert unicorn plant. • Permanent removal of 52 acres of CDFG jurisdictional resources. • No significant unavoidable impacts.

Table C-2 (continued)
Comparison of Action Alternatives: Gen-Tie Line

Environmental Discipline	GT-A-1 (Kaiser Rd to Desert Center, then east: 12.2 mi.)	GT-A-2 (SCE ROW to Substation A: 9.5 mi.)	GT-B-2 (Kaiser Rd to Desert Center, then west: 10 mi.)
Cultural Resources	**Less preferred** • Greatest number of CRHR eligible and potentially eligible sites impacted (6 potentially eligible). • Impacts to historic landscapes of the Colorado River Aqueduct, the North Chuckwalla Petroglyph District, the North Chuckwalla Mountains Quarry District, and the landscape and area of the potential DTC-CAMA historic district). • Impacts to 13 additional archeological resources. • Impacts would be significant and unavoidable.	**Cannot be compared** • Fewest number of known CRHR eligible and potentially eligible sites impacted (2 potentially eligible). • Impacts to historic landscapes of the Colorado River Aqueduct, the North Chuckwalla Petroglyph District, the North Chuckwalla Mountains Quarry District, and the landscape and area of the potential DTC-CAMA historic district). • Impacts to 2 additional archeological resources. • Surveys were incomplete for this corridor, and additional resources likely exist, and therefore this alternative cannot be compared to the alternatives with full-coverage surveys. • Impacts would be significant and unavoidable.	**More preferred** • Greatest number of CRHR eligible and potentially eligible sites as GT-A-1 (6 potentially eligible). • Impacts to historic landscapes of the Colorado River Aqueduct, the North Chuckwalla Petroglyph District, the North Chuckwalla Mountains Quarry District, and the landscape and area of the potential DTC-CAMA historic district). • Impacts to 17 additional archeological resources. • Impacts would be significant and unavoidable.
Air Resources	**Roughly equivalent** • Emissions from stationary and mobile construction activities. • No significant unavoidable impacts.	**Roughly equivalent** • Emissions from stationary and mobile construction activities. • No significant unavoidable impacts.	**Roughly equivalent** • Emissions from stationary and mobile construction activities. • No significant unavoidable impacts.
Climate Change	**Least preferred** • Most greenhouse gas emissions associated with construction. • Equivalent greenhouse gas emissions from operations. • No significant unavoidable impacts.	**Preferred** • Fewest greenhouse gas emissions associated with construction. • Equivalent greenhouse gas emissions from operations. • No significant unavoidable impacts.	**Less preferred** • Greater greenhouse gas emissions associated with construction than GT-A-2. • Equivalent greenhouse gas emissions from operations. • No significant unavoidable impacts.
Visual Resources	**Less preferred** • Would require a new transmission corridor; impacts roughly equivalent to GT-B-2. • Impacts would be significant and unavoidable.	**Preferred** • Would be collocated with an existing transmission line for the majority of its length. • Impacts would be significant and unavoidable.	**Less preferred** • Would require a new transmission corridor; impacts roughly equivalent to GT-A-1. • Impacts would be significant and unavoidable.

Table C-2 (continued)
Comparison of Action Alternatives: Gen-Tie Line

Environmental Discipline	GT-A-1 (Kaiser Rd to Desert Center, then east: 12.2 mi.)	GT-A-2 (SCE ROW to Substation A: 9.5 mi.)	GT-B-2 (Kaiser Rd to Desert Center, then west: 10 mi.)
Water Resources	**Less preferred** • Requires more water during construction than GT-B-2, but less water than GT-A-1. • No significant unavoidable impacts.	**Least preferred** • Requires approximately 30 percent more water for construction than GT-A-1 despite being 3 miles shorter. • No significant unavoidable impacts.	**Preferred** • Impacts would be the same or less than GT-A-1 due to the shorter length of GT-B-2 and lower water requirements for construction. • No significant unavoidable impacts.
Paleontological Resources	**Equivalent** • Low potential for direct and indirect impacts to resources.	**Equivalent** • Low potential for direct and indirect impacts to resources.	**Equivalent** • Low potential for direct and indirect impacts to resources.
Geology and Soil Resources	**Equivalent** • Exposure of people and/or property to seismic hazards and increased erosion of soils from wind and water. • No significant unavoidable impacts.	**Equivalent** • Exposure of people and/or property to seismic hazards and increased erosion of soils from wind and water. • No significant unavoidable impacts.	**Equivalent** • Exposure of people and/or property to seismic hazards and increased erosion of soils from wind and water. • No significant unavoidable impacts.
Lands and Realty	**Roughly equivalent** • Temporary impacts at roadway crossings. • Would traverse one private parcel designated by the County's General Plan as Open-Space Rural (OS-RUR) and zoned Natural Assets (N-A). • No agricultural land impacted. • No significant unavoidable impacts.	**Roughly equivalent** • Temporary impacts at roadway crossings. • Would cross SR 177, which is under the jurisdiction of Caltrans. • Would cross approximately 1.5 miles of private agricultural land. • Would permanently preclude cultivation of 185 acres of currently cultivated non-prime land that is not under Williamson Act Contract. • No significant unavoidable impacts.	**Roughly equivalent** • Temporary impacts at roadway crossings. • Majority of line not within a designated utility corridor. • No agricultural land impacted. • No significant unavoidable impacts.
Noise	**Less preferred** • Closest existing residence is 500 feet. Equivalent to GT-B-2 • No significant unavoidable impacts.	**Preferred** • No nearby residences • No significant unavoidable impacts.	**Less preferred** • Closest existing residence is 500 feet. Equivalent to GT-A-1. • No significant unavoidable impacts.
Public Health and Safety/ Hazardous Materials	**Equivalent** • All three alternatives are subject to the same safety and hazards issues. • No significant unavoidable impacts.	**Equivalent** • All three alternatives are subject to the same safety and hazards issues. • No significant unavoidable impacts.	**Equivalent** • All three alternatives are subject to the same safety and hazards issues. • No significant unavoidable impacts.
Recreation	**Equivalent** • No impact.	**Equivalent** • No impact.	**Equivalent** • No impact.

Table C-2 (continued)
Comparison of Action Alternatives: Gen-Tie Line

Environmental Discipline	GT-A-1 (Kaiser Rd to Desert Center, then east: 12.2 mi.)	GT-A-2 (SCE ROW to Substation A: 9.5 mi.)	GT-B-2 (Kaiser Rd to Desert Center, then west: 10 mi.)
Socioeconomics and Environmental Justice	**Equivalent** • Impacts would be the same for all alternatives. • No significant unavoidable impacts.	**Equivalent** • Impacts would be the same for all alternatives. • No significant unavoidable impacts.	**Equivalent** • Impacts would be the same for all alternatives. • No significant unavoidable impacts.
Special Designations	**Equivalent** • No impacts.	**Equivalent** • No impacts.	**Equivalent** • No impacts.
Transportation and Public Access	**Roughly equivalent** • Impacts to traffic closure and road deterioration would be similar among all alternatives. • No significant unavoidable impacts.	**Roughly equivalent** • Impacts to traffic closure and road deterioration would be similar among all alternatives, but GT-A-2's proximity to a former airport would require coordination with airport owners prior to construction. • No significant unavoidable impacts.	**Roughly equivalent** • Impacts to traffic closure and road deterioration would be similar among all alternatives. • No significant unavoidable impacts.

C.2.6 Comparison of Solar Farm Layout Alternatives

Table C-3 presents a comparison of the two solar farm layouts. Based on the comparison presented in Table C-3, Solar Farm Layout C would have the fewest short-term impacts to environmental resources overall, including the fewest significant and unavoidable impacts on cultural resources and air quality, and significant but mitigable impacts to special-status species. By more greatly contributing to California's Renewable Portfolio Standard goals, Solar Farm Layout B would have fewer long-term indirect environmental impacts through local reduction in habitat for special status plants and wildlife through increased temperatures and drought conditions and encroachment by invasive plants in the Mojave Desert, and global loss of habitat through desertification of non-desert ecosystems. These short-term and long-term environmental impacts are difficult to compare. Therefore, Solar Farm Layouts B and C are considered to be environmentally equal.

Table C-3
Comparison of Action Alternatives: Solar Farm Site

Environmental Discipline	Solar Farm Layout B (3,912 acres)	Solar Farm Layout C (3,045 acres)
Wildlife	**Less preferred** • Greater habitat impacts; impacts to low and moderate density occupied habitat. • Greater impacts to special-status species, including desert tortoise. • No significant unavoidable impacts.	**Preferred** • Fewer habitat impacts; would avoid most moderate density occupied habitat. • Fewer impacts to special-status species; would avoid the areas of high desert tortoise sign. • No significant unavoidable impacts.
Vegetation	**Less preferred** • Greater total acreage of impacts to vegetation. • No significant unavoidable impacts.	**Preferred** • Fewer acres with impacts to vegetation. • No significant unavoidable impacts.

Table C-3 (continued)
Comparison of Action Alternatives: Solar Farm Site

Environmental Discipline	Solar Farm Layout B (3,912 acres)	Solar Farm Layout C (3,045 acres)
Cultural Resources	**Less preferred** • Would directly impact more culturally sensitive sites. • Impacts would be significant and unavoidable.	**Preferred** • Would directly impact fewer culturally sensitive sites. • Impacts would be significant and unavoidable.
Visual Resources	**Roughly equivalent** • Marginally greater long-term impact on visual resources. • Impacts would be significant and unavoidable.	**Roughly equivalent** • Marginally smaller long-term impact on visual resources. • Impacts would be significant and unavoidable.
Water Resources	**Equivalent** • Marginally greater use of groundwater. • No depletion of groundwater supply in the basin. • No significant unavoidable impacts.	**Equivalent** • Marginally less use of groundwater. • No depletion of groundwater supply in the basin. • No significant unavoidable impacts.
Air Resources	**Less preferred** • More ground disturbance. Greater emissions from construction activity • Impacts would be significant and unavoidable.	**Preferred** • Less ground disturbance • Fewer emissions from construction activity • Impacts would be significant and unavoidable.
Climate Change	**Less Preferred** • Greater total construction phase greenhouse gas emissions because site is larger.	**Preferred** • Fewer construction phase greenhouse gas emissions because of smaller project site.
Paleontological Resources	**Equivalent** • Low potential for direct and indirect impacts to resources.	**Equivalent** • Low potential for direct and indirect impacts to resources.
Geology and Soil Resources	**Equivalent** • Exposure of people and/or property to seismic hazards and increased erosion of soils from wind and water. • No significant unavoidable impacts.	**Equivalent** • Exposure of people and/or property to seismic hazards and increased erosion of soils from wind and water. • No significant unavoidable impacts.
Lands and Realty	**Less preferred** • Portions of Kaiser Steel Road and two OHV routes would be closed. • A transmission line and FERC easement could require modification. • No significant unavoidable impacts.	**Preferred** • No road closures. • A FERC easement could require modification. • No significant unavoidable impacts.
Noise	**Equivalent** • Distance to closest existing residence is 1,175 acres. • No significant unavoidable impacts.	**Equivalent** • Distance to closest existing residence is 1,175 acres. • No significant unavoidable impacts.
Public Health and Safety/ Hazardous Materials	**Equivalent** • Both solar farm sites are subject to the same safety and hazards issues. • No significant unavoidable impacts.	**Equivalent** • Both solar farm sites are subject to the same safety and hazards issues. • No significant unavoidable impacts.
Recreation	**Less preferred** • Temporary closure of three OHV routes. • No significant unavoidable impacts.	**Preferred** • No OHV route closures.
Socioeconomics and Environmental Justice	**Equivalent** • Impacts would be the same for both alternatives. • No significant unavoidable impacts.	**Equivalent** • Impacts would be the same for both alternatives. • No significant unavoidable impacts.

Table C-3 (continued)
Comparison of Action Alternatives: Solar Farm Site

Environmental Discipline	Solar Farm Layout B (3,912 acres)	Solar Farm Layout C (3,045 acres)
Special Designations	**Less preferred** • Within two miles of the Joshua Tree Wilderness Area. • Fugitive dust from construction would create a temporary visual distraction for users of this wilderness. • No significant unavoidable impacts.	**Preferred** • Within two miles of the Joshua Tree Wilderness Area. • Fugitive dust from construction would create a temporary visual distraction for users of this wilderness. • Indirect impacts are marginally reduced due to the smaller footprint. • No significant unavoidable impacts.
Transportation and Public Access	**Equivalent** • Marginally more road closures and road deterioration due to more intensive construction. • Duration of construction would be equivalent. • No significant unavoidable impacts.	**Equivalent** • Marginally fewer road closures and marginally less road deterioration due to less intensive construction. • Duration of construction would be equivalent. • No significant unavoidable impacts.

C.2.7 Comparison of Environmentally Superior Action Alternative to No Project Alternative

Also as described in Chapter 2, three No Action alternatives were considered as follows:

- Alternative 4—No Issuance of a Right-of-Way Grant and No Land Use Plan Amendment (No Action);
- Alternative 5—No Issuance of a Right-of-Way Grant with Land Use Plan Amendment to Exclude Solar Energy Development on the Site (No Project with Plan Amendment); and
- Alternative 6—No Issuance of a Right-of-Way Grant with Land Use Plan Amendment to Allow Solar Development on the Site (No Project with Plan Amendment).

With Alternative 4, none of the project components (Solar Farm, Gen-Tie Line, and Substation) would be built. This alternative is equivalent to the No Project Alternative under CEQA. The No Project alternative (Alternative 4) would not amend the California Desert Conservation Act Land Use Plan to allow or disallow renewable energy projects in this area; therefore, future development of renewable energy in this area cannot be precluded under this alternative. In addition, because of California's mandate for energy utilities to procure 20 percent of their energy from renewable sources by the year 2010 (with legislation mandating 33 percent is currently pending as of the writing of this EIS), it is reasonable to assume that under the No Project alternative, other renewable energy projects would be developed in other locations in Riverside County and throughout the State to meet this mandate. The following paragraph compares the environmentally superior action alternative (Substation A with Access Road 2, Gen-Tie GT-A-2, and either Solar Farm B or C) to Alternative 4, the CEQA No Project Alternative.

The No Project alternative would avoid the direct impacts of developing the project site, including removal of desert tortoise habitat and special-status plants, significant and irretrievable impacts to cultural resource sites, significant short-term impacts on air quality, and significant long-term

impacts on visual resources. However, it is reasonable to expect that, under the No Project alternative, other renewable energy projects would be developed in other locations to meet California's Renewable Portfolio Standard. In addition, if BLM does not amend the California Desert Conservation Area Land Use Plan under the No Project Alternative, another renewable energy project could be approved on the site of the environmentally superior action alternative in the future to facilitate meeting California's Renewable Portfolio Standard, and such a project would likely have impacts similar to or equivalent to those of the environmentally superior action alternative. Impacts of these other potential projects could be more or less severe than the environmentally superior action alternative. Speculation on the severity and magnitude of impacts from these potential other projects is not required (CEQA Guidelines 15126.6 [f][3]). However, because the No Project alternative would likely result in development of other renewable energy projects in other locations, and because the No Project alternative would not preclude future development of a renewable energy project on the site of the environmentally superior action alternative, resulting in impacts similar to those of the environmentally superior action alternative, the CPUC believes that the environmentally superior action alternative, an alternative combining **Substation A with Access Road 2**, **Gen-Tie GT-A-2**, **and either Solar Farm Layout B or Layout C**, is environmentally superior to the No Project alternative.

C.3 CEQA ENVIRONMENTALLY SUPERIOR ALTERNATIVE

Based on the comparison presented in Table C-1 and the following discussion, the CPUC believes the environmentally superior Substation alternative is Substation A with Access Road 2. Based on the comparison presented in Table C-2 and the following discussion, the CPUC believes the environmentally superior Gen-Tie Line alternative is GT-A-2. Based on the comparison presented in Table C-3 and the following discussion, the CPUC considers the two Solar Farm Alternatives (B and C) to be environmentally equal.

Based on the discussion presented in Section C.2.7, the CEQA environmentally superior alternative is an alternative combining **Substation A with Access Road 2**, **Gen-Tie GT-A-2**, **and either Solar Farm Layout B or Layout C**.

Appendix D

Air Quality Analyses

APPENDIX D-1

OVERVIEW OF THE CONSTRUCTION EMISSIONS SPREADSHEET MODEL

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OVERVIEW OF THE CNSTEMIS MODEL

Emissions from construction and demolition activities have been estimated using a detailed spreadsheet model (CNSTEMIS). The CNSTEMIS spreadsheet model calculates criteria pollutant emissions, diesel particulate emissions, and greenhouse gas emissions from construction or demolition activities and equipment. Criteria pollutant emission estimates are provided for reactive organic compounds, nitrogen oxides, carbon monoxide, sulfur oxides, inhalable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). Particulate matter emissions from diesel engines contain known and suspected carcinogens, and consequently have been designated as a toxic air contaminant by the California Air Resources Board. Exhaust emissions of PM_{10} from construction and demolition equipment provide the estimate of diesel particulate matter emissions. Greenhouse gas emission estimates are provided for carbon dioxide, methane, and nitrous oxide. The overall global warming potential of greenhouse gas emissions also is calculated in terms of carbon dioxide equivalents.

The CNSTEMIS spreadsheet model uses a conventional approach to estimating emissions from construction equipment and activity. In a normal application, users:

- Divide the construction or demolition project into activity phases that have similar equipment requirements;
- Identify equipment types needed for each construction or demolition phase;
- Identify how many items of each type will be needed, the typical horsepower rating for the item, and the typical engine load factor;
- Identify the hours per day with active use for each equipment item;
- Identify the fraction of each use hour when the equipment will actually be operating;
- Identify the overall disturbed area size for each phase of construction or demolition activity;
- Identify the duration of each construction or demolition phase;
- Identify the typical area size that will be disturbed on a given day during each phase of construction or demolition activity;
- Identify typical fugitive dust emission rates for each phase of construction or demolition activity; and
- Identify which construction or demolition phases overlap with each other.

Version 11J of the CNSTEMIS model includes a database of 514 entries covering 114 basic equipment types. Entries for each equipment type are subdivided into engine size and fuel type categories that correlate with emission standards that have been adopted in recent years by the US Environmental Protection Agency (EPA) and the California Air Resources Board (CARB). In addition to equipment powered by conventional diesel, gasoline, and compressed gas (propane/CNG/LNG/LPG) engines, the database includes information for electric arc welders, oxy-fuel welders, oxy-fuel cutting torches, plasma cutting torches, stationary diesel engines, large equipment powered by diesel-electric or turbine engines, and stationary gas turbine generators. Database entries also address multi-engine equipment designs for scrapers, concrete pavers, concrete finisher-vibrators, and off-road haul trucks. Metal fume emissions have been incorporated into the PM_{10} emission rates for welders and cutting torches. Fugitive PM_{10} emissions have been incorporated into the emission rates for rock drills, jackhammers, pavement

breakers, pavement scarifiers, concrete/industrial saws, and abrasive blasting equipment. Default database entries are provided for the appropriate range of small, medium, and large engine sizes for each equipment type. The current database provides default data for 514 combinations of equipment type, engine size range, and fuel type. Default engine sizes are representative of current equipment models from several major manufacturers (Caterpillar, Komatsu, Terex, John Deer, Case, Bobcat, Gradall, GOMACO, LeeBoy, TSE, Vermeer, APE, Hercules, and others) as well as older equipment models that are still in use.

Greenhouse gas emission rates used in the CNSTEMIS model are based on Appendix C of the California Climate Action Registry (CCAR) 2007 general greenhouse gas emissions reporting protocol. Most of the greenhouse gas emission rates in the CCAR protocol document are based on equipment or vehicle fuel consumption rates. Equipment fuel consumption estimates used in the CNSTEMIS model are derived from horsepower-hour based fuel use data presented in documentation reports for the 2005 version of the EPA NONROAD model. The CNSTEMIS model computes the overall global warming potential of carbon dioxide, methane, and nitrous oxide emissions using carbon dioxide equivalence factors identified by the Intergovernmental Panel on Climate Change (IPCC). Users can select from the 1995, 2001, or 2007 IPCC equivalence factor data sets. The 2007 data set is the default selection.

The main calculation sheet of the CNSTEMIS model allows construction or demolition projects to be divided into four activity phases. Multiple CNSTEMIS workbooks can be used for projects involving more than four activity phases. Separate CNSTEMIS workbooks by calendar year are encouraged when construction or demolition activity will occur in more than one calendar year. The main calculation sheet provides for simple data entry by the user: lookup table codes for equipment types by engine size range and fuel type; number of items of each type by construction activity phase; and active hours per day for each equipment type by construction activity phase. Default equipment parameters (engine horsepower, average load factor, and typical use time within active hours) are automatically loaded into the calculation sheet. User can modify default equipment parameters under each activity phase. An optional calculation section is provided for computing cut and fill balances and associated bulldozer and scraper requirements if that information is not available from other sources.

CNSTEMIS users can select from three primary emission rate datasets: emission rates based on the original 1991 EPA non-road equipment database (useful only for estimates of emission rates in the absence of emission standards); emission rates adjusted for California and EPA emission standards and fuel sulfur limits (for projects in California); or emission rates adjusted for EPA emission standards and fuel sulfur limits (for projects in states other than California). When the user specifies the construction activity year, the equipment database sheet calculates appropriate average emission rates for the mix of older and newer equipment models of each equipment entry, recognizing the fleet replacement period for each equipment type and the implementation years for relevant California or EPA emission standards and fuel sulfur limits. Equipment entries are assigned fleet replacement times of 10, 15, 20, 25, or 30 years. Users can modify the fleet replacement times in the database if desired.

In addition to equipment engine emissions, CNSTEMIS calculates emissions from several other construction-related sources:

- fugitive dust emissions from general construction and demolition site disturbance;
- fugitive dust from mechanical or explosive building demolition;
- fugitive dust from construction blasting;
- volatile organic compound emissions from the curing of asphalt pavement;
- volatile organic compound emissions from paints and surface coatings; and
- PM_{10} aerosol emissions from spray painting activities.

In addition to accounting for active dust control program effects, version 11J of the CNSTEMIS model allows emission calculations for fugitive dust from site disturbance to account for the seasonal frequency of precipitation events, frozen ground conditions, and snow cover. Fugitive dust emission estimates also can be adjusted to reflect the seasonal effects of persistently high soil moisture conditions from shallow perched water tables, seeps, or other natural factors. Natural dust control factors are applied to the residual fugitive dust generated after accounting for active dust control program effects.

The fugitive dust database sheet in the model provides a range of default fugitive dust generation rates for construction activity and building demolition, information on the PM_{10} and $PM_{2.5}$ content of soils according to soil texture class, information on water application rates for fugitive dust control, a calculator to estimate the required number of water trucks, and a calculator to estimate fugitive PM_{10} and $PM_{2.5}$ emissions from construction blasting. The fugitive volatile organic compound (VOC) database sheet includes a database of 49 categories of paints and coatings; a database of federal, state, and California air pollution control district limits for the VOC content of architectural coatings; and a calculator to generate project-specific fugitive VOC emission rates for up to four categories of coatings (e.g., exterior paints, interior paints, roof coatings, and floor coatings). The VOC emission rates account for the number and thickness of applied paint coats, which can include up to three coating types (for example, primers, main coats, and top coats) in each coating category. Internal calculations convert the coating thickness to a coating coverage value (square feet per gallon), which can be compared to a table of default coverage values for various types of coatings.

A building construction data worksheet allows users to calculate the square footage of exterior and interior wall areas, floor areas, ceiling areas, and roof areas for each building or group of buildings in a project. Building component square footage values account for building footprint area, building height, number of stories, and building shape (length to width ratio). Building component square footage data is useful for estimating the quantity of paint or architectural coatings required for individual buildings in a project. The building construction data worksheet also provides a convenient location to compute the acreage of project-related roadways, parking lots, or other features, or to develop a time schedule of project phases. The demolition debris sheet in CNSTEMIS allows users to estimate demolition debris volumes, tonnages, and debris haul truck loads when independent estimates are not available. Additional database sheets in the model provide information on typical material densities and typical heavy equipment work rates. A detailed unit conversion factor database sheet and a particle size unit conversion sheet also are included in the model.

The summary sheet in the CNSTEMIS model provides a comprehensive data summary for each phase of construction activity: disturbed acreages; total equipment item numbers; total

equipment use hours; total equipment fuel use; off-site truck trips; construction worker commute trips; assumptions used for fugitive emissions calculations; and annual, quarterly, and daily summaries of criteria pollutant emissions, diesel particulate matter emissions, and greenhouse gas emissions. The summary sheet also provides a detailed tabulation of equipment items by activity phase, including the assumed horsepower, load factor, operating time factor, number of items, active hours per day, hourly fuel use rate, criteria pollutant emission rates, and greenhouse gas pollutant emission rates for each item type. A construction phase overlap calculator in the summary sheet identifies the extent of overlap among work phases by calendar quarter, allowing calculation of maximum day and maximum calendar quarter emissions. The construction phase overlap calculator allows the user to specify the number of work days by calendar quarter (with allowances for major holidays; the average default values are 64 days for a 5-day work week schedule, 77 days for a 6-day work week schedule, and 89 days for a 7-day work week schedule.

The $PM_{2.5}$ emission estimates provided by the CNSTEMIS model are extrapolated from the PM_{10} emission estimates using separate $PM_{2.5}$ fractions for engine exhaust, fugitive dust, and spray painting, with the option of setting $PM_{2.5}$ fractions separately for each of these categories by construction phase. Default $PM_{2.5}$ fractions for engine exhaust and spray painting are based on the California Air Resources Board CEIDARS (California Emission Inventory Data and Reporting System) database. The default fugitive dust $PM_{2.5}$ fraction can be based on soil texture class using the fugitive dust database sheet in the model, or a more generic fraction from the CEIDARS database can be used. Users can substitute alternative $PM_{2.5}$ fractions for any of the default values.

A data entry notes sheet in the CNSTEMIS workbook provides users with detailed instructions and cell-by-cell discussions of data entry areas in the key worksheets of the model. Supplemental instructions and notes are provided in the individual worksheets throughout the workbook.

COMPARISON OF CNSTEMIS AND THE URBEMIS CONSTRUCTION MODULE

The CNSTEMIS model had its origins as a simple Lotus 1-2-3 spreadsheet model developed in the mid 1980s using emission rate data from AP-42 (EPA 1985a, 1985b). Data from the EPA Nonroad Engine and Vehicle Emissions Study (EPA 1991) was incorporated into the spreadsheet in the early 1990s, and the model was subsequently converted to an Excel spreadsheet format. Early versions of the CNSTEMIS model were developed before construction and demolition emissions were included in the URBEMIS model, which was originally developed to estimate emissions from highway traffic associated with the operational phase of urban development projects. Modules addressing construction activities and various other emission sources are more recent additions to URBEMIS.

The CNSTEMIS model and the URBEMIS model are designed for different user audiences. The CNSTEMIS model has been developed to provide flexible calculation of project-specific emissions from any type of construction or demolition activity, with applicability to any US location, not just California. All features of the CNSTEMIS model can be modified by the user if necessary. In contrast, the URBEMIS model is designed for users with limited air quality analysis experience. Consequently, the construction module of URBEMIS model is designed to use simple default values, and is structured to evaluate common residential, commercial, office, and industrial development projects. While recent versions have improved flexibility for use by those with more extensive air quality analysis experience, the design of the URBEMIS model has never emphasized flexibility for detailed project-specific analyses of complex or unusual projects. The equipment database in URBEMIS is much smaller than that in CNSTEMIS, and is limited to diesel engine equipment. The construction equipment database in URBEMIS limits the potential for comprehensive analyses. In addition, several components of the construction module in URBEMIS use fixed coding that prevents user substitution of project-specific data. Similarities and differences between version 11J of the CNSTEMIS model and the construction activity module in URBEMIS2007 are noted in the table below.

Summary Comparison of Construction Emissions Analyses in the CNSTEMIS Model and URBEMIS2007

Component	CNSTEMIS-11J	URBEMIS2007
Source of uncontrolled equipment emission rates.	EPA 1991 nonroad engine and vehicle emissions study	CARB database
Incorporates emission and fuel sulfur standards for California locations.	Yes	Yes
Incorporates EPA emission and fuel sulfur standards for non-California locations.	Yes	No
Size of equipment database (equipment types and fuel type/engine size entries).	114 equipment types, 514 total entries. Users select from the 514 individual entries.	36 equipment types, 212 total entries (hidden from users). Users select only from the 36

Component	CNSTEMIS-11J	URBEMIS2007
		equipment types.
Engine/Fuel types in database.	Diesel, 2-Stroke Gasoline, 4-Stroke Gasoline, Compressed Gas, Diesel-Electric, Turbine-Electric, Gas Turbine	Diesel only
Database includes multi-engine equipment types.	Yes (scrapers, concrete pavers, concrete finisher-vibrators, off-road haul trucks)	No
Database includes specialized road construction equipment types.	Yes (cold planers, soil stabilizers, asphalt road reclaimers, roadbed trimmers, placer/spreaders, asphalt pavers, concrete pavers, concrete texture/curing machines, pavement scarifiers)	No. Only generic database entries for pavers, paving equipment, and surfacing equipment with no explanation of differences among these equipment categories.
Database includes agricultural and forestry equipment sometimes needed for land clearing.	Yes	No
Database includes hand-operated equipment.	Yes, numerous equipment types	Limited; only a few types
Program allows user expansion of equipment database.	Yes	No. Three generic "other equipment" entries provided in the database. Users can change equipment entry names, but cannot add new entries, change program defaults, or change emission rate data.
Program provides default equipment types and number of items by construction phase.	No. Users select expected equipment by phase from the database, with number of items for each type entered separately.	Yes. Default equipment types provided according to pre-defined construction phases. Default lists tend to be short, but vary somewhat by project size. Number of items based on overall project acreage. Users can modify default equipment lists.
Program provides default engine horsepower.	Yes. Defaults by relative size category for each equipment type. Users select equipment entries from multiple HP ranges, most tagged with general descriptions of size	Yes. Program default is statewide average engine size for equipment type. Users can override with alternative HP value, but program does not provide additional information

Component	CNSTEMIS-11J	URBEMIS2007
	categories (mini, small, medium, large, giant, etc.).	on equipment type HP ranges.
Program provides default load factor.	Yes, based mostly on EPA data	Yes, based on CARB OFFROAD model
Users can modify default horsepower value and load factor.	Yes	Yes
Program provides default equipment use hours per day.	No. Users specify active hours per day for each equipment entry in each construction phase.	Yes, with minor variations by construction phase and total project acreage. Users can modify default values.
Explicit consideration of percent operating time during active hours.	Yes, with user-modifiable defaults provided for each database entry.	No. Program calculates emissions assuming 100% operation time in each active hour.
Equipment fleet replacement cycle periods.	User-modifiable defaults of 10, 15, 20, 25, or 30 years assigned in the equipment database.	Based on the CARB OFFROAD model, but not further identified in URBEMIS2007 documentation. Other sources indicate the CARB OFFROAD model uses 2 to 32 years for different equipment types. No user modification option.
Equipment replacement rates can vary within an equipment type according to engine size.	Yes. User-modifiable default values identified in the equipment database.	CARB OFFROAD model data, but not further identified in URBEMIS2007 documentation. Other sources indicate the CARB OFFROAD model varies replacement period for small engine sizes in some equipment types. No user modification option.
Fugitive PM_{10} emissions included for rock drills, jackhammers, pavement breakers, pavement scarifiers, concrete saws, and abrasive blasting equipment.	Yes	No. Database includes concrete saws but does not include rock drills, jackhammers, pavement breakers, pavement scarifiers, or abrasive blasting equipment.
Fugitive metal fume emissions included for cutting torches and welders.	Yes	No. Database includes electric welders but does not include cutting torches.

Component	CNSTEMIS-11J	URBEMIS2007
Fugitive NOx emissions included for plasma cutting torches.	Yes	No. Database does not include cutting torches.
Includes calculation of both PM_{10} and $PM_{2.5}$ emissions.	Yes	Yes
Includes calculation of diesel particulate matter emissions.	Yes (equipment exhaust PM_{10})	Yes (equipment exhaust PM_{10})
Direct calculation of greenhouse gas emissions.	CO_2, CH_4, and N_2O, with 9 fuel type distinctions (California diesel, non-California diesel, biodiesel, gasoline, dual fuel, propane, CNG, LNG, and LPG). Choice of IPCC data sets for calculating CO_2 equivalents.	CO_2 only, diesel fuel only
Time frames for emissions summaries	Daily, Calendar Quarter, and Annual	Daily and Annual only
Calendar Year limits.	None	2005 through 2040 only
Flexibility for defining work phases.	Complete flexibility, no pre-defined phases. Basic workbook accommodates 4 phases. Multiple workbooks can be used to accommodate more than 4 phases. Example building construction, building demolition, and road construction phases provided in user instructions.	Users must select from 7 pre-defined phase types (demolition, mass grading, fine grading, trenching, building construction, asphalt paving, and architectural coating). User can duplicate and rename pre-defined phase types to accommodate a larger number of phases as long as duplicated phases have different start or end dates.
Ease of defining work phases for highway, bridge, airport, pipeline, or other less common types of construction or demolition projects.	Complete flexibility to define phases according to project characteristics. Basic workbook accommodates 4 phases. Multiple workbooks can be used to accommodate more than 4 phases.	Somewhat cumbersome procedure. Requires users to select and re-name pre-defined construction phases, modify default equipment lists, and modify other phase-based default data such as truck activity.
Flexible treatment of work phase overlaps.	Yes. Users specify which if any phases overlap within each calendar quarter.	Yes. Users specify start and end dates for each phase. For phases with intermittent activity, users must duplicate the phase and enter start and end dates for each intermittent activity period.

Component	CNSTEMIS-11J	URBEMIS2007
Options for specifying work days per week.	Yes. Users specify available work days by calendar quarter, with defaults provided for 5-day, 6-day, and 7-day work weeks (with allowances for major holidays). Users are not limited to fixed work-week lengths.	Yes, with choice of 3-day, 4-day, 5-day, 6-day, or 7-day work weeks.
Fugitive dust emissions from site disturbance included in all construction phases.	Yes	No. Only included for mass grading and fine grading phases.
Fugitive dust emission rates can be varied by phase to reflect the phase-specific extent of site disturbance.	Yes. Typically set as a percent of EPA or CARB default TSP rates, with PM_{10} and $PM_{2.5}$ fractions set separately (normally based on soil texture class).	No. Default values only, and only for mass grading and fine grading phases. Choice of 4 methods to calculate fugitive dust emission factors based on available construction details.
Database for identifying PM_{10} and $PM_{2.5}$ fractions of fugitive dust based on soil texture class.	Yes	No
Fugitive dust control factors can be varied by phase.	Yes. Guidance provided.	Limited. Users can apply items on a default list of mitigation measures only for mass grading and fine grading phases
Optional adjustment of fugitive dust from soil disturbance based on natural conditions (seasonal frequency of precipitation, frozen ground, snow cover, or naturally high soil moisture levels).	Yes. All optional factors applied to calendar quarter and annual fugitive dust emissions. Daily fugitive dust emissions typically adjusted only for naturally high soil moisture levels.	No
Includes fugitive dust from mechanical building demolition.	Yes. Separate user-modifiable defaults for masonry/stone versus wood facade types. Optional separation of fugitive dust generation between building knockdown and debris removal phases.	Yes. Fixed default for all building types.
Includes fugitive dust from explosive building demolition.	Yes. User-modifiable default, with optional separation of fugitive dust generation between building implosion	No

Component	CNSTEMIS-11J	URBEMIS2007
	and debris removal phases.	
Includes option for specifying dust control during mechanical or explosive building demolition.	Yes. Suggested control factors by type of control.	No
Calculation of demolition debris quantities.	Optional worksheet for direct calculation of debris volume, debris tonnage, and truck loads based on building size and shape, extent of interior walls, extent of debris grinding, truck capacity, etc. Also default suggestions based on building type for quick analysis.	Default calculation of truck loads from building volume and truck capacity. No debris tonnage estimates.
Includes fugitive dust from construction blasting.	Yes. User-modifiable default.	No
Includes option for specifying dust control during construction blasting.	Yes. Suggested control factors by type of control.	No
Calculation of painted surface areas.	Optional worksheet for direct calculation from building size and shape, extent of interior walls, extent of non-painted exterior area, etc. Also default tables for quick analysis.	Default calculation based on square footage of nonresidential buildings and number of residential units. Fixed default building square footage values for residential land uses. No option for user input of actual residential building sizes.
Flexibility of architectural coating emission calculations.	Optional worksheet for up to 4 surface coating categories at a time, each category allowing multiple coats of up to 3 different coatings with user-specified wet coating thickness (with resulting coverage factor shown).	Default calculations only. A fixed paint coverage factor and 2 fixed coating categories (exterior and interior) for each land use type, with mitigation option of specifying % reduction from use of low VOC coatings. No option for user-specified coating types or VOC content.
Accuracy of architectural coating emission calculations.	Proper calculation converting regulatory VOC content into actual volumetric VOC content. Internal database of properties for 49 coating types. Users can substitute	Incorrect calculation methodology, treating regulatory VOC content as actual volumetric VOC content. No provision for user correction. Internal database

Component	CNSTEMIS-11J	URBEMIS2007
	product-specific data. Internal database of regulatory VOC limits for EPA, CARB, and California APCDs.	of regulatory VOC limits for California APCDs.
Includes PM_{10} emissions from spray painting.	Yes. EPA default in fugitive ROG database.	No
Includes fugitive VOC emissions from the curing of asphalt pavement.	Yes. User-modifiable CARB default.	Yes. Fixed CARB default.
Direct calculation of emissions from on-site heavy truck activity.	Yes. 13 heavy truck types included in the equipment database.	Not in default setups. Users must add truck items to the default equipment list (using one of three truck types or "other equipment" database entries), and then modify as necessary the URBEMIS default use hours, HP ratings, and load factors.
Direct calculation of emissions from on-site light/medium duty vehicle activity (ATVs, pickups, vans, SUVs, etc.).	Utility ATVs (all terrain vehicles) included in database. No light/medium duty highway vehicles in database. Users should calculate light/medium duty highway vehicle emissions separately using URBEMIS2007 operational analysis or EMFAC2007 for projects in California and MOBILE6.2 for projects in other states.	No. No ATVs in database. Users should calculate light/medium duty highway vehicle emissions separately using URBEMIS2007 operational analysis procedures.
Direct calculation of emissions from construction worker commute vehicle traffic.	No. Users should calculate separately using URBEMIS2007 operational analysis or EMFAC2007 for projects in California and MOBILE6.2 for projects in other states. CNSTEMIS computes a direct estimate of worker commute trips by project phase.	Yes, for each construction phase. URBEMIS generates default trip data and vehicle type mix. Users can modify trip rate but not trip distance or vehicle mix. Fixed vehicle type mix (50% autos, 50% light trucks) seems to underestimate typical light and medium truck fractions for construction worker vehicles.
Direct calculation of emissions from off-site truck traffic.	No. Users should calculate separately using URBEMIS2007 operational analysis or EMFAC2007 for	Yes, for Demolition, Grading, Building Construction, and Asphalt Paving phases only. Users can specify truck

Component	CNSTEMIS-11J	URBEMIS2007
	projects in California and MOBILE6.2 for projects in other states. CNSTEMIS computes a direct estimate of off-site truck trips by project phase.	capacity and round trip mileage for soil hauling in the grading phases only. For other phases, URBEMIS generates fixed values for trip data and truck mixes.

The following tables list the equipment types included in the URBEMIS2007 and the CNSTEMIS-11J models.

EQUIPMENT TYPES INCLUDED IN THE URBEMIS2007 MODEL

Rubber Tired Dozers	Rubber Tired Loaders	Crawler Tractors
Tractors/Loaders/Backhoes	Skid Steer Loaders	Trenchers
Excavators	Scrapers	Motor Graders
Rollers	Cranes	Dumper/Tenders
Bore-Drill Rigs	Off-Highway Trucks	Water Trucks
Off-Highway Tractors	Sweepers/Scrubbers	Forklifts
Rough Terrain Forklifts	Aerial Lifts	Cement and Mortar Mixers
Pavers	Paving Equipment	Surfacing Equipment
Plate Compactors	Crushing/Processing Equipment	Concrete/Industrial Saws
Generator Sets	Air Compressors	Pumps
Signal Boards	Welders	Pressure Washers
Other Construction Equipment	Other General Industrial Equipment	Other Material Handling Equipment

EQUIPMENT TYPES INCLUDED IN THE CNSTEMIS-11J MODEL

Wheeled Dozer	Tracked Dozer	Wheeled Tractor
Tracked Tractor	Wheeled Loader	Tracked Loader
Backhoe-Loader	Wheeled Skid-Steer Loader	Tracked Multi-Terrain Loader
Trencher	Continuous Excavator	Tracked Shovel Excavator
Wheeled Shovel Excavator	Mining Shovel	Cable Excavator/Stripping Shovel
Clamshell/Dragline Excavator	Scraper	Motor Grader
Standard Roller/Compactor	Vibratory Roller/Compactor	Mobile Crane
Stationary (Derrick) Crane	Side-Boom Tractor	Tracked Wrecking Ball
Tracked Material Handler	Wheeled Material Handler	Tracked Carrier/Dumper

Wheeled Carrier/Dumper	Wheeled Pavement Breaker	Tracked Pavement Breaker
Excavator-Mounted Auger	Truck-Mounted Auger	Excavator-Mounted Pile Driver
Utility All Terrain Vehicles	Wheeled Cable Plow	Tracked Cable Plow
Directional Bore/Drill Rig	Dump Truck	Articulated Dump Truck
Off-Road Hauler	Equipment Transporter	Flatbed Truck
Cement Mixer Truck	Heavy Truck (mixed types)	Off-Highway Truck-Tractor Unit
Water Truck	Fuel Truck	Other Specialty Trucks
Street Sweeper	Standard Forklift	Rough Terrain Forklift
Extended Reach Forklift	Aerial Lift	Line Puller
Concrete Pump	Portable Cement/Mortar Mixer	Roofing Equipment
Roadbed Trimmer	Soil Stabilizer	Cold Planer/Pavement Profiler
Placer/Spreader	Asphalt Road Reclaimer	Asphalt Paver
Concrete Paver	Concrete Texture/Curing Machine	Concrete Finisher/Vibrator
Pavement Scarifier	Motorized Line Painter	Tampers & Rammers
Plate Compactor	Rock Drill Rig	Standard Pile Drivers
Jackhammer & Compressor	Concrete/Industrial Saws	Crushing/Grinding Equipment
Screening/Sorting Equipment	Generator Set < 600 hp	Air Compressors < 600 hp
Pumps < 600 hp	Light Set	Signal Board
Other Portable IC Engine Equipment	Stationary IC Engines < 600 hp	Stationary IC Engines 600+ hp
Gas Turbine Generator	Electric Arc Welder	Oxy-Fuel Welder
Plasma Cutting Torch	Oxy-Fuel Cutting Torch	Pressure Washer
Abrasive Blasting	Fans and Blowers	Post Hole Auger
Conveyor Equipment	Stackers	Stockpile Reclaimers
Chippers & Stump Grinders	Weed Trimmers and Cutters	Chain Saws
Agricultural Shredders	Agricultural Mowers	Rear Engine Riding Mowers
Tracked Brush Cutters	Wheeled Brush Cutters	Land Clearing Machine
Forestry Feller-Bunchers	Log Skidders	Forestry Forwarders
Knuckleboom Loaders	Timber Handler/Forestry Machine	Diesel-Electric Wheeled Loaders
Diesel-Electric Mining Shovels	Diesel-Electric Off-Road Haulers	Turbine-Electric Off-Road Haulers

Comparisons of diesel equipment emission rates generated by the CNSTEMIS model and URBEMIS2007 show that the CNSTEMIS model typically generates somewhat higher emission rates (grams per horsepower-hour) than does the URBEMIS2007 model. The differences are most likely due to the differences in uncontrolled emission rates (EPA database in CNSTEMIS) and differences in equipment fleet replacement times (generally longer in CNSTEMIS).

Differences in overall construction activity emission estimates between CNSTEMIS and URBEMIS are more difficult to predict. The CNSTEMIS database includes many types of

equipment not covered by the URBEMIS database. The CNSTEMIS database includes equipment using gasoline and compressed gas fuels while the URBEMIS database is limited to diesel-fueled equipment. The larger database allows CNSTEIMS analyses to account for more types of equipment than can be addressed by URBEMIS. In general, URBEMIS uses only a short list of default equipment types for each construction phase, and the default equipment lists do not include many items commonly seen at construction sites (tracked dozers, wheeled loaders, heavy trucks, trenchers, skid steer loaders, aerial lifts, air compressors, etc.). On the other hand, URBEMIS tends to assume relatively high default use hours for most equipment types, with no adjustment for the fact that most items do not operate continuously, even in active hours. The CNSTEMIS model explicitly addresses this issue through an operating time factor (percent operating time during active use hours). CNSTEMIS users select equipment items by engine size range, rather than relying on statewide average engine size defaults as in URBEMIS. In many cases, the URBEMIS statewide average horsepower rating is higher than the midpoint of the size range distribution for an equipment type. Overall, the CNSTEMIS model allows for a more comprehensive and refined analysis of construction emissions than can be provided by the URBEMIS model.

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APPENDIX D-2

ADDITIONAL CONSTRUCTION EMISSIONS ANALYSIS INFORMATION

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CONSTRUCTION INFORMATION FOR THE PROPOSED PROJECT AND ALTERNATIVES

The proposed project includes three major facility components: the Solar Farm, the Gen-Tie Line, and the Red Bluff Substation. Appendix D-1 provides an overview of the CNSTEMIS spreadsheet model used for analysis of on-site construction emissions. Separate CNSTEMIS analyses have been prepared for each alternative of each component. For each facility component, individual CNSTEMIS spreadsheets have been prepared for each calendar year that would have construction activity. Multiple CNSTEMIS spreadsheets were created for a calendar year when there would be more than four construction activity phases during the year. Analyses of the seven alternative facility components required a total of 35 separate CNSTEMIS spreadsheets. The combinations of Solar Farm, Gen Tie Line, and Red Bluff Substation site for each of the three alternatives are listed below.

Alternative 1

- Solar Farm Layout B
- Gen-Tie Line Alignment A-1
- Red Bluff Substation Site A

Alternative 2

- Solar Farm Layout B
- Gen-Tie Line Alignment B-2
- Red Bluff Substation Site B

Alternative 3

- Solar Farm Layout C
- Gen-Tie Line Alignment A-2
- Red Bluff Substation Site A

Solar Farm development would occur over a 26-month period, with construction activity undertaken as a rolling sequence of activity on different subareas of the site. Construction would generally progress as incremental work areas from the south end to the north end of the project site. Tortoise exclusion fencing of the entire site would be the initial phase of activity, followed by threatened species removals and relocations. Temporary construction offices, sanitary facilities, and water supply facilities would be established prior to initiating subarea construction activities. Incremental construction of access roads and staging areas would generally lead the main construction activity sequence, followed by site clearing and grading, which would be followed by various facility construction activity stages. The overall construction process was analyzed in terms of the following 18 construction phases:

- Tortoise exclusion fencing;
- Access roads and staging areas;
- Temporary construction offices, water supply, and sanitary facilities;
- Security fencing and west side debris and drainage basins;

- Vegetation (site) clearing;
- Site grading;
- Installation of array support posts;
- Trenching and underground power cable installation;
- Soil compacting and dust palliative application;
- Installation of on-site power poles;
- Installation of on-site switchgear;
- Construction of the On-site Substation;
- Solar array assembly;
- Installation of on-site overhead power lines;
- Construction of permanent buildings;
- Functional testing;
- De-compaction of areas between solar arrays and dust palliative application; and
- Site cleanup.

Construction activity generally would occur over a standard five-day workweek with activity limited to daytime hours. For safety reasons, some electrical connection activity would typically occur at night when the solar panels are not energized, but this activity would not require any significant heavy equipment operations. For analysis purposes, it was assumed that construction activity would be initiated on about 11 acres per day (55.2 acres per week) for Solar Farm Layout B and on about 8 acres per day (39.8 acres per week) for Solar Farm Layout C.

Construction of the Gen-Tie Line would occur over an 8-month period beginning in January 2011, but the Gen-Tie Line would not be energized until late 2012 or later, depending on completion of the Red Bluff Substation. Final cleanup of the construction corridor would occur after the Gen-Tie Line is energized. The overall construction process was analyzed in terms of the following six construction phases:

- Site preparation;
- Tower foundations;
- Tower assembly and erection;
- Power line stringing;
- Testing; and
- Site cleanup.

Construction activity generally would occur over a standard five-day workweek with activity limited to daytime hours. Construction activity would progress in a linear fashion along the transmission corridor. In general, only a few acres would be actively disturbed at any one time

during construction, with about five acres per day being disturbed during site preparation. The site preparation and tower foundation construction phases would overlap, but all other construction phases would occur sequentially. Normal dust control practices would be followed during construction.

The alternative Gen Tie Line routes would be of different lengths and would require somewhat different amounts of construction materials. Gen Tie Line A-1 would be about 12.2 miles long with 73 towers. Approximately 77 acres of the 233-acre transmission line corridor would be disturbed by construction activity. Gen Tie Line B-2 would be about 10 miles long, with 58 towers. Approximately 62 acres of the 189-acre transmission line corridor would be disturbed by construction. Gen Tie Line A-2 would be about 9.5 miles long with 55 towers. Approximately 62 acres of the 185-acre transmission line corridor would be disturbed by construction.

Construction of the Red Bluff Substation would occur over a 26-month period beginning in April 2011. Construction activity would include construction of the separate telecommunications site. Because the telecommunication site is so small, construction activity at that site has been included in the analysis of the main Substation site. The overall construction process was analyzed in terms of the following 11 construction phases:

- Access road construction
- Site fencing
- Site clearing
- Site grading and compaction
- Trenching and foundations
- Equipment pads
- Equipment installation
- Power line connections
- Testing
- Driveways, other paving, and security wall
- Site cleanup

At the time that emissions analyses were performed, the two Red Bluff Substation alternatives were each assumed to require 90 acres for the substation proper, 0.22 acres for the telecommunications site along Highway 177, plus additional land area for access roads, transmission line connections, drainage improvements (30 acres for Substation Site A and 20 acres for Substation Site b), and temporary construction staging areas. Current plans for the Red Bluff Substation have reduced the acreage requirement for the substation proper to 75 acres, reduced the area required for drainage improvements (20 acres for Substation Site A and 11 acres for Substation Site B), and have increased the area required for access roads and associated drainage improvements. The revisions to the Red Bluff Substation design were received too late to allow revisions of the CNSTEMIS analyses for the substation and associated facilities.

Emissions summaries from the CNSTEMIS analyses have been presented in Sections 4.2 and 4.5 of the EIS, and are not repeated here. The material that follows provides tabular summaries of additional information supporting the emission estimates presented in the EIS. This additional information is organized into groups of tables identifying:

- Construction schedules by activity phase;
- Equipment use by activity phase;
- Construction-related vehicle trips per day by activity phase; and
- Fugitive emissions parameters by activity phase.

SOLAR FARM CONSTRUCTION, LAYOUT B (ALTERNATIVES 1 AND 2)

Table D2-1.
Schedule For Solar Farm Layout B Construction

Activity Phase	Activity Duration, days	Work Days By Calendar Quarter			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4
2011 Activity					
Exclusion Fencing	98	61	37	0	0
Roads and Staging Areas	89	44	15	15	15
Construction Offices	43	0	43	0	0
Security Fencing	148	0	42	64	42
Site Clearing	161	0	42	64	55
Site Grading	161	0	37	64	60
Array Support Posts	141	0	21	64	56
Trenching and Cables	141	0	16	64	61
Soil Compacting	141	0	21	64	56
On-Site Power Poles	49	0	7	21	21
Switchgear Facilities	140	0	16	64	60
On-Site Substation	43	0	21	22	0
Solar Array Assembly	141	0	21	64	56
On-Site Power Lines	49	0	7	21	21
Net Construction Days	**250**	**61**	**64**	**64**	**61**
2012 Activity					
Roads and Staging Areas	30	15	15	0	0
Site Clearing	181	61	64	56	0
Site Grading	181	56	64	61	0
Array Support Posts	201	51	64	64	22
Trenching and Cables	201	46	64	64	27
Soil Compacting	221	61	64	64	32
On-Site Power Poles	70	21	21	21	7
Switchgear Facilities	220	61	64	64	31
Solar Array Assembly	221	61	64	64	32
On-Site Power Lines	77	21	21	21	14
Permanent Buildings	54	54	0	0	0
Functional Testing	200	21	64	64	64
Net Construction Days	**253**	**61**	**64**	**64**	**64**
2013 Activity					
Functional Testing	21	21	0	0	0
Soil De-Compacting	21	21	0	0	0
Site Cleanup	21	21	0	0	0
Net Construction Days	**34**	**34**	**0**	**0**	**0**

Available Work Days Per Quarter	**61**	**64**	**64**	**64**

Table D2-2.
Equipment Use For Solar Farm Layout B Construction

Activity Phase	Acres Disturbed	On-Site Equipment Items	Total Items Including Off-Site Trucks	Equipment Use Hours At Site	On-Site Fuel Use, Gallons
2011 Activity					
Exclusion Fencing	36.2	7	16	1,492	4,087
Roads and Staging Areas	42.6	23	41	5,663	32,632
Construction Offices	9.7	11	25	2,763	6,757
Security Fencing	83.7	9	20	2,888	8,310
Site Clearing	1,766.4	18	30	10,635	36,703
Site Grading	1,766.4	27	47	19,385	169,124
Array Support Posts	1,545.6	26	47	13,174	36,006
Trenching and Cables	772.8	11	20	5,663	24,240
Soil Compacting	1,545.6	13	22	6,360	71,771
On-Site Power Poles	7.2	8	15	569	1,883
Switchgear Facilities	6.7	11	19	2,401	9,289
On-Site Substation	14.4	29	70	2,049	7,690
Solar Array Assembly	1,545.6	78	133	41,521	63,538
On-Site Power Lines	7.2	13	20	2,313	9,073
2011 Totals	**1,938.6**	**284**	**525**	**116,876**	**481,102**
2012 Activity					
Roads and Staging Areas	29.4	23	38	1,815	10,497
Site Clearing	1,987.2	18	30	11,868	40,451
Site Grading	1,987.2	27	47	21,792	190,109
Array Support Posts	2,208.0	27	48	19,041	54,991
Trenching and Cables	1,104.0	11	20	7,594	32,684
Soil Compacting	2,428.8	13	22	9,967	112,454
On-Site Power Poles	10.3	8	15	812	2,674
Switchgear Facilities	9.5	11	18	3,740	14,261
Solar Array Assembly	2,428.8	78	132	65,055	98,667
On-Site Power Lines	11.4	13	20	3,634	14,249
Permanent Buildings	2.9	15	34	1,032	3,082
Functional Testing	1.0	33	37	43,563	14,903
2012 Totals	**2,470.6**	**277**	**461**	**189,914**	**589,023**
2013 Activity					
Functional Testing	1.0	31	33	4,465	1,405
Soil De-Compacting	1,534.9	16	32	1,115	6,217
Site Cleanup	250.0	7	13	284	1,263

2013 Totals	**1,784.9**	**54**	**78**	**5,864**	**8,885**

Table D2-3.
Traffic Generation For Solar Farm Layout B Construction

Activity Phase	**Total Workers**	**Daily Average 1-Way Vehicle Trips**			
		To/From Shuttle Assembly Points	**Shuttle Trips To/From Site**	**Personal Vehicle Trips To/From Site**	**Construction Truck Trips To/From Site**
2011 Activity					
Exclusion Fencing	29	42	4	5	0.2
Roads and Staging Areas	31	44	4	6	0.6
Construction Offices	30	43	4	5	3.5
Security Fencing	30	43	4	5	5.4
Site Clearing	38	54	5	6	2.3
Site Grading	37	53	5	6	0.8
Array Support Posts	46	66	6	8	8.1
Trenching and Cables	21	30	3	4	1.2
Soil Compacting	21	30	3	3	0.4
On-Site Power Poles	18	26	2	3	0.4
Switchgear Facilities	24	34	3	4	2.8
On-Site Substation	46	66	6	8	9.9
Solar Array Assembly	175	251	21	30	48.2
On-Site Power Lines	23	33	3	4	0.3
2011 Totals	**569**	**815**	**73**	**97**	**84**
2012 Activity					
Roads and Staging Areas	31	44	4	5	1.1
Site Clearing	38	54	4	6	0.2
Site Grading	37	53	4	5	0.8
Array Support Posts	47	67	4	5	8.0
Trenching and Cables	21	30	5	6	1.2
Soil Compacting	21	30	5	6	0.4
On-Site Power Poles	18	26	6	8	0.3
Switchgear Facilities	24	34	3	4	2.8
Solar Array Assembly	175	251	3	3	47.4
On-Site Power Lines	23	33	2	3	0.2
Permanent Buildings	30	43	3	4	2.8
Functional Testing	15	21	6	8	0.1
2012 Totals	**480**	**686**	**21**	**30**	**65**
2013 Activity					
Functional Testing	33	47	5	6	0.1

Soil De-Compacting	21	30	3	4	1.9
Site Cleanup	19	27	3	4	1.0
2013 Totals	**73**	**104**	**11**	**14**	**3**

Table D2-4.
Fugitive Emissions Parameters For Solar Farm Layout B, 2011 Construction

Parameter	Exclusion Fencing	Access Roads and Staging Areas	Construction Offices	Security Fencing	Site Clearing
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	75%	75%	50%	50%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	6.4%	6.1%	1.4%	2.9%	3.0%
Area Disturbed on a Typical Day, acres	0.37	0.48	9.68	0.57	11.00
Days of Disturbance	98	89	43	148	161
Uncontrolled TSP Rate, lbs/acre-day	40.0	80.0	80.0	40.0	80.0
Controlled PM10 Rate, lbs/acre-day	1.4	1.4	1.4	1.4	2.8
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-4 (continued).
Fugitive Emissions Parameters For Solar Farm Layout B, 2011 Construction

Parameter	Site Grading	Array Support Posts	Trenching and Cables	Soil Compacting	On-Site Power Poles
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	75%	75%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	3.1%	1.5%	3.4%	3.3%	3.3%
Area Disturbed on a Typical Day, acres	11.00	11.00	5.50	11.00	0.15
Days of Disturbance	161	141	141	141	49
Uncontrolled TSP Rate, lbs/acre-day	80.0	60.0	40.0	40.0	40.0
Controlled PM10 Rate, lbs/acre-day	2.8	2.1	1.4	0.7	0.7
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-4 (continued).
Fugitive Emissions Parameters For Solar Farm Layout B, 2011 Construction

Parameter	Switchgear Facilities	On-Site Substation	Solar Array Assembly	On-Site Power Lines
Assumed Soil Texture Class	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	75%	75%	75%

Natural Dust Control, Daily Basis	0%	0%	0%	0%
Natural Dust Control, Annual Basis	1.5%	2.2%	3.3%	3.3%
Area Disturbed on a Typical Day, acres	0.05	14.40	11.00	0.15
Days of Disturbance	140	43	141	49
Uncontrolled TSP Rate, lbs/acre-day	40.0	40.0	40.0	40.0
Controlled PM10 Rate, lbs/acre-day	0.7	0.7	0.7	0.7
Demolition PM10, total pounds	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%

Table D2-5.
Fugitive Emissions Parameters For Solar Farm Layout B, 2012 Construction

Parameter	Access Roads and Staging Areas	Site Clearing	Site Grading	Array Support Posts	Trenching and Cables
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	50%	50%	50%	50%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	5.4%	4.6%	4.4%	3.8%	4.1%
Area Disturbed on a Typical Day, acres	0.98	11.00	11.00	11.00	5.50
Days of Disturbance	30	181	181	201	201

Uncontrolled TSP Rate, lbs/acre-day	80.0	80.0	80.0	60.0	40.0
Controlled PM10 Rate, lbs/acre-day	1.4	2.8	2.8	2.1	1.4
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-5 (continued).
Fugitive Emissions Parameters For Solar Farm Layout B, 2012 Construction

Parameter	Soil Compacting	On-Site Power Poles	Switchgear Facilities	Solar Array Assembly	On-Site Power Lines
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	75%	75%	75%	75%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	4.5%	4.6%	3.9%	4.5%	4.6%
Area Disturbed on a Typical Day, acres	11.00	0.15	0.04	11.00	0.15
Days of Disturbance	221	70	220	221	77
Uncontrolled TSP Rate, lbs/acre-day	40.0	40.0	40.0	40.0	40.0
Controlled PM10 Rate, lbs/acre-day	0.7	0.7	0.7	0.7	0.7
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00

Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-5 (continued).
Fugitive Emissions Parameters For Solar Farm Layout B, 2012 Construction

Parameter	Permanent Buildings	Functional Testing
Assumed Soil Texture Class	sand	sand
Soil PM10 Fraction	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	75%
Natural Dust Control, Daily Basis	0%	0%
Natural Dust Control, Annual Basis	9.4%	3.5%
Area Disturbed on a Typical Day, acres	2.88	1.00
Days of Disturbance	54	200
Uncontrolled TSP Rate, lbs/acre-day	80.0	40.0
Controlled PM10 Rate, lbs/acre-day	1.4	0.7
Demolition PM10, total pounds	0	0
Construction Blasting PM10, total pounds	0	0
Acres of asphalt paving	0.00	0.00
Painted Surface Area, square feet	20,864	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%

Table D2-6.
Fugitive Emissions Parameters For Solar Farm Layout B, 2013 Construction

Parameter	Functional Testing	Soil De-Compacting	Site Cleanup
Assumed Soil Texture Class	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	75%	75%
Natural Dust Control, Daily Basis	0%	0%	0%
Natural Dust Control, Annual Basis	9.4%	9.4%	9.4%
Area Disturbed on a Typical Day, acres	1.00	73.09	11.90
Days of Disturbance	21	21	21
Uncontrolled TSP Rate, lbs/acre-day	40.0	40.0	16.0
Controlled PM10 Rate, lbs/acre-day	0.7	0.7	0.3
Demolition PM10, total pounds	0	0	0
Construction Blasting PM10, total pounds	0	0	0
Acres of asphalt paving	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%

SOLAR FARM CONSTRUCTION, LAYOUT C (ALTERNATIVE 3)

Table D2-7.
Schedule for Solar Farm Layout C Construction

Activity Phase	Activity Duration, days	Work Days By Calendar Quarter			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4
2011 Activity					
Exclusion Fencing	86	61	25	0	0
Roads and Staging Areas	89	44	15	15	15
Construction Offices	43	0	43	0	0
Security Fencing	129	0	42	64	23
Site Clearing	160	0	42	64	54
Site Grading	160	0	37	64	59
Array Support Posts	140	0	21	64	55
Trenching and Cables	140	0	16	64	60
Soil Compacting	140	0	21	64	55
On-Site Power Poles	49	0	7	21	21
Switchgear Facilities	140	0	16	64	60
On-Site Substation	43	0	21	22	0
Solar Array Assembly	140	0	21	64	55
On-Site Power Lines	49	0	7	21	21
Net Construction Days	**249**	**61**	**64**	**64**	**60**
2012 Activity					
Roads and Staging Areas	30	15	15	0	0
Site Clearing	180	61	64	55	0
Site Grading	173	56	64	53	0
Array Support Posts	192	51	64	64	13
Trenching and Cables	192	46	64	64	18
Soil Compacting	220	61	64	64	31
On-Site Power Poles	70	21	21	21	7
Switchgear Facilities	220	61	64	64	31
Solar Array Assembly	215	61	64	64	26
On-Site Power Lines	77	21	21	21	14
Permanent Buildings	54	54	0	0	0
Functional Testing	200	21	64	64	64
Net Construction Days	**253**	**61**	**64**	**64**	**64**
2013 Activity					
Functional Testing	21	21	0	0	0
Soil De-Compacting	21	21	0	0	0
Site Cleanup	21	21	0	0	0
Net Construction Days	**34**	**34**	**0**	**0**	**0**

Available Work Days Per Quarter	**61**	**64**	**64**	**64**

Table D2-8.
Equipment Use for Solar Farm Layout C Construction

Activity Phase	Acres Disturbed	On-Site Equipment Items	Total Items Including Off-Site Trucks	Equipment Use Hours At Site	On-Site Fuel Use, Gallons
2011 Activity					
Exclusion Fencing	17.3	7	16	1,103	3,217
Roads and Staging Areas	39.0	22	40	5,328	30,481
Construction Offices	9.7	11	25	2,763	6,757
Security Fencing	45.9	9	20	2,200	6,627
Site Clearing	1,273.6	15	25	7,775	27,123
Site Grading	1,273.6	21	38	14,889	127,558
Array Support Posts	1,114.4	22	40	10,722	30,745
Trenching and Cables	557.2	11	20	4,786	21,484
Soil Compacting	1,114.4	11	19	5,233	57,285
On-Site Power Poles	6.0	8	15	569	1,880
Switchgear Facilities	5.0	11	19	2,376	9,009
On-Site Substation	14.4	29	70	2,049	7,690
Solar Array Assembly	1,114.4	60	108	31,475	49,824
On-Site Power Lines	6.0	13	20	2,088	8,413
2011 Totals	**1,385.5**	**250**	**475**	**93,354**	**388,093**
2012 Activity					
Roads and Staging Areas	19.5	22	36	1,590	9,229
Site Clearing	1,432.8	15	25	8,716	30,214
Site Grading	1,965.6	21	38	16,097	137,889
Array Support Posts	2,184.0	22	41	14,703	42,128
Trenching and Cables	1,092.0	11	20	6,431	28,264
Soil Compacting	1,751.2	11	19	8,224	89,993
On-Site Power Poles	8.6	8	15	812	2,673
Switchgear Facilities	7.1	11	19	3,729	14,074
Solar Array Assembly	1,711.6	60	107	48,306	75,725
On-Site Power Lines	9.5	13	20	3,280	13,211
Permanent Buildings	2.9	15	34	1,033	3,089
Functional Testing	1.0	26	30	33,763	11,950
2012 Totals	**1,741.1**	**235**	**404**	**146,684**	**458,440**
2013 Activity					
Functional Testing	1.0	24	26	3,436	1,098
Soil De-Compacting	1,192.4	13	25	844	5,555
Site Cleanup	200.0	7	13	283	1,328

2013 Totals	**1,392.4**	**44**	**64**	**4,563**	**7,981**

Table D2-9.
Traffic Generation From Solar Farm Layout C Construction

Activity Phase	**Total Workers**	**Daily Average 1-Way Vehicle Trips**			
		To/From Shuttle Assembly Points	**Shuttle Trips To/From Site**	**Personal Vehicle Trips To/From Site**	**Construction Truck Trips To/From Site**
2011 Activity					
Exclusion Fencing	29	42	4	5	0.2
Roads and Staging Areas	30	43	4	5	0.6
Construction Offices	30	43	4	5	3.5
Security Fencing	30	43	4	5	5.2
Site Clearing	35	50	4	6	2.2
Site Grading	31	44	4	5	0.6
Array Support Posts	42	60	5	7	6.1
Trenching and Cables	21	30	3	4	0.9
Soil Compacting	19	27	2	3	0.3
On-Site Power Poles	18	26	2	3	0.4
Switchgear Facilities	24	34	3	4	2.1
On-Site Substation	46	66	6	8	9.9
Solar Array Assembly	157	225	19	26	36.7
On-Site Power Lines	23	33	3	4	0.3
2011 Totals	**535**	**766**	**67**	**90**	**69**
2012 Activity					
Roads and Staging Areas	30	43	4	5	1.0
Site Clearing	35	50	4	6	2.2
Site Grading	31	44	4	5	0.6
Array Support Posts	42	60	4	5	6.1
Trenching and Cables	21	30	5	6	0.9
Soil Compacting	19	27	5	6	0.3
On-Site Power Poles	18	26	6	8	0.3
Switchgear Facilities	24	34	3	4	2.1
Solar Array Assembly	157	225	3	3	37.6
On-Site Power Lines	23	33	2	3	0.2
Permanent Buildings	30	43	3	4	2.9
Functional Testing	15	21	6	8	0.1
2012 Totals	**445**	**636**	**21**	**30**	**54**
2013 Activity					
Functional Testing	26	37	3	5	0.2

Soil De-Compacting	18	26	2	3	1.3
Site Cleanup	19	27	2	4	0.6
2013 Totals	**63**	**90**	**7**	**12**	**2**

Table D2-10.
Fugitive Emissions Parameters For Solar Farm Layout C, 2011 Construction

Parameter	Exclusion Fencing	Access Roads and Staging Areas	Construction Offices	Security Fencing	Site Clearing
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	75%	75%	50%	50%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	7.1%	6.1%	1.4%	2.7%	3.0%
Area Disturbed on a Typical Day, acres	0.20	0.44	9.68	0.36	7.96
Days of Disturbance	86	89	43	129	160
Uncontrolled TSP Rate, lbs/acre-day	40.0	80.0	80.0	40.0	80.0
Controlled PM10 Rate, lbs/acre-day	1.4	1.4	1.4	1.4	2.8
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-10 (continued).
Fugitive Emissions Parameters For Solar Farm Layout C, 2011 Construction

Parameter	Site Grading	Array Support Posts	Trenching and Cables	Soil Compacting	On-Site Power Poles
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	75%	75%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	3.1%	1.6%	3.4%	3.3%	3.3%
Area Disturbed on a Typical Day, acres	7.96	7.96	3.98	7.96	0.12
Days of Disturbance	160	140	140	140	49
Uncontrolled TSP Rate, lbs/acre-day	80.0	60.0	40.0	40.0	40.0
Controlled PM10 Rate, lbs/acre-day	2.8	2.1	1.4	0.7	0.7
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-10 (continued).
Fugitive Emissions Parameters For Solar Farm Layout C, 2011 Construction

Parameter	Switchgear Facilities	On-Site Substation	Solar Array Assembly	On-Site Power Lines
Assumed Soil Texture Class	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	75%	75%	75%

Natural Dust Control, Daily Basis	0%	0%	0%	0%
Natural Dust Control, Annual Basis	1.5%	2.2%	3.3%	3.3%
Area Disturbed on a Typical Day, acres	0.04	14.40	7.96	0.12
Days of Disturbance	140	43	140	49
Uncontrolled TSP Rate, lbs/acre-day	40.0	40.0	40.0	40.0
Controlled PM10 Rate, lbs/acre-day	0.7	0.7	0.7	0.7
Demolition PM10, total pounds	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%

Table D2-11.
Fugitive Emissions Parameters For Solar Farm Layout C, 2012 Construction

Parameter	Access Roads and Staging Areas	Site Clearing	Site Grading	Array Support Posts	Trenching and Cables
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	50%	50%	50%	50%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	5.4%	4.6%	4.5%	4.0%	4.1%
Area Disturbed on a Typical Day, acres	0.65	7.96	7.96	7.96	3.98
Days of Disturbance	30	180	173	192	192

Uncontrolled TSP Rate, lbs/acre-day	80.0	80.0	80.0	60.0	40.0
Controlled PM10 Rate, lbs/acre-day	1.4	2.8	2.8	2.1	1.4
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-11 (continued).
Fugitive Emissions Parameters For Solar Farm Layout C, 2012 Construction

Parameter	Soil Compacting	On-Site Power Poles	Switchgear Facilities	Solar Array Assembly	On-Site Power Lines
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	75%	75%	75%	75%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	4.5%	4.6%	3.9%	4.5%	4.6%
Area Disturbed on a Typical Day, acres	7.96	0.12	0.03	7.96	0.12
Days of Disturbance	220	70	220	215	77
Uncontrolled TSP Rate, lbs/acre-day	40.0	40.0	40.0	40.0	40.0
Controlled PM10 Rate, lbs/acre-day	0.7	0.7	0.7	0.7	0.7
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00

Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-11 (continued).
Fugitive Emissions Parameters For Solar Farm Layout C, 2012 Construction

Parameter	Permanent Buildings	Functional Testing
Assumed Soil Texture Class	sand	sand
Soil PM10 Fraction	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	75%
Natural Dust Control, Daily Basis	0%	0%
Natural Dust Control, Annual Basis	9.4%	3.5%
Area Disturbed on a Typical Day, acres	2.88	1.00
Days of Disturbance	54	200
Uncontrolled TSP Rate, lbs/acre-day	80.0	40.0
Controlled PM10 Rate, lbs/acre-day	1.4	0.7
Demolition PM10, total pounds	0	0
Construction Blasting PM10, total pounds	0	0
Acres of asphalt paving	0.00	0.00
Painted Surface Area, square feet	20,864	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%

Table D2-12.
Fugitive Emissions Parameters For Solar Farm Layout C, 2013 Construction

Parameter	Functional Testing	Soil De-Compacting	Site Cleanup
Assumed Soil Texture Class	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	75%	75%	75%
Natural Dust Control, Daily Basis	0%	0%	0%
Natural Dust Control, Annual Basis	9.4%	9.4%	9.4%
Area Disturbed on a Typical Day, acres	1.00	56.78	9.52
Days of Disturbance	21	21	21
Uncontrolled TSP Rate, lbs/acre-day	40.0	40.0	16.0
Controlled PM10 Rate, lbs/acre-day	0.7	0.7	0.3
Demolition PM10, total pounds	0	0	0
Construction Blasting PM10, total pounds	0	0	0
Acres of asphalt paving	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%

GEN-TIE LINE CONSTRUCTION, ALIGNMENT A-1 (ALTERNATIVE 1)

Table D2-13.
Schedule for Gen Tie Line A-1 Construction

Activity Phase	Activity Duration, days	Work Days By Calendar Quarter			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4
2011 Activity					
Site Preparation	15	15	0	0	0
Tower Foundations	45	45	0	0	0
Tower Assembly and Erection	65	15	50	0	0
Power Line Stringing	45	0	10	35	0
Testing	21	0	0	21	0
Net Construction Days	**176**	**60**	**60**	**56**	**0**
2012 Activity					
Site Cleanup	21	0	0	21	0
Net Construction Days	**21**	**0**	**0**	**21**	**0**
Available Work Days Per Quarter		**61**	**64**	**64**	**64**

Site Preparation and Tower Foundations phases would overlap. Other phases would not overlap.

Table D2-14.
Equipment Use for Gen Tie Line A-1 Construction

Activity Phase	Acres Disturbed	On-Site Equipment Items	Total Items Including Off-Site Trucks	Equipment Use Hours At Site	On-Site Fuel Use, Gallons
2011 Activity					
Site Preparation	76.7	7	21	407	2,781
Tower Foundations	1.0	24	56	1,588	6,182
Tower Assembly and Erection	38.4	9	15	1,697	6,622
Power Line Stringing	38.4	18	30	1,798	11,416
Testing	18.0	2	2	109	913
2011 Totals	**76.7**	**60**	**124**	**5,600**	**27,913**
2012 Activity					
Site Cleanup	18.0	4	4	70	192
2012 Totals	**18.0**	**4**	**4**	**70**	**192**

Table D2-15.
Traffic Generation From Gen Tie Line A-1 Construction

Activity Phase	Total Workers	Daily Average 1-Way Vehicle Trips			
		To/From Shuttle Assembly Points	Shuttle Trips To/From Site	Personal Vehicle Trips To/From Site	Construction Truck Trips To/From Site
2011 Activity					
Site Preparation	20	0	0	35	3.7
Tower Foundations	30	0	0	53	23.5
Tower Assembly and Erection	20	0	0	35	2.4
Power Line Stringing	30	0	0	53	1.8
Testing	5	0	0	8	0.0
2011 Maximum	**50**	**0**	**0**	**88**	**27**
2012 Activity					
Site Cleanup	9	0	0	14	0
2012 Maximum	**9**	**0**	**0**	**14**	**0**

Site Preparation and Tower Foundations phases would overlap. Other phases would not overlap.

Table D2-16.
Fugitive Emissions Parameters For Gen Tie Line A-1, 2011 Construction

Parameter	Site Preparation	Tower Foundations	Tower Assembly and Erection	Power Line Stringing	Testing
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%	0%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	9.4%	9.4%	3.3%	2.6%	2.9%
Area Disturbed on a Typical Day, acres	5.11	0.02	0.59	0.85	0.86
Days of Disturbance	15	45	65	45	21
Uncontrolled TSP Rate,	40.0	80.0	80.0	40.0	20.0

lbs/acre-day					
Controlled PM10 Rate, lbs/acre-day	1.4	2.8	2.8	1.4	1.4
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-17.
Fugitive Emissions Parameters For Gen Tie Line A-1, 2012 Construction

Parameter	Site Cleanup
Assumed Soil Texture Class	sand
Soil PM10 Fraction	7.0%
Active Dust Control Program Effectiveness	50%
Natural Dust Control, Daily Basis	0%
Natural Dust Control, Annual Basis	2.9%
Area Disturbed on a Typical Day, acres	0.86
Days of Disturbance	21
Uncontrolled TSP Rate, lbs/acre-day	20.0
Controlled PM10 Rate, lbs/acre-day	0.7
Demolition PM10, total pounds	0
Construction Blasting PM10, total pounds	0
Acres of asphalt paving	0.00
Painted Surface Area, square feet	0

PM2.5 fraction of engine exhaust PM10	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%
PM2.5 fraction of spray paint PM10	91.2%

GEN-TIE LINE CONSTRUCTION, ALIGNMENT A-2 (ALTERNATIVE 3)

Table D2-18.
Schedule for Gen Tie Line A-2 Construction

Activity Phase	Activity Duration, days	Work Days By Calendar Quarter			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4
2011 Activity					
Site Preparation	15	15	0	0	0
Tower Foundations	45	45	0	0	0
Tower Assembly and Erection	65	15	50	0	0
Power Line Stringing	45	0	10	35	0
Testing	21	0	0	21	0
Net Construction Days	**176**	**60**	**60**	**56**	**0**
2012 Activity					
Site Cleanup	21	0	0	21	0
Net Construction Days	**21**	**0**	**0**	**21**	**0**
Available Work Days Per Quarter		**61**	**64**	**64**	**64**

Site Preparation and Tower Foundations phases would overlap. Other phases would not overlap.

Table D2-19.
Equipment Use for Gen Tie Line A-2 Construction

Activity Phase	Acres Disturbed	On-Site Equipment Items	Total Items Including Off-Site Trucks	Equipment Use Hours At Site	On-Site Fuel Use, Gallons
2011 Activity					
Site Preparation	62.3	7	21	407	2,781
Tower Foundations	1.0	24	56	1,566	5,976
Tower Assembly and Erection	31.2	9	15	1,693	6,581
Power Line Stringing	31.2	18	30	1,798	11,416
Testing	21.0	2	2	109	913
2011 Totals	**62.3**	**60**	**124**	**5,573**	**27,668**
2012 Activity					
Site Cleanup	21	4	4	70	192
2012 Totals	**21**	**4**	**4**	**70**	**192**

Table D2-20.
Traffic Generation From Gen Tie Line A-2 Construction

Activity Phase	Total Workers	Daily Average 1-Way Vehicle Trips			
		To/From Shuttle Assembly Points	Shuttle Trips To/From Site	Personal Vehicle Trips To/From Site	Construction Truck Trips To/From Site
2011 Activity					
Site Preparation	20	0	0	35	3.7
Tower Foundations	30	0	0	53	20.2
Tower Assembly and Erection	20	0	0	35	1.9
Power Line Stringing	30	0	0	53	1.8
Testing	5	0	0	8	0.0
2011 Maximum	**50**	**0**	**0**	**88**	**24**
2012 Activity					
Site Cleanup	9	0	0	14	0
2012 Maximum	**9**	**0**	**0**	**14**	**0**

Site Preparation and Tower Foundations phases would overlap. Other phases would not overlap.

Table D2-21.
Fugitive Emissions Parameters For Gen Tie Line A-2, 2011 Construction

Parameter	Site Preparation	Tower Foundations	Tower Assembly and Erection	Power Line Stringing	Testing
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%	0%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	9.4%	9.4%	3.3%	2.6%	2.9%
Area Disturbed on a Typical Day, acres	4.15	0.02	0.48	0.69	1.00
Days of Disturbance	15	45	65	45	21
Uncontrolled TSP Rate, lbs/acre-day	40.0	80.0	80.0	40.0	20.0

Controlled PM10 Rate, lbs/acre-day	1.4	2.8	2.8	1.4	1.4
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-22.
Fugitive Emissions Parameters For Gen Tie Line A-2, 2012 Construction

Parameter	Site Cleanup
Assumed Soil Texture Class	sand
Soil PM10 Fraction	7.0%
Active Dust Control Program Effectiveness	50%
Natural Dust Control, Daily Basis	0%
Natural Dust Control, Annual Basis	2.9%
Area Disturbed on a Typical Day, acres	1.00
Days of Disturbance	21
Uncontrolled TSP Rate, lbs/acre-day	20.0
Controlled PM10 Rate, lbs/acre-day	0.7
Demolition PM10, total pounds	0
Construction Blasting PM10, total pounds	0
Acres of asphalt paving	0.00
Painted Surface Area, square feet	0
PM2.5 fraction of engine	92.0%

exhaust PM10	
PM2.5 fraction of fugitive dust PM10	20.0%
PM2.5 fraction of spray paint PM10	91.2%

GEN-TIE LINE CONSTRUCTION, ALIGNMENT B-2 (ALTERNATIVE 2)

Table D2-23.
Schedule for Gen Tie Line B-2 Construction

Activity Phase	Activity Duration, days	Work Days By Calendar Quarter			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4
2011 Activity					
Site Preparation	15	15	0	0	0
Tower Foundations	45	45	0	0	0
Tower Assembly and Erection	65	15	50	0	0
Power Line Stringing	45	0	10	35	0
Testing	21	0	0	21	0
Net Construction Days	**176**	**60**	**60**	**56**	**0**
2012 Activity					
Site Cleanup	21	0	0	21	0
Net Construction Days	**21**	**0**	**0**	**21**	**0**
Available Work Days Per Quarter		**61**	**64**	**64**	**64**

Site Preparation and Tower Foundations phases would overlap. Other phases would not overlap.

Table D2-24.
Equipment Use for Gen Tie Line B-2 Construction

Activity Phase	Acres Disturbed	On-Site Equipment Items	Total Items Including Off-Site Trucks	Equipment Use Hours At Site	On-Site Fuel Use, Gallons
2011 Activity					
Site Preparation	62.1	7	21	407	2,781
Tower Foundations	1.0	24	56	1,568	5,993
Tower Assembly and Erection	31.1	9	15	1,694	6,589
Power Line Stringing	31.1	18	30	1,798	11,416
Testing	12.0	2	2	109	913
2011 Totals	**62.1**	**60**	**124**	**5,576**	**27,691**
2012 Activity					
Site Cleanup	12.0	4	4	70	192
2012 Totals	**12.0**	**4**	**4**	**70**	**192**

Table D2-25.
Traffic Generation From Gen Tie Line B-2 Construction

Activity Phase	Total Workers	Daily Average 1-Way Vehicle Trips			
		To/From Shuttle Assembly Points	Shuttle Trips To/From Site	Personal Vehicle Trips To/From Site	Construction Truck Trips To/From Site
2011 Activity					
Site Preparation	20	0	0	35	3.7
Tower Foundations	30	0	0	53	21.1
Tower Assembly and Erection	20	0	0	35	2.0
Power Line Stringing	30	0	0	53	1.8
Testing	5	0	0	8	0.0
2011 Maximum	**50**	**0**	**0**	**88**	**25**
2012 Activity					
Site Cleanup	9	0	0	14	0
2012 Maximum	**9**	**0**	**0**	**14**	**0**

Site Preparation and Tower Foundations phases would overlap. Other phases would not overlap.

Table D2-26.
Fugitive Emissions Parameters For Gen Tie Line B-2, 2011 Construction

Parameter	Site Preparation	Tower Foundations	Tower Assembly and Erection	Power Line Stringing	Testing
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%	0%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	9.4%	9.4%	3.3%	2.6%	2.9%
Area Disturbed on a Typical Day, acres	4.14	0.02	0.48	0.69	0.57
Days of Disturbance	15	45	65	45	21

Uncontrolled TSP Rate, lbs/acre-day	40.0	80.0	80.0	40.0	20.0
Controlled PM10 Rate, lbs/acre-day	1.4	2.8	2.8	1.4	1.4
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-27.
Fugitive Emissions Parameters For Gen Tie Line B-2, 2012 Construction

Parameter	Site Cleanup
Assumed Soil Texture Class	sand
Soil PM10 Fraction	7.0%
Active Dust Control Program Effectiveness	50%
Natural Dust Control, Daily Basis	0%
Natural Dust Control, Annual Basis	2.9%
Area Disturbed on a Typical Day, acres	0.57
Days of Disturbance	21
Uncontrolled TSP Rate, lbs/acre-day	20.0
Controlled PM10 Rate, lbs/acre-day	0.7
Demolition PM10, total pounds	0
Construction Blasting PM10, total pounds	0
Acres of asphalt paving	0.00
Painted Surface Area, square	0

feet	
PM2.5 fraction of engine exhaust PM10	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%
PM2.5 fraction of spray paint PM10	91.2%

RED BLUFF SUBSTATION CONSTRUCTION, SITE A (ALTERNATIVES 1 AND 3)

Table D2-28.
Schedule for Red Bluff Substation A Construction

Activity Phase	Activity Duration, days	Work Days By Calendar Quarter			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4
2011 Activity					
Access Road Improvements	40	0	40	0	0
Site Fencing	25	0	20	5	0
Site Clearing	60	0	0	59	1
Grading and Compacting	60	0	0	0	60
Net Construction Days	**185**	**0**	**60**	**64**	**61**
2012 Activity					
Trenching and Foundations	20	20	0	0	0
Equipment Pads	30	30	0	0	0
Equipment Installation	90	10	64	16	0
Power Line Connections	60	0	0	45	15
Testing	45	0	0	0	45
Net Construction Days	**245**	**60**	**64**	**61**	**60**
2013 Activity					
Testing	45	45	0	0	0
Driveways and Walls	40	15	25	0	0
Site Cleanup	15	0	15	0	0
Net Construction Days	**100**	**60**	**40**	**0**	**0**
Available Work Days Per Quarter		**61**	**64**	**64**	**64**

Construction phases would not overlap.

Table D2-29.
Equipment Use for Red Bluff Substation A Construction

Activity Phase	Acres Disturbed	On-Site Equipment Items	Total Items Including Off-Site Trucks	Equipment Use Hours At Site	On-Site Fuel Use, Gallons
2011 Activity					
Access Road Improvements	1.2	5	12	395	3,283
Site Fencing	3.5	6	14	298	848
Site Clearing	114.0	6	17	1,065	4,939
Grading and Compacting	114.0	9	17	1,642	11,678

2011 Totals	**118.7**	**26**	**60**	**3,401**	**20,747**
2012 Activity					
Trenching and Foundations	114.0	12	21	511	2,257
Equipment Pads	114.0	8	24	999	8,210
Equipment Installation	114.0	8	15	1,977	11,689
Power Line Connections	22.5	10	20	1,180	4,882
Testing	1.0	1	1	88	725
2012 Totals	**114.0**	**39**	**81**	**4,755**	**27,763**
2013 Activity					
Testing	1.0	1	1	88	717
Driveways and Walls	26.3	8	41	1,226	6,639
Site Cleanup	5.0	3	6	59	162
2013 Totals	**32.3**	**12**	**48**	**1,372**	**7,518**

Table D2-30.
Traffic Generation From Red Bluff Substation A Construction

Activity Phase	**Total Workers**	**Daily Average 1-Way Vehicle Trips**			
		To/From Shuttle Assembly Points	**Shuttle Trips To/From Site**	**Personal Vehicle Trips To/From Site**	**Construction Truck Trips To/From Site**
2011 Activity					
Access Road Improvements	6	0	0	10	2.2
Site Fencing	10	0	0	16	0.6
Site Clearing	8	0	0	13	0.4
Grading and Compacting	11	0	0	18	0.3
2011 Maximum	**11**	**0**	**0**	**18**	**2**
2012 Activity					
Trenching and Foundations	13	0	0	20	3.1
Equipment Pads	12	0	0	19	116.6
Equipment Installation	12	0	0	19	21.3
Power Line Connections	14	0	0	22	0.5
Testing	2	0	0	4	0.0
2012 Maximum	**14**	**0**	**0**	**22**	**117**
2013 Activity					
Testing	2	0	0	4	0.0
Driveways and Walls	10	0	0	20	86.9
Site Cleanup	5	0	0	10	0.5

2013 Maximum	**10**	**0**	**0**	**20**	**87**

Construction phases would not overlap.

Table D2-31.
Fugitive Emissions Parameters For Red Bluff Substation A, 2011 Construction

Parameter	Access Road Improvements	Site Fencing	Site Clearing	Grading and Compacting
Assumed Soil Texture Class	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%
Natural Dust Control, Daily Basis	0%	0%	0%	0%
Natural Dust Control, Annual Basis	1.4%	1.7%	2.9%	4.3%
Area Disturbed on a Typical Day, acres	0.03	0.12	1.90	1.90
Days of Disturbance	40	25	60	60
Uncontrolled TSP Rate, lbs/acre-day	80.0	40.0	80.0	80.0
Controlled PM10 Rate, lbs/acre-day	2.8	1.4	2.8	2.8
Demolition PM10, total pounds	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%

Table D2-33.
Fugitive Emissions Parameters For Red Bluff Substation A, 2012 Construction

Parameter	Trenching and Foundations	Equipment Pads	Equipment Installation	Power Line Connections	Testing
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%	0%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	9.4%	9.4%	2.6%	3.3%	4.3%
Area Disturbed on a Typical Day, acres	5.70	11.40	11.40	22.50	1.00
Days of Disturbance	20	30	90	60	45
Uncontrolled TSP Rate, lbs/acre-day	40.0	40.0	40.0	40.0	20.0
Controlled PM10 Rate, lbs/acre-day	1.4	1.4	1.4	1.4	1.4
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-34.
Fugitive Emissions Parameters For Red Bluff Substation A, 2013 Construction

Parameter	Testing	Driveways and Walls	Site Cleanup
Assumed Soil Texture Class	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	0%	50%	50%
Natural Dust Control, Daily	0%	0%	0%

Basis			
Natural Dust Control, Annual Basis	9.4%	4.4%	1.4%
Area Disturbed on a Typical Day, acres	1.00	2.63	0.33
Days of Disturbance	45	40	15
Uncontrolled TSP Rate, lbs/acre-day	20.0	40.0	40.0
Controlled PM10 Rate, lbs/acre-day	1.4	1.4	1.4
Demolition PM10, total pounds	0	0	0
Construction Blasting PM10, total pounds	0	0	0
Acres of asphalt paving	0.00	22.81	0.00
Painted Surface Area, square feet	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%

RED BLUFF SUBSTATION CONSTRUCTION, SITE B (ALTERNATIVE 2)

Table D2-34.
Schedule for Red Bluff Substation B Construction

Activity Phase	Activity Duration, days	Work Days By Calendar Quarter			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4
2011 Activity					
Access Road Improvements	15	0	15	0	0
Site Fencing	25	0	20	5	0
Site Clearing	60	0	0	59	1
Grading and Compacting	60	0	0	0	60
Net Construction Days	**160**	**0**	**35**	**64**	**61**
2012 Activity					
Trenching and Foundations	20	20	0	0	0
Equipment Pads	30	30	0	0	0
Equipment Installation	90	10	64	16	0
Power Line Connections	60	0	0	45	15
Testing	45	0	0	0	45
Net Construction Days	**245**	**60**	**64**	**61**	**60**
2013 Activity					
Testing	45	45	0	0	0
Driveways and Walls	40	15	25	0	0
Site Cleanup	15	0	15	0	0
Net Construction Days	**100**	**60**	**40**	**0**	**0**
Available Work Days Per Quarter		**61**	**64**	**64**	**64**

Construction phases would not overlap.

Table D2-35.
Equipment Use for Red Bluff Substation B Construction

Activity Phase	Acres Disturbed	On-Site Equipment Items	Total Items Including Off-Site Trucks	Equipment Use Hours At Site	On-Site Fuel Use, Gallons
2011 Activity					
Access Road Improvements	1.2	5	12	147	1,219
Site Fencing	3.1	6	14	298	848
Site Clearing	114.0	6	17	1,065	4,939
Grading and Compacting	114.0	9	17	1,642	11,678

2011 Totals	**118.3**	**26**	**60**	**3,152**	**18,683**
2012 Activity					
Trenching and Foundations	114.0	12	21	511	2,257
Equipment Pads	114.0	8	24	999	8,210
Equipment Installation	114.0	8	15	1,977	11,689
Power Line Connections	22.5	10	20	1,180	4,882
Testing	1.0	1	1	88	725
2012 Totals	**114.0**	**39**	**81**	**4,755**	**27,763**
2013 Activity					
Testing	1.0	1	1	88	717
Driveways and Walls	12.8	8	35	939	4,054
Site Cleanup	5.0	3	6	59	162
2013 Totals	**18.8**	**12**	**42**	**1,085**	**4,933**

Table D2-36.
Traffic Generation From Red Bluff Substation B Construction

Activity Phase	**Total Workers**	**Daily Average 1-Way Vehicle Trips**			
		To/From Shuttle Assembly Points	**Shuttle Trips To/From Site**	**Personal Vehicle Trips To/From Site**	**Construction Truck Trips To/From Site**
2011 Activity					
Access Road Improvements	6	0	0	10	1.2
Site Fencing	10	0	0	16	0.6
Site Clearing	8	0	0	13	0.4
Grading and Compacting	11	0	0	18	0.3
2011 Maximum	**11**	**0**	**0**	**18**	**1**
2012 Activity					
Trenching and Foundations	13	0	0	20	3.1
Equipment Pads	12	0	0	19	116.6
Equipment Installation	12	0	0	19	21.3
Power Line Connections	14	0	0	22	0.5
Testing	2	0	0	4	0.0
2012 Maximum	**14**	**0**	**0**	**22**	**117**
2013 Activity					
Testing	2	0	0	4	0.0
Driveways and Walls	10	0	0	20	37.6
Site Cleanup	5	0	0	10	0.5
2013 Maximum	**10**	**0**	**0**	**20**	**38**

Construction phases would not overlap.

Table D2-37.
Fugitive Emissions Parameters For Red Bluff Substation B Construction

Parameter	Access Road Improvements	Site Fencing	Site Clearing	Grading and Compacting
Assumed Soil Texture Class	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%
Natural Dust Control, Daily Basis	0%	0%	0%	0%
Natural Dust Control, Annual Basis	1.4%	1.7%	2.9%	4.3%
Area Disturbed on a Typical Day, acres	0.08	0.12	1.90	1.90
Days of Disturbance	15	25	60	60
Uncontrolled TSP Rate, lbs/acre-day	80.0	40.0	80.0	80.0
Controlled PM10 Rate, lbs/acre-day	2.8	1.4	2.8	2.8
Demolition PM10, total pounds	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%

Table D2-38.
Fugitive Emissions Parameters For Red Bluff Substation B, 2012 Construction

Parameter	Trenching and Foundations	Equipment Pads	Equipment Installation	Power Line Connections	Testing
Assumed Soil Texture Class	sand	sand	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%	0%
Natural Dust Control, Daily Basis	0%	0%	0%	0%	0%
Natural Dust Control, Annual Basis	9%	9%	3%	3%	4%
Area Disturbed on a Typical Day, acres	5.70	11.40	11.40	22.50	1.00
Days of Disturbance	20	30	90	60	45
Uncontrolled TSP Rate, lbs/acre-day	40.0	40.0	40.0	40.0	20.0
Controlled PM10 Rate, lbs/acre-day	1.4	1.4	1.4	1.4	1.4
Demolition PM10, total pounds	0	0	0	0	0
Construction Blasting PM10, total pounds	0	0	0	0	0
Acres of asphalt paving	0.00	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%	91.2%	91.2%

Table D2-39.
Fugitive Emissions Parameters For Red Bluff Substation B, 2013 Construction

Parameter	Testing	Driveways and Walls	Site Cleanup
Assumed Soil Texture Class	sand	sand	sand
Soil PM10 Fraction	7.0%	7.0%	7.0%
Active Dust Control Program Effectiveness	0%	50%	50%
Natural Dust Control, Daily Basis	0%	0%	0%

Natural Dust Control, Annual Basis	9.4%	4.4%	1.4%
Area Disturbed on a Typical Day, acres	1.00	1.28	0.33
Days of Disturbance	45	40	15
Uncontrolled TSP Rate, lbs/acre-day	20.0	40.0	40.0
Controlled PM10 Rate, lbs/acre-day	1.4	1.4	1.4
Demolition PM10, total pounds	0	0	0
Construction Blasting PM10, total pounds	0	0	0
Acres of asphalt paving	0.00	9.67	0.00
Painted Surface Area, square feet	0	0	0
PM2.5 fraction of engine exhaust PM10	92.0%	92.0%	92.0%
PM2.5 fraction of fugitive dust PM10	20.0%	20.0%	20.0%
PM2.5 fraction of spray paint PM10	91.2%	91.2%	91.2%

APPENDIX D-3

URBEMIS VEHICLE EMISSIONS ANALYSIS INFORMATION

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URBEMIS ANALYSES FOR ON-ROAD TRAFFIC EMISSIONS

Criteria pollutant and greenhouse gas emissions from construction-related traffic and from operational traffic were estimated using version 9.4 of the URBEMIS2007 model spreadsheet (Rimpo and Associates 2008) and supplemental spreadsheet analyses. URBEMIS2007 estimates carbon dioxide emissions from vehicle use, but does not estimate emission rates for methane or nitrous oxide. A spreadsheet analysis was used to estimate overall greenhouse gas emissions from worker commute travel. Emission rates for methane and nitrous oxide were obtained from Appendix C of the California Climate Action Registry 2007 general greenhouse gas emissions reporting protocol.

To simplify the number of URBEMIS runs required for the analysis, a series of generic URBEMIS runs were made for each relevant calendar year for each vehicle mix category that would comprise construction-related or operations traffic for the various project components (Solar Farm, Gen-Tie Line, and Red Bluff Substation). These generic URBEMIS runs used a mix of trip numbers (200 per day) and mean travel distances (75 miles per trip) that were high enough to avoid having any emission results round to zero. Subsequent spreadsheet analyses were used to convert the generic results from the URBEMIS runs into project-specific emission estimates. Because most travel would occur on freeways, an average travel speed of 55 mph was used for all URBEMIS runs.

Five general vehicle mixes were used for the generic URBEMIS runs, as indicated in Table D3-1. URBEMIS runs were made for 2011, 2012, and 2013 for each vehicle mix group. Separate runs were made for winter and summer temperature conditions. Separate URBEMIS runs also were made with roadway re-suspended dust turned on and off. URBEMIS runs with re-suspended dust turned on provided overall PM_{10} and $PM_{2.5}$ emission rates. URBEMIS runs with re-suspended dust turned off provided exhaust PM_{10} emission rates, which were used as the estimate of diesel particulate matter emissions. A monthly mean temperature values at the Eagle Mountain meteorological station were used to determine the weighting factors for winter and summer emission rates. Temperatures below or over 75 degrees Fahrenheit used to determine the number of months classified as winter or summer, respectively. Data from the Eagle Mountain meteorological station showed six months each for winter and summer temperature conditions. The construction worker personal vehicle mix presented in Table D3-1 reflects the high fraction of pickup truck and SUV vehicles expected for a construction project work force. The construction worker personal vehicle mix was also used for operational worker traffic analyses. The MHD truck mix was used for operational truck traffic at the Solar Farm. The LHT2 vehicle mix was used for operational maintenance inspection traffic for the Gen Tie Line and the Red Bluff Substation.

Table D3-1.
Vehicle Mix Groups Used for Generic URBEMIS Runs

Trip Type	Vehicle	Percent By	Temperature, Deg F	Average	Fuel Mix

	Type	Type	Winter	Summer	Speed, mph	
Construction Worker Personal Vehicles	LDA	25.6%	60	90	55	Default
	LDT1	16.3%	60	90	55	Default
	LDT2	37.4%	60	90	55	Default
	MDT	20.7%	60	90	55	Default
Shuttles	LHT2	100.0%	60	90	55	All Gasoline
Construction Trucks, most phases	HDD	100.0%	60	90	55	Default
Construction Trucks, site clearing and site cleanup	MHD	100.0%	60	90	55	All Diesel
Construction Trucks, selected Gen Tie Line phases	MHD	96.7%	60	90	55	Default
	HHD	3.3%	60	90	55	Default

LDA = light duty autos
LDT1 = pickup trucks, vans, and sport utility vehicles, gross vehicle weight rating up to 3,750 pounds
LDT2 = pickup trucks, vans, and sport utility vehicles, gross vehicle weight rating of 3,751 – 5,750 pounds
MDT = pickup trucks, vans, and sport utility vehicles, gross vehicle weight rating of 5,751 – 8,500 pounds
LHT2 = medium trucks and multi-passenger vehicles, gross vehicle weight rating of 10,001 – 14,000 pounds
MDT = heavy trucks, gross vehicle weight rating of 14,001 – 33,000 pounds
HHD = heavy trucks, gross vehicle weight rating of 33,001 – 60,000 pounds

The generic URBEMIS runs were all made using trip number and trip distance data that produced 15,000 vmt (vehicle miles traveled) per day. The URBEMIS estimates of criteria pollutant emissions for this generic amount of vehicle travel are summarized in Table D3-2. The companion estimates of greenhouse gas pollutant emissions for this generic amount of vehicle travel are summarized in Table D3-3.

Table D3-2.
URBEMIS Estimates of Criteria Pollutant Emissions For 15,000 VMT

Vehicle Group	Season	Pounds Per Day Produced By 15,000 VMT						
		ROG	NOx	CO	SOx	PM10	PM2.5	DPM
2011 Emission Rates								
Personal Vehicles	Winter	6.31	12.58	91.08	0.13	25.71	4.86	1.21
	Summer	7.26	9.16	119.43	0.16	25.71	4.86	1.21
	Average	6.79	10.87	105.26	0.15	25.71	4.86	1.21

Shuttles	Winter	5.01	18.18	45.85	0.17	25.43	4.51	0.93
	Summer	4.24	12.95	47.13	0.17	25.43	4.51	0.93
	Average	4.63	15.57	46.49	0.17	25.43	4.51	0.93
HHD Trucks	Winter	21.84	425.85	91.39	0.53	43.10	20.00	18.60
	Summer	21.84	354.35	91.39	0.53	43.10	20.00	18.60
	Average	21.84	390.10	91.39	0.53	43.10	20.00	18.60
MHD Trucks	Winter	4.06	256.42	41.80	0.46	30.32	9.01	5.81
	Summer	4.06	213.37	41.80	0.46	30.32	9.01	5.81
	Average	4.06	234.90	41.80	0.46	30.32	9.01	5.81
Mixed Trucks	Winter	5.34	239.88	59.88	0.43	30.15	8.83	5.65
	Summer	5.28	198.28	60.51	0.43	30.15	8.83	5.65
	Average	5.31	219.08	60.20	0.43	30.15	8.83	5.65
2012 Emissions								
Personal Vehicles	Winter	6.09	11.71	86.76	0.13	25.71	4.86	1.21
	Summer	6.99	8.53	113.53	0.16	25.71	4.86	1.21
	Average	6.54	10.12	100.15	0.15	25.71	4.86	1.21
Shuttles	Winter	4.67	17.41	40.89	0.17	25.43	4.51	0.93
	Summer	3.90	12.02	41.96	0.17	25.43	4.51	0.93
	Average	4.29	14.72	41.43	0.17	25.43	4.51	0.93
HHD Trucks	Winter	19.66	373.94	85.28	0.53	41.45	18.48	16.95
	Summer	19.66	311.17	85.28	0.53	41.45	18.48	16.95
	Average	19.66	342.56	85.28	0.53	41.45	18.48	16.95
MHD Trucks	Winter	3.90	231.24	40.67	0.46	30.05	8.67	5.55
	Summer	3.90	192.42	40.67	0.46	30.05	8.67	5.55
	Average	3.90	211.83	40.67	0.46	30.05	8.67	5.55
Mixed Trucks	Winter	5.01	215.87	56.29	0.43	29.88	8.58	5.38
	Summer	4.96	178.46	56.82	0.43	29.88	8.58	5.38
	Average	4.99	197.17	56.56	0.43	29.88	8.58	5.38
2013 Emissions								
Personal Vehicles	Winter	5.89	10.89	82.65	0.13	25.73	4.88	1.22
	Summer	6.74	7.92	107.92	0.16	25.73	4.88	1.22
	Average	6.32	9.41	95.29	0.15	25.73	4.88	1.22
Shuttles	Winter	4.32	16.12	36.44	0.17	25.43	4.51	0.93
	Summer	3.62	11.13	37.34	0.17	25.43	4.51	0.93
	Average	3.97	13.63	36.89	0.17	25.43	4.51	0.93
HHD Trucks	Winter	17.51	324.81	79.10	0.53	39.86	17.02	15.36
	Summer	17.51	270.30	79.10	0.53	39.86	17.02	15.36
	Average	17.51	297.56	79.10	0.53	39.86	17.02	15.36
MHD Trucks	Winter	3.73	208.88	39.75	0.46	29.82	8.55	5.32
	Summer	3.73	173.79	39.75	0.46	29.82	8.55	5.32
	Average	3.73	191.34	39.75	0.46	29.82	8.55	5.32
Mixed Trucks	Winter	4.70	194.44	53.17	0.43	29.63	8.35	5.13
	Summer	4.65	160.75	53.61	0.43	29.63	8.35	5.13
	Average	4.68	177.60	53.39	0.43	29.63	8.35	5.13

ROG = reactive organic compounds (ozone and particulate matter precursors)

NOx = nitrogen oxides (ozone and particulate matter precursors)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter, particles generally smaller than 50 microns
$PM_{2.5}$ = fine particulate matter, particles generally smaller than 6 microns
DPM = diesel particulate matter (carcinogen)

Table D3-3.
Estimates of Greenhouse Gas Emissions For 15,000 VMT

Vehicle Group	Season	Pounds Per Day Produced By 15,000 VMT			
		CO_2	CH_4	N_2O	CO_2e
2011 Emissions					
Personal Vehicles	Winter	13,084.86	1.65	1.65	13,618.93
	Summer	16,514.08	1.65	1.65	17,048.15
	Average	14,799.47	1.65	1.65	15,333.54
Shuttles	Winter	16,875.21	1.98	1.65	17,417.55
	Summer	16,875.21	1.98	1.65	17,417.55
	Average	16,875.21	1.98	1.65	17,417.55
HHD Trucks	Winter	54,923.52	1.98	1.65	55,465.86
	Summer	54,923.52	1.98	1.65	55,465.86
	Average	54,923.52	1.98	1.65	55,465.86
MHD Trucks	Winter	49,724.67	1.98	1.65	50,267.01
	Summer	49,724.67	1.98	1.65	50,267.01
	Average	49,724.67	1.98	1.65	50,267.01
Mixed Trucks	Winter	45,926.01	1.98	1.65	46,468.35
	Summer	45,926.01	1.98	1.65	46,468.35
	Average	45,926.01	1.98	1.65	46,468.35
2012 Emissions					
Personal Vehicles	Winter	13,082.90	1.65	1.65	13,616.97
	Summer	16,518.44	1.65	1.65	17,052.51
	Average	14,800.67	1.65	1.65	15,334.74
Shuttles	Winter	16,875.00	1.98	1.65	17,417.34
	Summer	16,875.00	1.98	1.65	17,417.34
	Average	16,875.00	1.98	1.65	17,417.34
HHD Trucks	Winter	54,923.52	1.98	1.65	55,465.86
	Summer	54,923.52	1.98	1.65	55,465.86
	Average	54,923.52	1.98	1.65	55,465.86
MHD Trucks	Winter	49,724.67	1.98	1.65	50,267.01
	Summer	49,724.67	1.98	1.65	50,267.01
	Average	49,724.67	1.98	1.65	50,267.01
Mixed Trucks	Winter	45,926.01	1.98	1.65	46,468.35
	Summer	45,926.01	1.98	1.65	46,468.35
	Average	45,926.01	1.98	1.65	46,468.35
2013 Emissions					
Personal	Winter	13,081.22	1.65	1.65	13,615.29

Vehicles	Summer	16,524.23	1.65	1.65	17,058.30
	Average	14,802.73	1.65	1.65	15,336.79
Shuttles	Winter	16,874.81	1.98	1.65	17,417.15
	Summer	16,874.81	1.98	1.65	17,417.15
	Average	16,874.81	1.98	1.65	17,417.15
HHD Trucks	Winter	54,923.52	1.98	1.65	55,465.86
	Summer	54,923.52	1.98	1.65	55,465.86
	Average	54,923.52	1.98	1.65	55,465.86
MHD Trucks	Winter	49,724.67	1.98	1.65	50,267.01
	Summer	49,724.67	1.98	1.65	50,267.01
	Average	49,724.67	1.98	1.65	50,267.01
Mixed Trucks	Winter	45,926.01	1.98	1.65	46,468.35
	Summer	45,926.01	1.98	1.65	46,468.35
	Average	45,926.01	1.98	1.65	46,468.35

CO_2 = carbon dioxide, GWP multiplier = 1
CH_4 = methane, GWP multiplier = 25
N_2O = nitrous oxide, GWP multiplier = 298
CO_2e = carbon dioxide equivalents
GWP = global warming potential as CO_2e, based on multipliers from IPCC 2007

To assist in estimating travel distances within California for construction-related and operational vehicle trips, a map program was used to measure distances between the Solar Farm site and various communities. The results of that analysis are presented in Table D3-4. The analysis of emissions from construction-related truck trips was limited to truck travel in California. No attempt was made to estimate the residency pattern for construction workers, but the data in Table D3-4 were used to assist in making generalized travel distance estimates.

Table D3-4.
Highway Distances Between the Solar Farm Site and Surrounding Communities

Community	1-Way Miles	Miles in SCAQMD Jurisdiction	1-Way Miles By Air Basin			% Miles By Air Basin		
			South Coast	Salton Sea	Mojave Desert	South Coast	Salton Sea	Mojave Desert
Blythe	55	27	55	0	0	100.0%	0.0%	0.0%
Twentynine Palms	84	37	84	0	0	100.0%	0.0%	0.0%
Indio	60	60	16	44	0	26.7%	73.3%	0.0%
Palm Springs	81	81	16	65	0	19.8%	80.2%	0.0%
Salton City	89	75	16	73	0	18.0%	82.0%	0.0%
Brawley	123	75	16	107	0	13.0%	87.0%	0.0%
El Centro	138	75	16	122	0	11.6%	88.4%	0.0%
Yucca Valley	102	89	29	73	0	28.4%	71.6%	0.0%
Victorville	169	89	96	73	0	56.8%	43.2%	0.0%

Banning	101	101	16	72	13	15.8%	71.3%	12.9%
Morengo Valley	121	121	16	72	33	13.2%	59.5%	27.3%
Riverside	134	134	16	72	46	11.9%	53.7%	34.3%
Corona	145	145	16	72	57	11.0%	49.7%	39.3%
San Bernardino	133	133	16	72	45	12.0%	54.1%	33.8%
Fontana	137	137	16	72	49	11.7%	52.6%	35.8%
Ontario Airport	144	144	16	72	56	11.1%	50.0%	38.9%
Upland	150	150	16	72	62	10.7%	48.0%	41.3%

Criteria pollutant and greenhouse gas emission estimates associated with construction and operation of Project facilities have been presented in Sections 4.2 and 4.5 of the EIS, and are not repeated here. Section 4.2 of the EIS also summarizes daily and annual vehicle trips and VMT for construction and operational phases of each project component, so that data is not repeated here. The following sections provide additional information specific to the analyses of emissions from construction truck traffic, construction worker traffic, and operational traffic.

CONSTRUCTION-RELATED HEAVY-DUTY TRUCK TRAFFIC ANALYSES

Construction-related vehicle trip numbers were estimated using the CNSTEMIS model analyses (see Appendix D-1 and Appendix D-2). Sunlight and SCE provided preliminary estimates of construction-related truck traffic. Sunlight also provided estimates on the point of origin for most construction material deliveries. CNSTEMIS analyses allocated the applicant-supplied truck load estimates to appropriate construction phases and made further adjustments to reflect other expected truck traffic (including equipment transporters). Additional adjustments were made as necessary when changes were made to the project description. In particular, the decision to use on-site power screeners resulted in deleting estimates of sand and gravel deliveries to the Solar Farm site. Sunlight provided generalized estimates of average and maximum construction worker numbers for construction of the Solar Farm and Gen Tie Line. The CNSTEMIS model was used to develop estimates of the number of construction workers by activity phase so as to approximate Sunlight's estimate of the maximum work force. SCE provided estimates of work force requirements for the Red Bluff Substation according to type of construction activity. The SCE workforce numbers were extrapolated to the construction phases used in the CNSTEMIS analyses.

CONSTRUCTION WORKER COMMUTE TRAFFIC ANALYSES

Construction worker commute traffic for the Solar Farm was analyzed in terms of several components. Sunlight plans to provide a shuttle bus system transport most construction workers to and from the Solar Farm site, with shuttle assembly points in the Palm Springs and Blythe

areas. Some workers, however, would commute to the Solar Farm site in personal vehicles, either by choice, because they miss the shuttle connection, or because their travel route makes it inconvenient to use the shuttle buses. The analysis assumed that 10.5 percent of workers would use personal vehicles, and that 40 percent of those workers would carpool with two workers per vehicle. The remaining 89.5 percent of workers were assumed to use the shuttle buses. To provide a conservative analysis, it was assumed that the 20-passenger shuttles would have an average occupancy of 15 workers per vehicle. Workers who use the shuttle bus system would still need to drive to and from the shuttle assembly points. It was assumed that 40 percent of those trips would be by 2-person carpools.

No shuttle system use was assumed in the analysis of construction worker commute traffic for the Gen Tie Line and the Red Bluff Substation. The analysis of the Gen Tie Line assumed that for most construction phases, 25 percent of the workers would carpool with two workers per vehicle. Construction of the Red Bluff Substation might be done by SCE crews or by contractor. SCE will require any contractors bidding on the project to provide a transportation plan for outlining procedures that would be used to reduce construction worker commute traffic. The analysis of construction worker commute traffic for the Red Bluff Substation assumed that for most construction phases, 50 percent of the workers would carpool with two workers per vehicle.

OPERATIONAL TRAFFIC ANALYSES

The only component of the Project that would have on-site operational employees would be the Solar Farm. The Solar Farm would have only 10 to 15 workers on-site on any given day. Due to the low number of on-site employees, the analysis of operational worker commute emissions assumed no shuttle system or carpooling.

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Rimpo and Associates. 2008. **URBEMIS2007 Version 9.2.4.** Computer program downloaded from URBEMIS website http://www.urbemis.com. Accessed on February 18, 2008.

APPENDIX D-4

WIND EROSION EMISSIONS ANALYSIS INFORMATION

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FUGITIVE DUST EMISSIONS FROM WIND EROSION

Introduction

Wind can move soil particles by three general processes: surface creep (rolling along the ground surface), saltation (a bouncing movement along the ground surface caused by particle collisions that help force a particle into the air for a brief time before it falls back to the ground), and suspension transport (particles lofted into the air and remaining suspended for more than a minute). Surface creep and saltation typically account for most soil mass movement associated with wind erosion, and normally involve larger sand-size soil particles. Suspension transport normally involves smaller silt and clay size soil particles. From an air pollution standpoint, suspension transport of soil particles is the wind erosion process that generates fugitive dust.

The extent of fugitive dust generated by wind erosion is affected by numerous factors, including:

- Soil texture (the mix of clay, silt, and sand sized particles in a soil);
- Particle aggregation (mostly due to clay content);
- Soil moisture conditions;
- Organic matter content of soils;
- Non-erodible surface features (gravel, rocks, boulders, rock outcrops, etc.);
- Extent and density of vegetation cover;
- Surface crusting – mineral or biological crusts – especially between vegetation stems;
- Wind speed;
- Vertical air turbulence;
- Sedimentation of erodible material from upslope water erosion or from flood deposits; and
- Active disturbance of surface soils.

Soil moisture conditions and surface conditions are important factors determining the vulnerability of an area to wind erosion. In desert areas, soil moisture levels are high only during and after rainfall or flash flood events. Consequently, soil moisture levels in desert areas are high enough to influence wind erosion processes for only brief intermittent periods.

The surface features of greatest importance are non-erodible surface material, vegetation cover, mineralized soil crusts, and biological soil crusts. The most common types of non-erodible surface materials in deserts include scattered rocks and boulders, rock formation outcrops, and desert pavement. Desert pavements are areas with rock fragments of pebble to cobble size that cover an underlying layer of sand, silt, or clay. Desert pavement areas typically have little or no

vegetation cover. The extent to which desert pavement reduces wind erosion and resulting fugitive dust depends on the density of the rock fragments covering the underlying soil.

Vegetation is commonly the primary feature affecting natural wind erosion conditions. Both live and dead vegetation can reduce wind erosion. Studies of the effect of vegetation on wind erosion show that:

- Canopy cover is a better predictor of wind erosion control than overall biomass.
- The effectiveness of vegetation cover in reducing wind erosion is strongly non-linear, with even low vegetation cover values providing meaningful reductions in wind erosion.
- Upright vegetation is more effective at reducing wind erosion than the same vegetation knocked flat against the ground.
- For a given biomass, vegetation with multiple thin stems is more effective at reducing wind erosion than vegetation with fewer thick stems.
- A vegetation structure with canopy cover distributed down to ground level is more effective than vegetation structure with the canopy limited to the tops of tall stems or trunks.

Vegetation plantings often provide a more effective windbreak than solid barriers of equivalent height. Solid barriers tend to generate air turbulence along the upwind side, over the top of the barrier, and at the ends of the barrier. This air turbulence increases localized wind erosion. Somewhat porous windbreaks, such as vegetation plantings, reduce wind speeds in the downwind area without off-setting increases in wind turbulence.

Surveys of the proposed solar farm site indicate that there are areas of desert pavement in both the northwest and southwest portions of the site. An estimated 20 to 30 percent of the overall site has moderate to strong desert pavement, with an additional 5 to 15 percent of the overall site having weakly developed desert pavement (Earth Systems Southwest 2010a). The remainder of the solar farm site is typical Mojave Desert vegetation on a sandy soil. Vegetation cover, mineral soil crusts, and biological soil crusts all help reduce fugitive dust from wind erosion from such areas. Existing vegetation at the solar farm site provides an estimated 15 percent canopy coverage, with little or no stable biological or mineral crusts in the open areas between desert shrubs (Hughes 2010).

Geotechnical studies conducted at the solar farm site indicate sandy soils throughout the site, with a typical silt plus clay content of 5 to 13 percent (Eberhart/United Consultants 2007; Earth Systems Southwest 2010b). The Natural Resources Conservation Service (NRCS) has conducted limited soil surveys on some private agricultural lands near Desert Center. Agricultural development of desert soils typically results in an increase in organic matter content, resulting in a more loamy texture to the soils than would occur without agricultural development. Agricultural lands near the solar farm site were generally characterized as gravelly loamy, coarse sand, or loamy sand with a high potential for wind erosion (Houdeshell 2010).

Overview of the WNDEROSN Model

Fugitive dust emissions from wind erosion have been estimated using a spreadsheet model (WNDEROSN) that was developed from analyses used to model wind erosion and dust storm conditions at Mono Lake in the early 1990s. The spreadsheet model generates a sigmoidal curve equation based on a minimum of two data points: a zero value point at the threshold wind speed for initiating wind erosion, and a practical maximum emission rate normally set at a wind speed of 50 mph. The sigmoidal curve equation can be fitted to data points for additional wind speed values if portable wind tunnel study data are available. Most environmental assessments, however, lack project-specific portable wind tunnel data, and thus rely on a default curve generated from the assumed wind speed threshold for initiating wind erosion and a practical maximum wind erosion rate based on comparison to emission rates from other types of soil disturbance.

The spreadsheet model also includes default emission reduction equations that can be used to assess the effects of vegetation cover on wind erosion. The vegetation cover effectiveness equations also can be used in assessing wind erosion reduction from other types of ground cover (desert pavement, solar arrays, etc.) by converting coverage values for those conditions into "equivalent vegetation cover" factors.

The spreadsheet model provides default maximum emission rates based on other types of soil disturbance, all of which have emission rates that vary according to soil clay plus silt content. The following types of conditions are used for setting the maximum wind erosion rate:

- Fugitive dust form agricultural tilling;
- Fugitive dust from general construction activity;
- Fugitive dust from vehicle travel on unpaved dirt roads, with an adjustment for silt depletion on heavily used unpaved roads; and
- Fugitive dust from vehicle travel on unpaved dirt roads, assuming no silt content depletion compared to adjacent soils.

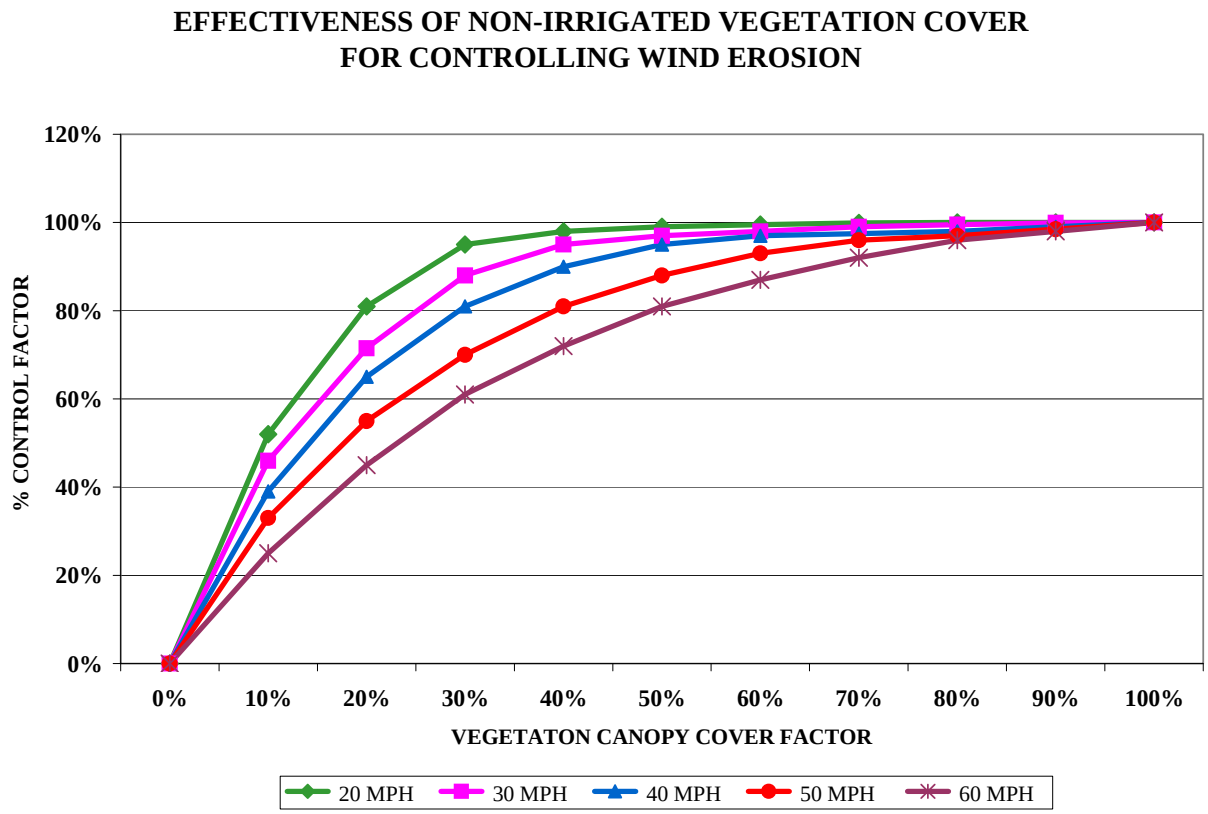
The spreadsheet model provides three general categories of default equations:

- Normal wind erosion conditions, using maximum wind erosion rates based on agricultural tilling or construction site fugitive dust, whichever is greater for the soil conditions of interest;
- Unusual wind erosion conditions (high silt content soils with little clay content, oxidized peat soils, diatomaceous earth sediments, etc.), using maximum wind erosion rates based on unpaved dirt roads with silt depletion compared to adjacent soils; and
- Extreme wind erosion conditions (unconsolidated volcanic ash deposits, etc.), using maximum wind erosion rates based on unpaved dirt roads with no silt depletion.

The normal wind erosion condition equations are applicable to the project area.

The basic equations generated by the WNDEROSN model apply to barren soil conditions. The model includes optional equations that can be used to estimate the wind erosion control effect of vegetation cover. The effectiveness of vegetation cover in reducing wind erosion varies with wind speed. Figure D4-1 illustrates the default vegetation cover effectiveness estimates used in the WNDEROSION model.

Figure D4-1



Parameters Used for the Desert Sunlight Analysis

The wind erosion analysis for the Solar Farm site was prepared as a net change analysis comparing the developed Solar Farm site conditions to existing natural conditions. All analyses used the normal wind erosion condition equations and a 7 percent clay plus silt content. Annual emission estimates were developed by estimating the annual wind speed frequency distribution for the project area, and then applying the wind erosion equations to that wind speed frequency distribution to generate an annual barren ground wind erosion emission estimate. The barren ground wind erosion data were then adjusted for natural conditions (ground cover by vegetation, desert pavement, and soil biological crusts) to produce an annual baseline wind erosion estimate. For the Solar Farm layout alternatives, the barren ground wind erosion data were adjusted for ground cover by Solar Farm facilities (converting ground cover by solar arrays, building and

equipment pads, gravel roads, etc. to equivalent vegetation cover values) to produce annual developed site wind erosion estimates. The difference between annual wind erosion estimates for the developed Solar Farm layouts and baseline conditions represents the net change in wind erosion conditions for the site.

No site-specific wind speed data was readily available, so data from other locations was used to develop estimates for the project area. Hourly wind speed data was not readily available for the Blythe airfield. The closest location with a reasonable period of readily available hourly wind data was the Barstow-Daggett airfield in San Bernardino County (WebMet 2010). Hourly wind speed data from Barstow-Daggett for January 1980 through December 1990 were used to establish a basic wind speed frequency profile. A comparison of summary wind statistics for the Barstow-Daggett and Blythe airfields showed that wind speeds at Blythe were noticeably lower than concurrent wind speeds at Barstow-Daggett. The mean wind speed at Barstow-Daggett was 11.4 mph for 1996 – 2006, while the mean wind speed at Blythe was 7.9 mph for the same period (Western Regional Climate Center 2007). Consequently, the Barstow-Daggett hourly wind data were adjusted by the ratio of mean wind speeds to approximate a wind speed profile for Blythe. The estimated wind speed profile for Blythe was assumed to be representative of wind speeds in the Project area. This analysis procedure produced a mean wind speed estimate at Blythe of 8.1 mph for the 1980 through 1990 data, with a maximum hourly average wind speed of 36 mph. Table D4-1 summarizes the wind speed distribution generated from the 1980 through 1990 data.

Table D4-1.

Estimated Wind Speed Distribution for the Project Area

Wind Speed, mph	Incremental Percent of Hours	Cumulative Percent of Hours
0	8.654%	8.65%
1	0.004%	8.66%
2	2.083%	10.74%
3	5.676%	16.42%
4	9.583%	26.00%
5	6.121%	32.12%
6	6.300%	38.42%
7	12.800%	51.22%
8	10.982%	62.20%
9	3.572%	65.78%
10	6.287%	72.06%
11	6.117%	78.18%
12	5.556%	83.74%
13	1.606%	85.34%
14	1.684%	87.03%
15	3.544%	90.57%
16	3.915%	94.48%
17	0.617%	95.10%

Wind Speed, mph	Incremental Percent of Hours	Cumulative Percent of Hours
18	1.152%	96.25%
19	0.669%	96.92%
20	0.595%	97.52%
21	1.361%	98.88%
22	0.203%	99.08%
23	0.377%	99.46%
24	0.070%	99.53%
25	0.301%	99.83%
26	0.053%	99.88%
27	0.033%	99.91%
28	0.016%	99.93%
29	0.047%	99.98%
30	0.004%	99.98%
31	0.007%	99.99%
32	0.001%	99.99%
33	0.007%	100.00%
34	0.000%	100.00%
35	0.000%	100.00%
36	0.001%	100.00%
37	0.000%	100.00%
38	0.000%	100.00%
39	0.000%	100.00%
40	0.000%	100.00%
41	0.000%	100.00%
42	0.000%	100.00%
43	0.000%	100.00%
44	0.000%	100.00%
45	0.000%	100.00%

The wind erosion equation generated for the project area was based on sandy soils with a silt plus clay fraction of 7 percent and an 18-mph threshold for the initiation of wind erosion. The sigmoidal equation generated by the WNDEROSN model for the Solar Farm site was:

$$Q = \frac{0.00048907*0.514206*[0.944748+e^{(-4.85366+0.170731707*U)} - e^{(-1*(-.85366+0.170731707*U))}]}{[0.944748+e^{(-4.85366+0.170731707*U)} + e^{(-1*(-.85366+0.170731707*U))}]}$$

where:

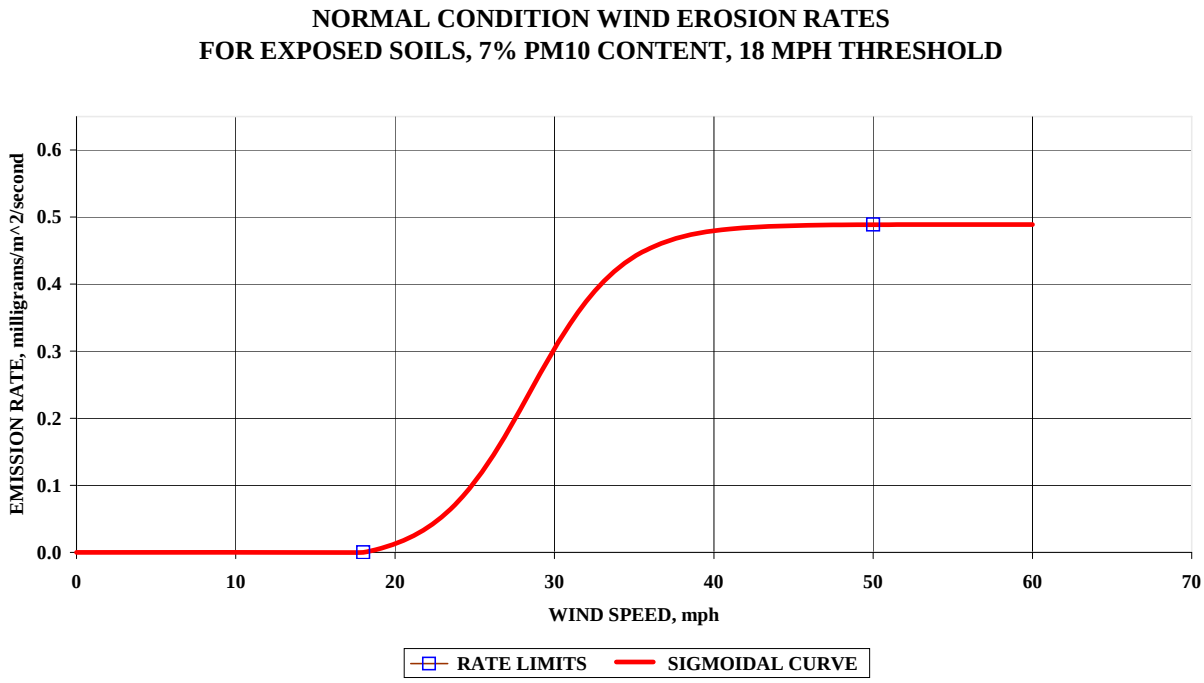
Q = wind erosion rate for PM_{10} in grams per square meter per second

e = the base for natural logarithms

U = hourly average wind speed in mph

Figure D4-2 illustrates the PM_{10} wind erosion rates estimated for the project area as a function of hourly average wind speed.

Figure D4-2



The wind erosion rates illustrated in Figure D4-2 represent barren soil conditions. Under existing conditions, these emission rates are reduced by the combination of vegetation cover, desert pavement cover, and soil biological crust cover. Desert pavement conditions vary in different portions of the site, with most desert pavement areas showing moderate to strong development. For simplicity in the wind erosion analysis, the overall desert pavement coverage was assumed to be equivalent to 35 percent area coverage with moderately strong desert pavement development. The Solar Farm site does not have extensive soil biological crusts. A nominal 5 percent of the Solar Farm site was assumed to have soil biological crusts. The remaining 60 percent of the Solar Farm site was assumed to have a vegetation cover of about 15 percent.

The vegetation cover effect equations in the WNDEROSN model were used to estimate wind erosion reductions attributable to desert pavement and soil crusts. This was accomplished by assigning a “vegetation cover equivalence factor” to these types of surface coverings. Soil biological crusts were assumed to be as effective in reducing wind erosion as vegetation with 35 percent vegetation canopy coverage. Desert pavement areas were assumed to be as effective in reducing wind erosion as vegetation with 50 percent canopy coverage. For existing conditions,

the combination of vegetation, desert pavement, and soil biological crusts would be equivalent to vegetation with 28.3 percent canopy coverage across the entire Solar Farm site.

Development of the Solar Farm would remove existing vegetation, soil biological crusts, and desert pavement from the site, replacing these features with gravel road and parking areas; buildings and equipment pads; solar panel arrays; and open areas that have been compacted and treated with dust palliatives. Solar Farm operations would have limited site disturbance from periodic security, equipment inspection, and equipment maintenance activities. On-site traffic volumes would be quite low compared to the construction period. Areas covered by buildings and equipment pads would be completely protected from wind erosion. Areas covered by gravel surfaces or by solar arrays would be partially protected from wind erosion. Mitigation measures recommended in the EIS text include annual re-application of dust palliatives to gravel roads and open areas.

Evaluation of wind erosion rates for the Solar Farm alternatives required assigning a vegetation cover equivalence factor to each of the categories of physical features that would be present following construction. Buildings and equipment pads were assigned a vegetation cover equivalence factor of 100 percent. Gravel roads and parking areas were assigned a vegetation cover equivalence factor of 27 percent. Previous compaction and dust palliative applications for open areas of the site would reduce wind erosion from these areas. In addition, open areas between the solar panel arrays would receive wind shielding from the array structures, especially for the predominant wind directions. Given these considerations, open areas of the site were assigned a vegetation cover equivalence factor of 23 percent.

Approximately one third of the Solar Farm site would be directly covered by solar panel arrays. The solar panel arrays would have a windbreak effect that varies according to wind direction. The panel arrays would be aligned in an east-west direction, with the panels would be sloped to the south. The vegetation cover equivalence factor assigned to the areas directly covered by the solar panels was varied according to wind direction. For winds from the south, the vegetation cover equivalence factor was set equal to the area coverage factor for the solar panels (33 percent for Solar Farm Layout B and 34.1 percent for Solar Farm Layout C). For north winds, the vegetation cover equivalence factor was set at 5 percentage points less than the physical area coverage for the solar panels, since the slope of the panels would generate some downward wind turbulence when winds blow from the north. The linear solar array layout would result in only limited wind erosion reduction for winds from the east or west. The vegetation cover equivalence factor for east and west winds was set at 8 percent. Overall wind direction frequencies were assumed to be 35 percent for north winds, 5 percent for east winds, 45 percent for south winds, and 15 percent for west winds. Table D4-2 summarizes the vegetation cover equivalence factors and resulting wind erosion reduction factors used for the analysis.

Table D4-2.

Summary of Wind Erosion Control Factors for Solar Farm Features

Parameter	Wind Speed, mph	Vegetation Cover Equivalence Factor	Percent Reduction in Wind Erosion Rates		
			Existing Conditions	Solar Farm Layout B	Solar Farm Layout C
Vegetation Cover	20	15.0%	69.8%	0.0%	0.0%
	30	15.0%	58.2%	0.0%	0.0%
	40	15.0%	54.9%	0.0%	0.0%
	50	15.0%	44.8%	0.0%	0.0%
	60	15.0%	35.8%	0.0%	0.0%
Soil Biological Crusts	20	35.0%	96.5%	0.0%	0.0%
	30	35.0%	92.1%	0.0%	0.0%
	40	35.0%	84.5%	0.0%	0.0%
	50	35.0%	76.1%	0.0%	0.0%
	60	35.0%	66.7%	0.0%	0.0%
Desert Pavement	20	50.0%	99.1%	0.0%	0.0%
	30	50.0%	97.0%	0.0%	0.0%
	40	50.0%	93.8%	0.0%	0.0%
	50	50.0%	88.2%	0.0%	0.0%
	60	50.0%	81.0%	0.0%	0.0%
Gravel Surfaced Areas with dust palliative treatments	20	27.0%	0.0%	92.2%	92.2%
	30	27.0%	0.0%	85.4%	85.4%
	40	27.0%	0.0%	75.9%	75.9%
	50	27.0%	0.0%	66.2%	66.2%
	60	27.0%	0.0%	56.2%	56.2%

Parameter	Wind Speed, mph	Vegetation Cover Equivalence Factor	Percent Reduction in Wind Erosion Rates		
			Existing Conditions	Solar Farm Layout B	Solar Farm Layout C
Open Areas with dust palliative treatments	20	23.0%	0.0%	88.0%	88.0%
	30	23.0%	0.0%	79.6%	79.6%
	40	23.0%	0.0%	70.3%	70.3%
	50	23.0%	0.0%	60.0%	60.0%
	60	23.0%	0.0%	50.1%	50.1%
Solar Arrays, North Wind Conditions	20	28.0% - 29.1%	0.0%	93.0%	93.7%
	30	28.0% - 29.1%	0.0%	86.6%	87.7%
	40	28.0% - 29.1%	0.0%	77.2%	78.5%
	50	28.0% - 29.1%	0.0%	67.6%	69.1%
	60	28.0% - 29.1%	0.0%	57.7%	59.2%
Solar Arrays, East Wind Conditions	20	8%	0.0%	44.0%	44.0%
	30	8%	0.0%	39.5%	39.5%
	40	8%	0.0%	35.0%	35.0%
	50	8%	0.0%	27.4%	27.4%
	60	8%	0.0%	20.7%	20.7%
Solar Arrays, South Wind Conditions	20	33.0% - 34.1%	0.0%	95.8%	96.2%
	30	33.0% - 34.1%	0.0%	90.9%	91.6%
	40	33.0% - 34.1%	0.0%	82.6%	83.7%
	50	33.0% - 34.1%	0.0%	73.9%	75.2%
	60	33.0% - 34.1%	0.0%	64.3%	65.6%

Parameter	Wind Speed, mph	Vegetation Cover Equivalence Factor	Percent Reduction in Wind Erosion Rates		
			Existing Conditions	Solar Farm Layout B	Solar Farm Layout C
Solar Arrays, West Wind Conditions	20	8%	0.0%	44.0%	44.0%
	30	8%	0.0%	39.5%	39.5%
	40	8%	0.0%	35.0%	35.0%
	50	8%	0.0%	27.4%	27.4%
	60	8%	0.0%	20.7%	20.7%
Overall Site Conditions	**20**	**24.4% - 28.3%**	**93.2%**	**89.7%**	**90.0%**
	30	**24.4% - 28.3%**	**86.9%**	**81.9%**	**82.4%**
	40	**24.4% - 28.3%**	**77.6%**	**72.4%**	**72.8%**
	50	**24.4% - 28.3%**	**68.0%**	**62.3%**	**62.8%**
	60	**24.4% - 28.3%**	**58.1%**	**52.3%**	**52.8%**

Under existing conditions for the assumed wind speed distribution, natural vegetation and ground cover conditions provide a 90.5 percent reduction from barren ground wind erosion rates. Under developed Solar Farm conditions with the assumed wind speed distribution, the developed Solar Farm site would provide an 86.4 percent reduction from barren ground wind erosion rates under Solar Farm Layout B, and an 86.8 percent reduction from barren ground wind erosion rates under Solar Farm Layout C. Table D4-3 summarizes the net changes in wind erosion rates estimated by the WNDEROSN model.

Table D4-3.

Estimated Net Changes in Wind Erosion Rates for the Solar Farm Site

Parameter	**Units**	**Solar Farm Site B**	**Solar Farm Site C**
Site Acres	Acres	4,245	3,045
Barren Ground Wind Erosion Rate for PM_{10}	Tons Per Year	818.0	586.8
Natural Condition Wind Erosion Rate for PM_{10}	Tons Per Year	78.0	55.9
Developed Solar Farm Condition Wind Erosion Rate for PM_{10}	Tons Per Year	111.7	77.2
Net Change, Solar Farm versus Natural Conditions	**Tons Per Year**	**33.7**	**21.2**
Net Change, Solar Farm versus Natural Conditions	**Pounds Per Acre Per Year**	**15.863**	**13.943**

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APPENDIX D-5

GREENHOUSE GAS EMISSIONS AVOIDED THROUGH DISPLACEMENT OF ALTERNATIVE POWER GENERATION SOURCES

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INTRODUCTION

The proposed Solar Farm would have a power generation capacity of 550 MW under Solar Farm Layout B, and 413 MW under Solar Farm Layout C. These power generation capacities translate into an estimated 1.2 billion kilowatt-hours of electrical power generation per year for Solar Farm Layout B and 901 million kilowatt-hours or electrical power generation per year for Solar Farm C. Southern California Edison (SCE) and Pacific Gas and Electric (PG&E) have signed power purchase agreements with Desert Sunlight. Based on their respective power purchase agreements, SCE would receive 45.45 percent of the power generated by the Solar Farm and PG&E would receive 54.55 percent of the power.

Electrical power is distributed through an integrated transmission system grid with multiple inter-connected power generation sources. Electrical power demand at any time is balanced among available sources of power generation. Any new source of power generation added to the grid necessarily affects power generation by other power plants that are connected to the transmission grid, since total power generation must be balanced against current power demand. Consequently, power generation by the Proposed Project will effectively displace other power generation sources that otherwise would be used to meet the prevailing electrical power demand in the SCE and PG&E service areas.

POWER GENERATION MIXES FOR SCE AND PG&E

Both SCE and PG&E rely on a mix of power generation sources to meet electrical power demands in their respective service areas. Tables D5-1 and D5-2 summarize current (2009) overall power generation mixes for SCE and PG&E, respectively. Also included in Tables D5-1 and D5-2 are average greenhouse gas emission rates associated with each type of power source.

Table D5-1.
Summary of 2009 Power Generation Mix for SCE

Power Plant Type	Percent of Annual Power Generation	Emission Factor, Pounds per Kilowatt-Hour			
		CO_2	CH_4	N_2O	GWP as CO_2e
Coal	10.0%	0.710	0.000075	0.000011	**0.715**
Large Hydro	5.0%	0.000	0.000000	0.000000	**0.000**
Natural Gas	50.7%	0.399	0.000007	0.000001	**0.399**
Nuclear	17.9%	0.000	0.000000	0.000000	**0.000**
Biomass/Waste	2.0%	0.706	0.000226	0.000030	**0.720**
Geothermal	9.0%	0.057	0.000000	0.000000	**0.057**
Small Hydro	1.0%	0.000	0.000000	0.000000	**0.000**
Solar	1.0%	0.000	0.000000	0.000000	**0.000**
Wind	3.0%	0.000	0.000000	0.000000	**0.000**

Power Plant Type	Percent of Annual Power Generation	Emission Factor, Pounds per Kilowatt-Hour			
		CO_2	CH_4	N_2O	GWP as CO_2e
Other	0.5%	0.000	0.000000	0.000000	**0.000**
Total	**100.0%**	**0.292**	**0.000015**	**0.000002**	**0.293**
Renewable Sources	**16.4%**	**0.116**	**0.000027**	**0.000004**	**0.118**

CO_2 = carbon dioxide, GWP multiplier = 1
CH_4 = methane, GWP multiplier = 25
N_2O = nitrous oxide, GWP multiplier = 298
CO_2e = carbon dioxide equivalents
GWP = global warming potential as CO_2e, based on multipliers from IPCC 2007
Data Sources: Southern California Edison (2009); California Air Resources Board (2008)

Table D5-2.
Summary of 2009 Power Generation Mix for PG&E

Power Plant Type	Percent of Annual Power Generation	Emission Factor, Pounds per Kilowatt-Hour			
		CO_2	CH_4	N_2O	GWP as CO_2e
Coal	2.0%	0.710	0.000075	0.000011	**0.715**
Large Hydro	15.8%	0.000	0.000000	0.000000	**0.000**
Natural Gas	46.3%	0.399	0.000007	0.000001	**0.399**
Nuclear	19.7%	0.000	0.000000	0.000000	**0.000**
Biomass/Waste	3.9%	0.706	0.000226	0.000030	**0.720**
Geothermal	3.9%	0.057	0.000000	0.000000	**0.057**
Small Hydro	3.9%	0.000	0.000000	0.000000	**0.000**
Solar	0.5%	0.000	0.000000	0.000000	**0.000**
Wind	3.0%	0.000	0.000000	0.000000	**0.000**
Other	1.0%	0.000	0.000000	0.000000	**0.000**
Total	**100.0%**	**0.229**	**0.000014**	**0.000002**	**0.230**
Renewable Sources	**16.3%**	**0.185**	**0.000055**	**0.000007**	**0.188**

CO_2 = carbon dioxide, GWP multiplier = 1
CH_4 = methane, GWP multiplier = 25
N_2O = nitrous oxide, GWP multiplier = 298
CO_2e = carbon dioxide equivalents
GWP = global warming potential as CO_2e, based on multipliers from IPCC 2007
Data Sources: Pacific Gas & Electric (2009); California Air Resources Board (2008)

Based on 2009 data, both SCE and PG&E obtain slightly more than 16 percent of their power generation from renewable energy sources. Both utilities, however, are still below the Renewable Portfolio Standard of 20 percent by 2010.

GREENHOUSE GAS EMISSIONS AVOIDED THROUGH THE USE OF DESERT SUNLIGHT POWER INSTEAD OF ALTERNATIVE POWER SOURCES

Because operation of electrical power distribution grids balances power generation from multiple power sources against prevailing power demand, the addition of power from the Desert Sunlight project would necessary result in compensating reductions in power generation from other power plants connected to the grid. As discussed in the EIS text, operation of the Solar Farm and associated substations will directly and indirectly generate small amounts of greenhouse gases throughout the operational life of the Project. Direct greenhouse gas emissions would come primarily from sulfur hexafluoride emissions associated with substation equipment. Indirect greenhouse gas emissions would come from vehicle traffic associated with operation and maintenance activities for the Solar Farm, Gen-Tie Line, and Red Bluff Substation.

The small quantities of direct and indirect greenhouse gas emissions associated with Solar Farm operations would be more than off-set by greenhouse gas emissions avoided through the use of solar power instead of alternative power sources. Relative power generation costs and operational flexibility would typically be dominant factors in determining which power generation sources are displaced by power from the Desert Sunlight Project. An additional consideration, however, is the fact that all power plants are subject to scheduled and unscheduled maintenance shutdowns. Consequently, power from the Desert Sunlight Project could, over the course of a year, displace or replace power from any other existing power generation source being used by SCE and PG&E. The existing power mixes for SCE and PG&E have been used to provide a conservative estimate of the greenhouse gas emissions avoided through use of power generated by the Desert Sunlight Project. Tables D5-3 and D5-4 summarize the amounts of greenhouse gas emissions avoided annually through use of Desert Sunlight power from Solar Farm Layouts B and C, respectively.

Table D5-3.
Avoided Greenhouse Gas Emissions For SCE and PG&E
Using Power From Solar Farm Layout B

Utility	Annual Power Received From the Solar Farm B, kilowatt-hours per year	Avoided Greenhouse Gas Emissions, Tons Per Year			
		CO_2	CH_4	N_2O	GWP as CO_2e
SCE	545,454,545	79,678.9	4.203	0.574	**79,955.0**
PG&E	654,545,455	74,852.1	4.422	0.575	**75,133.9**
Total	**1,200,000,000**	**154,531.0**	**8.625**	**1.148**	**155,088.9**

CO_2 = carbon dioxide, GWP multiplier = 1
CH_4 = methane, GWP multiplier = 25
N_2O = nitrous oxide, GWP multiplier = 298
CO_2e = carbon dioxide equivalents
GWP = global warming potential as CO_2e, based on multipliers from IPCC 2007

Table D5-4.
Avoided Greenhouse Gas Emissions For SCE and PG&E
Using Power From Solar Farm Layout C

Utility	Annual Power Received From the Solar Farm B, kilowatt-hours per year	Avoided Greenhouse Gas Emissions, Tons Per Year			
		CO_2	CH_4	N_2O	GWP as CO_2e
SCE	409,586,777	60,130.8	3.172	0.433	**60,339.1**
PG&E	491,504,132	57,050.2	3.370	0.438	**57,265.0**
Total	**901,090,909**	**117,181.0**	**6.542**	**0.871**	**117,604.1**

CO_2 = carbon dioxide, GWP multiplier = 1
CH_4 = methane, GWP multiplier = 25
N_2O = nitrous oxide, GWP multiplier = 298
CO_2e = carbon dioxide equivalents

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APPENDIX D-6

WIND EROSION MEMORANDUM

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Memorandum

To	Bureau of Land Management Palm Springs - South Coast Field Office
Subject	Wind Erosion, PM10, and PM2.5 Formation at Desert Sunlight Solar Farm Site
From	Amanda Beck, First Solar
Date	December 27, 2010

Wind Erosion, PM10, and PM2.5 Formation at Desert Sunlight Solar Farm Site

INTRODUCTION

This report provides an estimate of the change in emissions of particulate matter (PM) from the modified First Solar Desert Sunlight Solar Farm Project (Project) site due to wind erosion. The change is evaluated based on comparing the wind erosion emissions during normal operations (i.e., post-construction) from the modified Project to wind erosion emissions from the pre-Project condition (i.e., undisturbed desert). The modified Project reduces the footprint and alters the conditions of the disturbed soil which will alter the quantity of soil eroded and emissions formed. The potential impacts of the Project from PM emission are being assessed by BLM as part of the environmental review process for the Project under the National Environmental Protection Act (NEPA).

The Project will be located in an arid desert area with a variety of soils and geologic conditions that are influenced by wind (aeolian) processes. There are two principal processes by which wind erosion occurs: creep and saltation. Creep is the process by which kinetic energy is transferred from the wind to a soil particle causing the particle to move along the ground. Saltation occurs when the moving particle collides with a stationary particle or object and becomes temporarily airborne before returning to the soil surface. The creeping or saltating particle can impact and shatter in the collision, resulting in additional suspended airborne particles. These processes are initiated when wind energy immediately above the ground exceeds the creep/saltation threshold for the soils at the site, at which point soil particles of various sizes can be suspended and carried by the wind. The majority of creeping and saltating particles settle quickly and thus do not contribute to emissions, but do contribute to soil erosion. Similarly, the majority of suspended particles do not contribute to emissions; only some of this suspended particulate matter is smaller than 10 micrometers (µm) (PM10), and an even smaller proportion is smaller than 2.5 µm (PM2.5). Together, these fine particulates are criteria air pollutants. Only the PM that becomes suspended and subsequently exits the boundary of the Project site would be considered emissions.

METHODOLOGY

Wind erosion leading to PM emissions is a complex process. Quantifying potential PM emissions requires understanding various physical factors that lead to wind erosion. These factors include soil properties, climatological conditions such as wind and precipitation, the hydrologic and physical properties of the soils, and the boundary layer meteorological attributes of the site, such as characterization of surface roughness, friction velocity, and vertical wind profile.

To estimate emissions from the pre-Project undisturbed desert, AECOM used the Wind Erosion from Unpaved Operational Areas calculation recommended by the Mojave Desert Air Quality Management District in it's Emissions Inventory Guidance: Mineral Handling and Processing Industries (MDAQMD model), which is adapted from Industrial Wind Erosion discussion (§13.2.5) in USEPA's AP-42 (MDAQMD 2000). This model is believed to provide a representative emissions estimate from undisturbed desert.

A number of wind erosion models for use in estimating wind-blown dust emissions from the Project were reviewed. To date, no single model that adequately addresses all of the parameters that would contribute to changes in windblown dust emissions due to the Project, such as the change from natural vegetation to the installation of solar panels or from soil compaction were identified. Due to these limitations, two models are used in combination to estimate emissions, and certain other factors are discussed qualitatively rather than quantitatively. To estimate uncontrolled emissions from Project site during normal operations, emissions from the Project site were calculated using the MDAQMD model, assuming all vegetation is removed. Then the Wind Erosion Prediction System (WEPS) model developed by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) (Skidmore and Hagen 2000) was used to estimate the reduction in wind erosion emissions that could be attributed to site compaction. Finally, the reduction in emissions that can be attributed to the application of dust palliatives was estimated. A method to quantitatively evaluate the influence solar panels would have on wind erosion emissions was not identified; however, a qualitative assessment of the influence that solar panels would likely have on the wind erosion emissions is provided.

Both the WEPS and MDAQMD models require various input parameters. A discussion of how those parameters are defined and applied to the models is provided in the following sections.

Overview of Models

The MDAQMD model was developed for consistency, accuracy, and fairness when permitting mineral handling and processing industries and provides various levels of complexity, dependent upon availability of environmental data such as wind data and soil conditions.

The NRCS developed WEPS to estimate wind erosion from agricultural fields. It is a comprehensive model that includes modules to account for meteorological process (i.e., rain and wind) that result in wind erosion, boundary layer meteorological effects that govern the transfer of energy from the wind to particles on the ground, physical and hydrological properties of the soil that govern its susceptibility to erosion, the physics of creep and saltation that produce movement of soil particles, and the influence of agricultural crops on the wind flow over the field.

Vegetation in the WEPS model is dealt with in a manner specific to agriculture, rather than the general coverage method used in the MDAQMD model. Because the WEPS model is intended for agricultural fields, the existing vegetation type at the Project site is not contained within the WEPS crops database. Also, the plant communities in the database have little resemblance to the existing site vegetation. AECOM evaluated the crop module of WEPS with sensitivity testing of alternative plant community designations and densities. However, we ultimately concluded that use of the crop module in WEPS introduced unacceptable uncertainty into the analysis because of the generally ad-hoc assumptions that were required.

Both the WEPS and MDAQMD models were used to offset the limitations of each individual model. The WEPS model is intended for use in evaluating soil erosion in agricultural fields, but not in natural or non-agricultural landscapes, while the MDAQMD model is an adaptation of USEPA's model for a desert landscape, but does not have the complexity necessary to account for all the changes due to construction of the Project such as soil compaction or the installation of solar panels. As discussed below, a number of conservative assumptions were necessary in order to apply the two models for the Project site.

Site Soils

The soils in the region of the Project site have been mapped by the NRCS (U.S. Department of Agriculture 2006) to be approximately 80 percent gravel-based Vaiva-Quilotosa-Hyder-Cipriano-Cherioni and 20 percent sand-based Rositas-Dune land-Carsitas. Geotechnical studies of the Project site were conducted as part of the Project development and environmental review process (Earth Systems Southwest 2010). Five test pits were excavated during the geotechnical survey in order to characterize site soils. Of these test pits, four show sandy soil consistent with the Rositas-Dune land-Carsitas series, while only one test pit shows gravelly soil consistent with the Vaiva-Quilotosa-Hyder-Cipriano-Cherioni series. In general, the susceptibility to wind erosion of gravel-based soil is much less than that of sand-based soil due to the higher concentration of large particles in the gravel-based soil. Consequently, AECOM made the conservative assumption (i.e., conservative in that it will allow a high estimate of soil erosion), that the soil on the Project site is the sand-based Rositas-Dune land-Carsitas soil type. In addition, approximately 30 percent of the site is composed of naturally compacted soil, commonly referred to as “desert pavement”. This compacted and agglomerated soil is highly resistant to wind erosion, which is directly relevant to the evaluation of wind erosion from the Project site (post-construction). In order to account for the erosion resistant desert pavement, 30 percent of the proposed total Project acreage is omitted from the pre-Project emissions study. That acreage is included in the post-Project study as construction requires disturbing and re-compacting the desert pavement, leading to exposure of erosion-susceptible soil below the compact top layer.

Data describing the soil in the 2010 Project geotechnical report were used to calculate soil composition and density inputs for the WEPS model. The proportions of soil constituents were averaged from the four pits with sandy soil and the composition is estimated to be 28 percent gravel, 65 percent sand, 3 percent silt, and 4 percent clay. The one pit with gravelly soil has a composition of 60 percent gravel, 34 percent sand, 5 percent silt, and 1 percent clay. When gravel and rock fragments are neglected, as they are often not considered a soil constituent, the silt composes 13 percent of the remaining soil. This would indicate the soil from this pit to be highly susceptible to erosion, but the large proportion of gravel and rock fragments in the ground prevent all but the very surface layer of small particles from being eroded. Desert pavement is an extreme example of this phenomenon occuring over time. As this gravel-based soil was found in only one out of five test pits, and is less susceptible to erosion as compared to the sand-based soil, it was neglected in the averaging to determine the soil composition used in the WEPS model (Appendix B, Tables 1 and 2).

Soil bulk density is also a critical parameter in the WEPS model in that a soil which is more densely compacted will have fewer loose surface particles available for creep and saltation than would the same soil at a lower level of compaction, thus raising the threshold friction velocity. The threshold friction velocity is a measurement of the saltation threshold described above, and is directly proportional to the minimum wind speed required for erosion to occur. The soil bulk density values were estimated as the average maximum soil density from the geotechnical report multiplied by the estimated level of soil compaction at the Project site. The existing, undisturbed site soil’s estimated level of compaction is between 70 and 80 percent, while the post-construction level of compaction is estimated at between 84 and 89 percent, based on First Solar’s planned site preparation approach (Eberhart/United Consultants 2007). The post-construction values are derived from the weighted average density increase resulting from the planned soil compaction methods. The higher density within the range of natural soil bulk densities, 80 percent, was chosen as it would minimize pre-Project particulate emission estimates, and the lower density from the range of post-Project compacted soil bulk densities, 84 percent, was utilized to maximize the potential post-Project emission estimates. This approach leads to a conservative estimation of the existing and post-Project emissions (Appendix B, Tables 4 and 5). All other soil inputs, such as soil crust parameters and carbonate fraction, were obtained from the existing Rositas soil profile in the WEPS model database.

The MDAQMD model does not allow for variations in soil parameters, such as bulk density and composition, when determining the minimum wind speed for erosion. However, MDAQMD provides a value of 0.38 meters per second (m/s) for the threshold friction velocity of desert scrub. Published methods for determining threshold friction velocity show that this value can range by +/- 0.007 m/s (Mansell 2006, Marticorena 1997). Because the threshold friction velocity is incorporated in many parts of the MDAQMD model, small changes in this value can have a large effect on final calculated emissions, and thus a range of friction velocities were used in determining model uncertainty (Appendix C, Table 2).

The MDAQMD model also requires that the project area be determined as either a limited or unlimited source of PM. A limited source will become exhausted of PM after the wind exceeds the saltation threshold for an extended period of time, while an unlimited source can emit throughout the length of a wind event. In general, the soil at the Project site is characteristic of an unlimited PM reservoir in pre- and post-Project states, but desert pavement is characteristic of a limited PM reservoir prior to construction, but not easily defined after construction due to the possible effects of solar panels. However, to maintain consistency between the WEPS and MDAQMD models, the area that is desert pavement is neglected in the pre-Project MDAQMD model run, but included in the post-Project model runs. This has the added benefit of under-estimating pre-Project emissions, which results in a more conservative pre-Project emissions estimate calculated by the MDAQMD model (Appendix C, Tables 3 and 6).

The MDAQMD model calculates total emissions by mutiplying the calculated emissions factor by the area of the Project site. It does not account for the shape of the site. As mentioned above, the desert pavement is excluded in the pre-Project calculations, but included in post-Project calculations. This means the MDAQMD modeling for existing conditions was calculated using an area of 2,700 acres, while 3,800 acres was used in the modeling of post-construction conditions.

Site Vegetation

Project biological surveys indicate that, in general, the vegetation type for the Project site is typical desert scrub composed of sparsely populated plants with a small amount of foliage. These surveys also show average ground coverage by vegetation to be highly variable, ranging between 16 and 43 percent, with an average value of approximately 35 percent.

The MDAQMD model allows for changes in vegetation coverage. For the pre-Project emission estimates, AECOM used the average coverage value of 35 percent, while post-Project vegetation coverage used was 0 percent, as no studies could be found that compare solar panel arrays to an equivalent percentage of vegetative cover. AECOM considered using a percentage cover equivalent to a vineyard or orchard, as these types of agricultural fields are similar to solar panels in that they have an exposed base, extensive canopy, and are often located in an erosion susceptible climate. We decided against this, as the wind emission processes for vineyards and orchards are not well understood (Mansell 2006). However, it has been suggested that mature vineyards are not highly susceptible to aeolian erosion as their canopies provide good protection from wind (White 2003). For this reason, we believe that MDAQMD modeling of post-Project conditions provide a conservative over-estimate for emissions after solar panel installation.

Site Compaction

As noted, the soil would be compacted during Project construction. Compacted soil is less susptable to wind erosion. To assess the reduction in wind erosion potential due to compaction, the WEPS model is used. The limitations of the WEPS model require the field shape to be a rectangle or a quarter, half, or full circle. The Project site is approximately 3,800 acres in an irregular shape, but project site maps show nearly 30 percent of the site to be desert pavement. As explained above, the desert pavement is omitted from the modeling of existing conditions as it is nearly impervious to wind erosion. By excluding the desert pavement, the pre-Project area is reduced to approximately 2,700 acres in a shape resembling a

quarter-circle. After construction, the desert pavement is replaced with a mechanically compacted surface. Thus, the post-Project modeled area is presented in two sections closely resembling the full Project area. The same quarter-circle that was used for pre-Project modeling is again used, and a 1,100 acre square is also modeled to account for an area desert pavement that will be distrurbed during construction. Because per-acre emissions depend strongly on a field's perimeter to area ratio in the WEPS model, it was essential to model the post-Project in two pieces to best accomadate the modified Project site shape and perimeter. The project shape and modeled shape are shown graphically as Figure 1 in Appendix A.

Climate and Wind Data

The WEPS model requires both climate and wind data to determine wind erosion. While climate data is available from Eagle Mountain, CA, a town only 5 miles from the Project site, the nearest wind data comes from Blythe, CA at a distance of 40 miles. For consistency, Blythe climate and wind data were used, as Blythe is the nearest location with both sets of data available. Climate and wind data from Indio, CA is not available in the WEPS model database.

The MDAQMD model only requires mean annual wind speed in its calculation of emissions. For consistency, the annual mean of wind speed from the wind data used in the WEPS model was used for the MDAQMD modeling, which is 2.7 m/s.

Application of Dust Palliatives

A dust palliative will be applied on a periodic basis to the Project site during normal operations to reduce wind erosion PM emissions. Dust palliatives have been shown to effectively reduce PM emissions between 79 percent and 89 percent (CARB 2002, Countess 2006). This control efficiency is applied to the uncontrolled, compacted, post-Project emissions to determine the controlled post-Project emissions. The range of control efficiencies is taken into account in the uncertainty of the results (Appendix C, Table 4).

Solar Arrays

Due to the challenges and assumptions needed for incorporting solar panels in either the MDAQMD model or the WEPS model, the influence of the change from existing site vegetation to one of solar panels is discussed below in a qualitative manner based on boundary layer meteorological concepts.

With respect to wind erosion, the main effect of both existing vegetation and future solar array structures would be to reduce the wind energy reaching the ground surface of the Project Site. An estimation of low-level wind energy can be inferred from a boundary layer meteorological parameter called "surface roughness" that is characteristic of the number and size of obstacles on the ground that interfere with free wind flow across that surface. Surface roughness is a computed value with units of length that is a normalized measure of the influence that objects pose to flow of fluid (wind) past them. Using the concept of a roughness length, an idealized vertical profile of wind speed with height can be computed from boundary layer theory (Prandtl 1932). In the boundary layer, the wind speed near the surface is zero and increases with height above the ground. The rate of increase of wind speed with height is a function of the surface roughness, with the wind speed proportional to the square root of the wind energy. This relationship can be represented mathematically as a function of the natural logarithm of the height of the wind speed estimate divided by the applicable surface roughness height.

That is:

$$u(z) \propto \ln\left(\frac{z}{z_o}\right)$$

where u is wind speed, z is height of the desired wind measurement, and z_o is roughness length. This relationship shows that z_o is the height above the ground where wind speed becomes zero; therefore, as roughness length increases, the height where wind speed reaches zero will be further above the ground for all wind speeds.

Published values for z_o indicate that the surface roughness for flat desert grass and scrub is approximately 3 centimeters (cm) (Hodgin 1980). The removal of the existing vegetation and replacement with arrays of solar panels with a maximum height of approximately 2.5 meters (m) will increase the surface roughness values at the Project site. For example, the published surface roughness value for a flat island with 1 m to 2 m scrub is reported to be 16 cm (Hodgin 1980). Even if the post-Project roughness is only half this value (8 cm), the surface roughness of the Project site will still be considerably larger than that for the existing plant communities (3 cm). Then, since surface roughness is in the denominator of the above equation, the expected wind speed at any given height above the ground will be larger for the natural desert environment than for the post-Project case with its higher roughness value. It follows that the amount of kinetic energy in the surface boundary will be higher for current conditions compared to future conditions, resulting in more wind erosion potential for current conditions compared to post-construction conditions.

Based on the above qualitative analysis, exchanging desert flora for solar panels will increase the roughness length (z_o), due to the greater height of the solar panels when compared to natural desert vegetation, resulting in a lower potential for PM emissions from the Project Site. Therefore, neglecting the influence of solar panels from the post-construction emission estimates provides a conservative estimate for changes in PM emissions due to construction of the Project.

EMISSION CALCULATIONS

Modeling Parameters

Table 1 shows the input parameters for the model runs that were used to determine the change in PM emissions from pre-Project to post-Project conditions.

Table 1: Model Input Parameters

Model/Period	Field		Soil		Vegetation	Wind Speed (m/s)
	Size (acres)	Shape	Type	Density (lbs/ft^3)		
WEPS - Undisturbed Desert	2700	NE Quarter Circle	Rositas-based sand	99.6	0%	Varying in time
WEPS - Post-Construction	3800	NE Quarter Circle w/ square	Rositas-based sand	104.58	0%	Varying in time
MDAQMD - Undisturbed Desert	2700	NA	Rositas-based sand	NA	35%	2.7
MDAQMD - Post-Construction	3800	NA	Rositas-based sand	NA	0%	2.7
MDAQMD - Palliative	3800	NA	Rositas-based sand	NA	0%	2.7

Site Compaction

The results presented in Table 2 represent the difference in the output of the WEPS model runs. Total erosion is the sum of soil leaving the bounded area through creep, saltation, and suspension. Recall that only PM is considered for emissions, and PM10 is a fraction of the erosion due to suspension, and PM2.5 is a fraction of PM10. Also, only a fraction of the PM emissions calculated by the MDAQMD model are in the form of PM10 and PM2.5. These mass fractions are 0.5 and 0.2 respectively. These ratios are applied to the raw WEPS PM emission estimates to determine PM2.5 emissions, as they are not an output of that model.

Table 2: Results of WEPS Model Runs in tons per acre per year

Scenario	Total Erosion	Creep/Saltation	Suspension	PM10	PM2.5
Undisturbed Desert	245	31.5	213	18.9	7.56
Post-Construction	238	38.4	200	17.8	7.12
Difference	-7	6.9	-13	-1.1	-0.44
Percent Difference	-2.9%	22%	-6.1%	-5.9%	-5.9%

AECOM reminds the reader that the values presented in Table 2 do not attempt to quantify the potential surface wind energy reduction due to the solar panel installation; this is a factor that would tend to decrease post-construction wind erosion at the Project Site.

Even though the gross emission values determined by the WEPS model are abnormally large, the model runs show a clear reduction in wind erosion from the Project site from pre-existing conditions to post-construction conditions strictly due to compaction. Most importantly, modeling shows an approximate 6 percent reduction in both PM10 and PM2.5 emission rates, which is a conservative estimate because of the assumptions described above. For example, if the minimum within the range of natural bulk densities is used and the maximum within the range of predicted post-Project bulk densities are chosen as inputs for the model, the expected PM emissions would show a decrease of approximately 15 percent. Because of the large emission rates predicted by the WEPS model, AECOM studied the equations presented in the WEPS models's technical documentation and performed sensitivity analysis on the model to determine the effect of changes in bulk density on PM emissions. This sensitivity analysis neglects other modules within WEPS and does not account for the iterative processes required to run the model and thus an exact value cannot be determined, but AECOM was able to confirm that an increase in bulk density will lead to a decrease in PM emissions. Thus, the 6 percent decrease in emissions was applied to the uncontrolled emissions estimates from the MDAQMD model to determine emissions from the compacted site.

Results

The results of the emission calculations are presented in Table 3. The change in emissions shown in Table 3 is the change from modeled undisturbed desert at the Project site to a post-construction site with no vegetation, compacted soil, and a dust palliative applied. As noted elsewhere, the change in wind erosion emissions due to the installation of solar panels is neglected in this analysis, but the installation of solar panels is expected to reduce emissions due to a reduction in wind energy at the ground surface.

Table 3: Emission Comparison

Scenario	PM10	PM2.5
Pre-Project Emissions (lbs/day)		
Undisturbed Desert	673	269
Post-Project Emissions (lbs/day)		
Site w/ vegetation removed	1,460	583
	1,370	548
Site w/ vegetation removed, with compaction and quarterly palliative application	219	88
Change in emissions	-454	-181
Uncertainty	+/- 22%	+/- 22%

This analysis shows a 67 percent reduction in PM emissions with an uncertainty of +/- 22 percent, primarily due to the application of a dust palliative (Appendix C). Although this is a significant decrease, this is a conservative result due to the removal of desert pavement from the pre-Project conditions, the neglection of solar panels in post-Project conditions, and the minimum increase in bulk density due to compaction evaluated with the WEPS model.

In summary, construction of the Project is expected to significantly reduce wind erosion PM emissions from the Project Site. As such, the Project will not have an adverse effect on air quality due to wind erosion.

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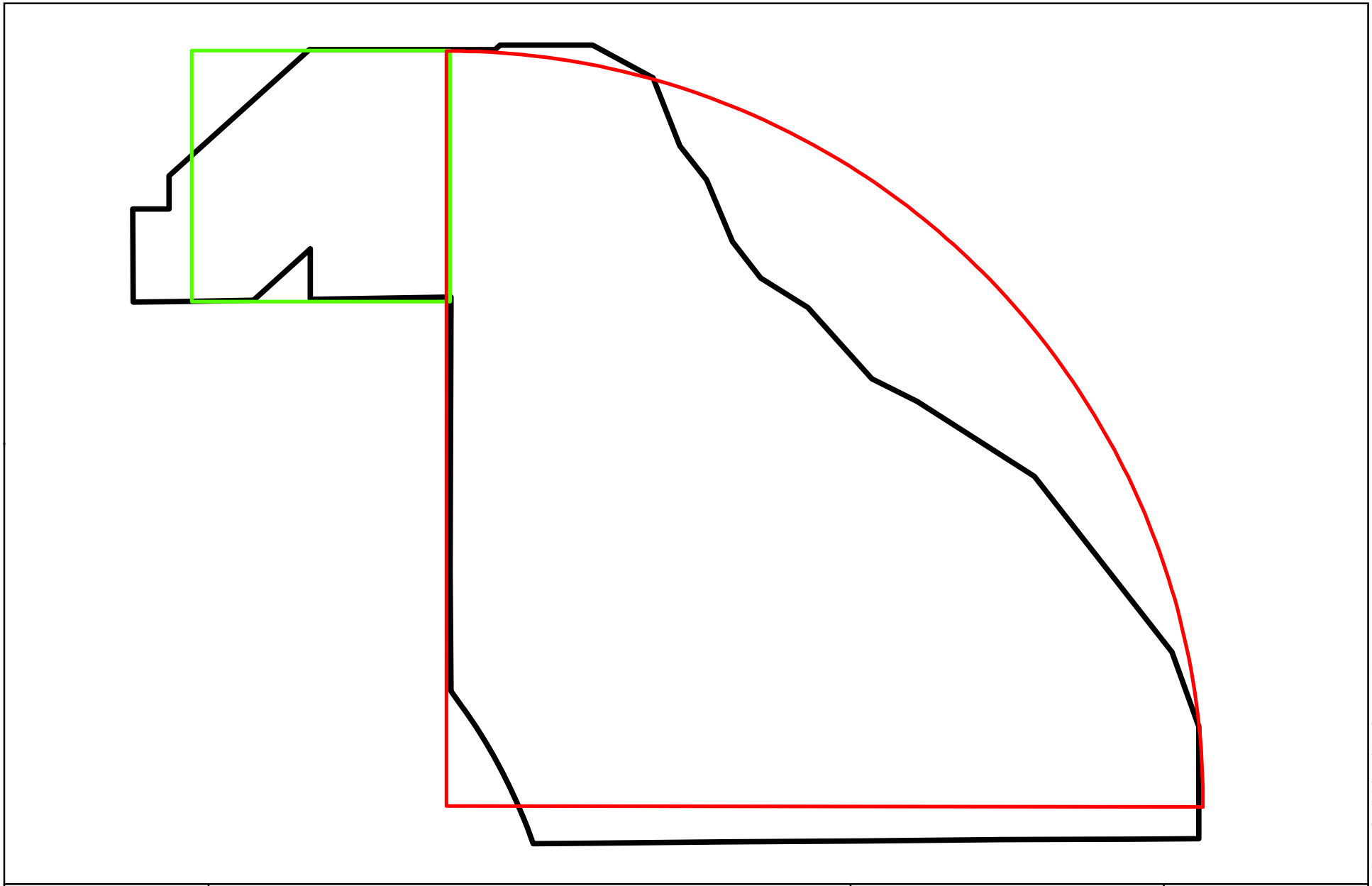

Map Location

Legend

- Post Project
- Pre and Post Project
- Currently Proposed Footprint

0 0.25 0.5 Miles

1 in = 1 miles

N W E S

Desert Sunlight Solar Farm Project

Figure 1
Comparison of Modeled Area to Project Site

First Solar.

AECOM

Project: 60139386-14
Date: December 2010

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Appendix B: Soil Properties

Table 1: Soil Constituent Information [1]

		Size [3]	BP1	BP2	BP3 (surf)	BP3 (deep)	BP3 (avg)	BP4	BP5
Gravel		>2 mm	0.6	0.35	0.22	0.43	0.325	0.28	0.18
Sand	Very Course	1mm-2mm	0.1	0.1	0.08	0.1	0.09	0.19	0.15
	Course	.5mm-1mm	0.07	0.12	0.12	0.14	0.13	0.26	0.17
	Medium	.25mm-.5mm	0.07	0.07	0.1	0.13	0.115	0.13	0.16
	Fine	.10mm-.25mm	0.08	0.29	0.42	0.13	0.275	0.06	0.19
	Very Fine	.05mm-.10mm	0.02	0.02	0.04	0.02	0.03	0.01	0.03
	Total	.05mm-2mm	0.34	0.6	0.76	0.52	0.64	0.65	0.7
Silt		2um-50um	0.05	0.04	0	0.03	0.015	0.02	0.06
Clay		<2um	0.01	0.01	0.02	0.02	0.02	0.05	0.06
Total			1	1	1	1	1	1	1

Table 2: Inputs for WEPS Modeled Soil [2]

		Size [3]	Vaiva based (BP1)		Rositas based (avg BP2-5)	
			Mean	Less Gravel	Mean	Less Gravel
Gravel		>2 mm	0.60	--	0.28	--
Sand	Very Course	1mm-2mm	0.10	0.25	0.13	0.18
	Course	.5mm-1mm	0.07	0.18	0.17	0.24
	Medium	.25mm-.5mm	0.07	0.18	0.12	0.17
	Fine	.10mm-.25mm	0.08	0.20	0.20	0.28
	Very Fine	.05mm-.10mm	0.02	0.05	0.02	0.03
	Total	.05mm-2mm	0.34	0.85	0.65	0.90
Silt		2um-50um	0.05	0.13	0.03	0.05
Clay		<2um	0.01	0.03	0.04	0.05
Total			1	1	1	1

Table 3: Mean Soil Particle Size (mm) [4]

	Vaiva based	Rositas based
Min	1.36	0.84
Max	2.73	1.68
Mean	2.05	1.26

Table 4: Soil Compaction

	Original Compaction		Compaction After Construction			
	Min	Max		% Project area	Min	Max
Undisturbed	0.7	0.8	Till and Roll	59%	0.80	0.85
			Cut and Fill	32%	0.90	0.95
			Surgical	9%	0.90	0.95
			Average		0.84	0.89

Table 5: Bulk Density [2]

		Vaiva Based		Rositas Based	
		pcf	Mg/m3	pcf	Mg/m3
Average Maximum [5]		142.50	2.28	124.50	1.99
Undisturbed	Min	99.75	1.60	87.15	1.39
	Max	114.00	1.82	99.60	1.59
Post-Project	Min	119.84	1.92	104.70	1.68
	Max	126.97	2.03	110.93	1.77

Table 6: Limited or Unlimited susceptibility to erosion [6]

Soil Type		Surf. Cover [7]	MPS	Crust [8]	L or U?
Undisturbed	Rositas based	L	U	U	U
	Vaiva based	L	L	L	L
Post-Project	Rositas based	U/L	U	U	U
	Vaiva based	U/L	L	U	U/L

1) Taken from plots in Appendix A of Appendix F - Geotechnical Studies of DEIS

2) Green highlighted values from Tables 2 and 5 were used as inputs in WEPS for the two soil types at First Solar location near Desert Center. Other values are set from Vaiva soil and Rositas soil in WEPS database.

3) Size classifications are taken from WEPS model inputs as defined in the User's Guide.

4) The mean soil particle size was used to determine the soil as a limited or unlimited source of PM in the MDAQMD model.

5) Maximum density values are taken from Sunlight Compact + Dust Control Water Est 12.08.2010.xlsx

6) MDAQMD has 3 criteria to determine this: a) Surface cover with rocks and/or clumps of vegetation is limited, b) Mean Particle Size (MPS) (>1.5mm limited susceptibility, <1.5 mm unlimited susceptibility), c) A non-friable crust greater than .25 inches thick is limited susceptibility.

7) Rositas based (pre) soil generally has clumps of vegetation. Vaiva based soil (pre) has large surface rock fragments. The post values depend on considerations of solar panels.

8) Rositas based soil (pre) does not have a non-friable or thick surface crust. Vaiva based soil (pre) is generally desert pavement with a thick crust.

Appendix C: MDAQMD Model Calculations

The unlimited erosion equations and parameters are:

$$E = k \times E_f \times A$$

$$E_f = 2.814 \times (1 - v) \times \left(\frac{u}{u_t}\right)^3 \times C(x)$$

$$u_t = u_t^* \times u^*$$

where

E	Emission rate in tons per year
k	Aerodynamic factor (0.5 for PM10, 0.2 for PM2.5)
A	Area is acres
E_f	Emission factor in tons per acre
v	Vegetation cover fraction
C	Correction factor based on x.
x	.886*(u_t/u)
u	Mean wind speed (m/s)
u_t	Threshold value of wind speed (m/s)
u_t*	Threshold friction velocity (m/s)
u*	Ratio of wind speed to friction velocity

Table 1: Input Parameters

u (m/s)		2.73	**PM10 fac (k)**	0.5
Area (acres)	**Undisturbed**	2700	**PM2.5 fac (k)**	0.2
	Post-Project	3800		
Friction Particle size (mm) [1]		0.3		

Table 2: Determining threshold wind speed

Variable	**z_o (m)** [2]	**u_t* (m/s)** [3]		**u*** [2]	**u_t (m/s)**	
	Rough. H.	**Marti.**	**alt**	**vel. ratio**	**Marti.**	**alt**
	0.04	0.373	0.388	13.80	5.14	5.35

Table 3: Determining the Correction Factor [4]

Variable	**x**		**C(x)**	
	Marti.	**alt**	**Marti.**	**alt**
	1.67	1.74	0.73	0.64

Table 4: MDAQMD Calculated Emissions

	Area	**Correction Factor C(x)**		**Control Factor** [5]		**Vegetative Cover**	**Emission Factor**		**Emissions (tons/year)**			
									PM10		**PM2.5**	
		Marti.	**alt**	**Compaction**	**Palliative**	**v**	**Marti.**	**alt**	**Marti.**	**alt**	**Marti.**	**alt**
Undisturbed	2700	0.73	0.64	0	0	0.35	0.10	0.08	137.81	107.84	55.13	43.13
No Veg	3800	0.73	0.64	0	0	0	0.16	0.12	298.40	233.49	119.36	93.40
Compacted	3800	0.73	0.64	0.06	0	0	0.16	0.12	280.49	219.48	112.20	87.79
Palliative	3800	0.73	0.64	0.06	0.79	0	0.16	0.12	58.90	46.09	23.56	18.44
	3800	0.73	0.64	0.06	0.84	0	0.16	0.12	44.88	35.12	17.95	14.05
	3800	0.73	0.64	0.06	0.89	0	0.16	0.12	30.85	24.14	12.34	9.66

1) The friction particle size used is the MDAQMD value given for Desert Scrub.

2) MDAQMD provides a table for roughness heights and equivalent u*, but the EPA method was used with the value given in Hodgin (1980).

3) The threshold friction velocity is given by MDAQMD in a table to be 0.38, but methods of determining this shown in Mansell (2006) and Marticorena (1997) provide for a range of values.

4) Again, MDAQMD provides a table for determining this value, but instead the piecewise function defined by *Cowherd, C., G. Muleski, P. Engelhart, and D. Gillette. 1985. Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. EPA/600/8-85/002. NTIS PB85- 192219. Office of Health and Environmental Assessment, U.S. Environmental Protection Agency, Washington, DC.*

5) These are incorporated by the MDAQMD method for unpaved roads, where E_c is the value of controlled emissions and E is uncontrolled emissions. C is the the Control Factor listed in Table 4 multiplied by 100%.

$$E_c = E \times \left(\frac{100 - C}{100}\right)$$

Appendix E

Noise Analyses

APPENDIX E-1

ADDITIONAL CONSTRUCTION NOISE ANALYSIS INFORMATION

OVERVIEW OF THE CNSTNOIZ MODEL

Noise impacts from construction activity have been estimated using a detailed spreadsheet model (CNSTNOIZ). The CNSTNOIZ model is structured to provide separate analyses for each construction phase. Different versions of the spreadsheet model accommodate from one to five construction phases in a single spreadsheet. In addition to the main data entry sheet for each construction phase, the CNSTNOIZ model provides a summary sheet and chart of noise levels versus distance for each construction phase. The CNSTNOIZ model has an expandable database of 140 equipment entries including heavy equipment, power tools, and other noise sources such as equipment backup beepers and manual hammering. Some equipment types have multiple entries to reflect a range of typical engine sizes. The database provides a default reference noise level at 50 feet, the range of reference noise levels expected for the general equipment type, default atmospheric absorption coefficients, and default operating time factors for hours when the equipment is active. The operating time fractions allow for more realistic modeling of noise from intermittent equipment operations.

The database in the CNSTNOIZ model incorporates data from a wide range of published sources plus some additional data based on direct monitoring data and manufacturer information. Default atmospheric absorption rated included in the database were calculated according to the 1978 American National Standards Institute (ANSI) procedures using available frequency spectrum data for major types of equipment. Data included in the database represent minimum atmospheric absorption rates (typically representing cool temperatures and high relative humidity levels). Database entries for default equipment operating time factors for active hours are generally consistent with default values used in the CNSTEMIS air quality spreadsheet model.

Noise calculations performed by the CNSTNOIZ model employ a conventional distance extrapolation procedure for point sources of noise incorporating a 6-dBA drop-off rate pre doubling of distance plus a minimum atmospheric absorption adjustment.

The primary calculation sheet allows users to replace the program default values with project-specific estimates. The model requires users to specify the number and type of equipment items active in the same general work area for each hour of a 24-hour cycle, thus allowing realistic calculation of various noise metrics, including: hourly average noise levels by time of day; maximum hourly noise levels; average daytime, evening, and nighttime noise levels; 24-hour average noise levels (24-hour Leq); and 24-hour CNEL or Ldn noise levels. The model automatically calculates noise levels at 20 distances from the main activity areas of the construction site (default distances range from 50 feet to 2 miles). The model provides a tabular summary of noise levels at all distances. The model also provides a chart of noise levels at distances out to 3,000 feet, comparing maximum 1-hour Leq, average daytime Leq, and 24-hour CNEL or Ldn level at each distance. The hourly noise contributions from each type of equipment are available in the primary calculation sheet of the model.

ANALYSES FOR THE PROPOSED PROJECT AND ALTERNATIVES

Alternatives 1, 2, and 3 would use similar equipment for comparable construction phases. Although Alternative 3 might have lower numbers of some equipment items than Alternatives 1 or 2 at the solar farm site, the equipment would typically operate in multiple groups of items that would be similar for all alternatives. Consequently, a single analysis for each of the modeled construction phases would be applicable to all three alternatives.

Overall construction equipment use for each phase of construction was consistent with the construction emissions analyses summarized in Appendix D-2. The CNSTNOIZ analyses considered various equipment groupings likely to occur during each phase of construction. The grouping producing the greatest noise impact was used to represent noise impacts from each construction phase.

NOISE LEVEL CHARTS FOR MAJOR CONSTRUCTION PHASES OF PROJECT COMPONENTS

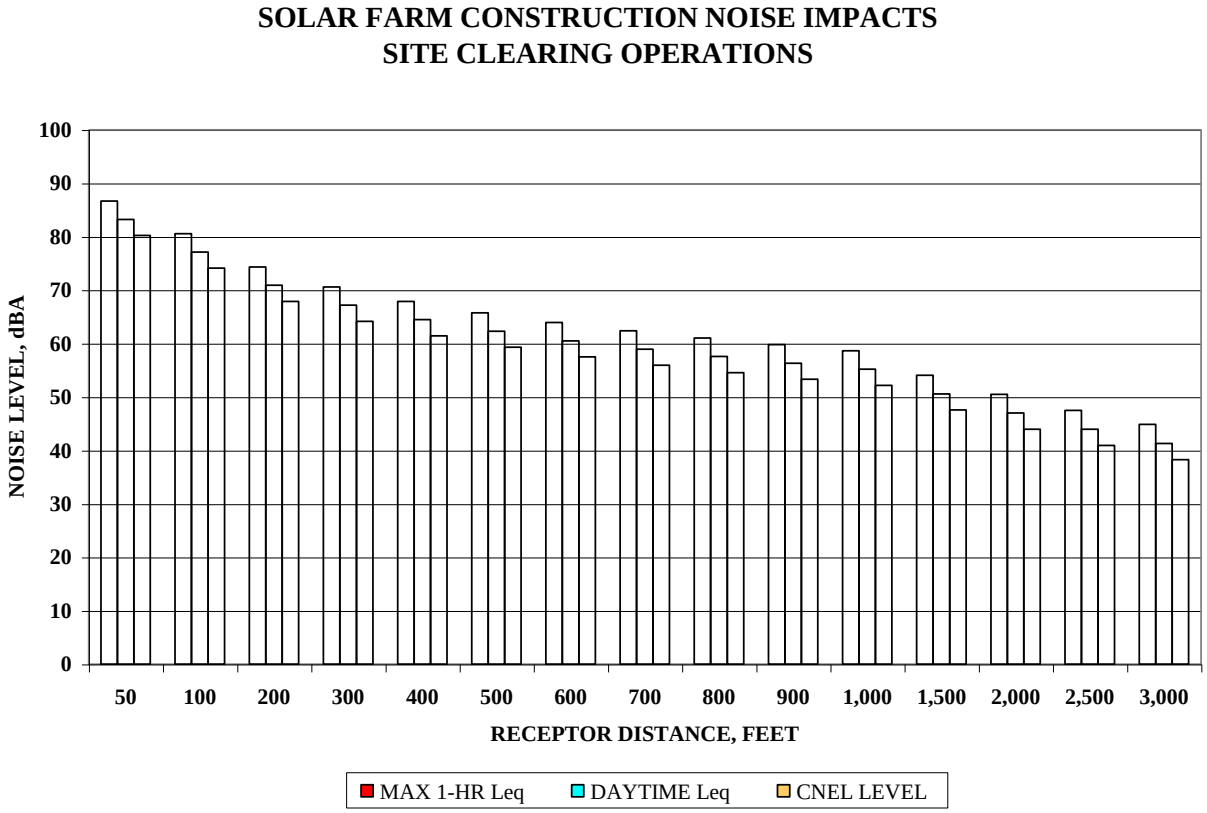
The following tables and charts summarize the results of the construction noise analysis for major construction phases at the solar farm, Gen-Tie Line, and Red Bluff Substation. .

SOLAR FARM CONSTRUCTION

Site Clearing Phase

Table E1-1.
Equipment Group Analyzed for the Site Clearing Phase

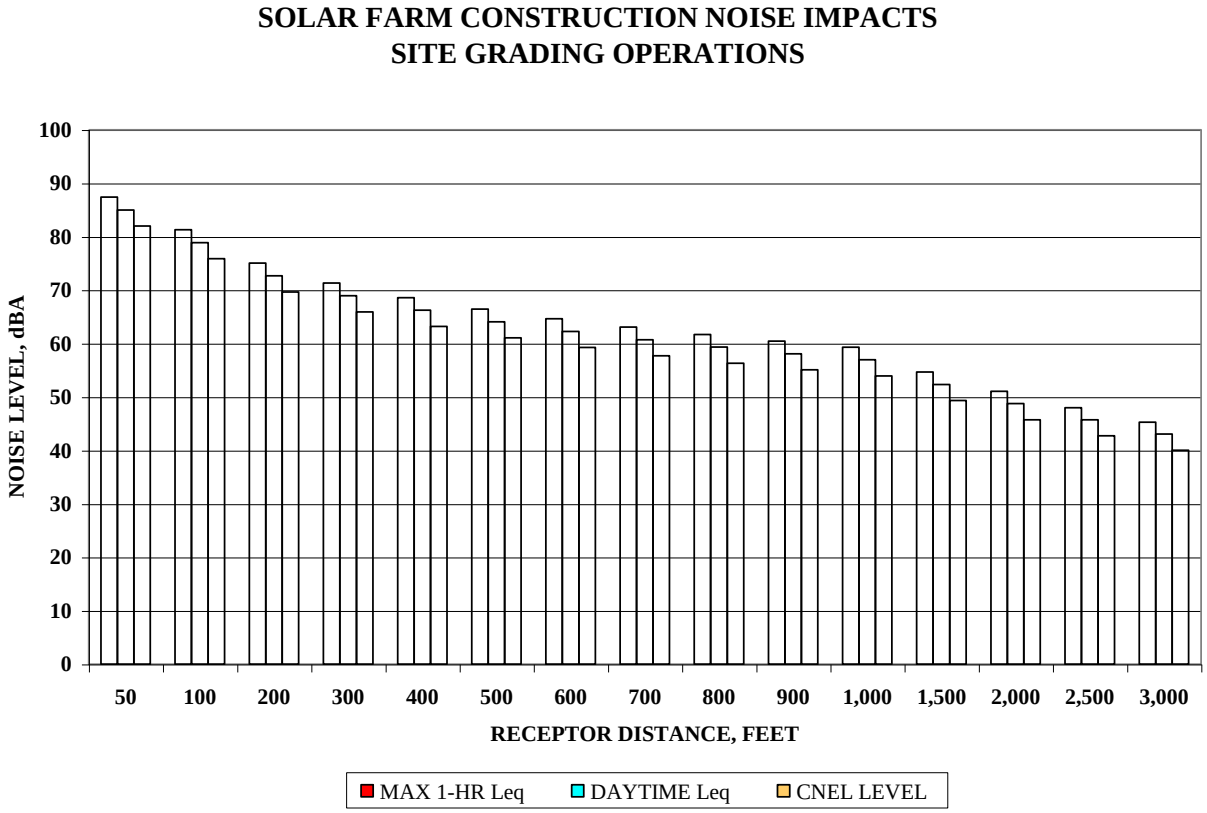
Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Brush Cutters	2	8	6.8	81	0.75
Tracked Dozer	1	2	0.5	88	0.75
Wheeled Tractor	1	4	3.4	80	0.75
Wheeled Loader	1	2	1.5	80	0.50
Wood Chipper	1	2	0.5	91	0.75
ATVs	1	4	2.6	70	0.50
Water Truck	1	2	1.3	80	0.50
Dump Truck	1	2	0.5	80	032



Site Grading Phase

Table E1-2.
Equipment Group Analyzed for the Site Grading Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Scraper	1	8	6.8	85	0.75
Tracked Dozer	1	4	3.4	88	0.75
Grader	1	4	3.4	82	0.75
Roller-Compactor	1	4	3.4	73	0.45
ATVs	1	4	2.6	70	0.50
Water Truck	1	4	2.6	80	0.50

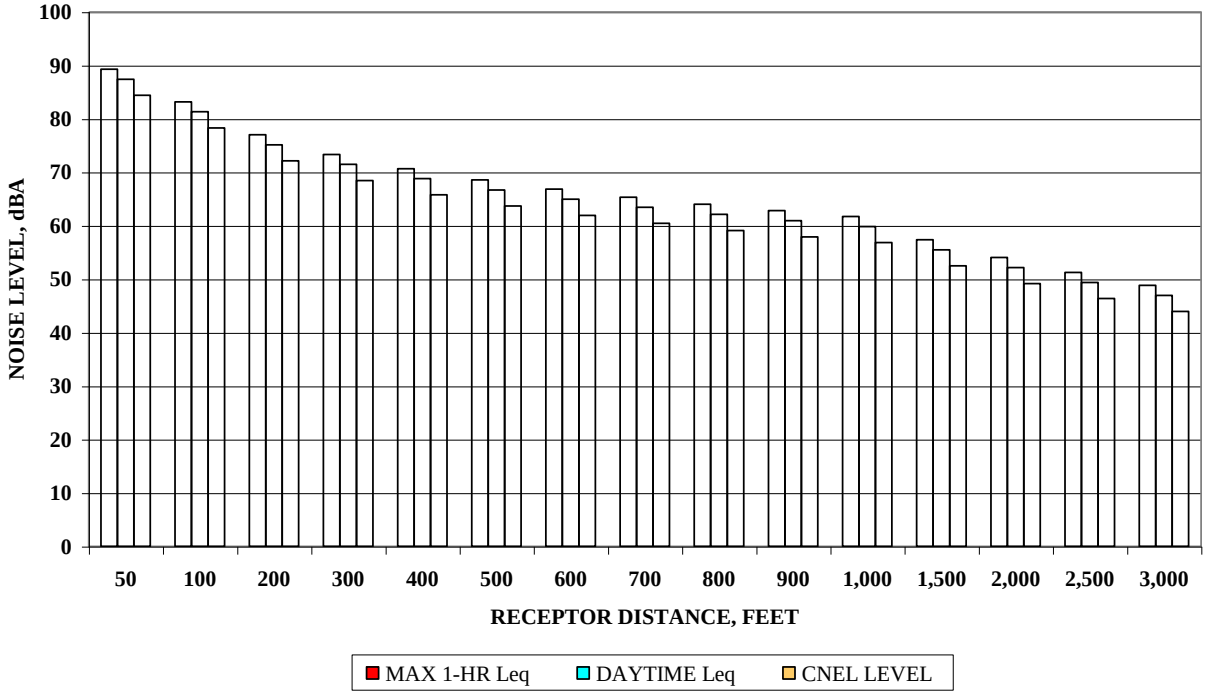


Array Support Post Phase

Table E1-3.
Equipment Group Analyzed for the Array Support Post Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Auger Rig	1	8	3.6	85	0.66
Vibratory Pile Driver	2	8	8.0	85	0.54
Forklift	1	4	2.6	80	0.50
ATVs	1	4	2.6	70	0.50
Water Truck	1	4	2.6	80	0.50
Flatbed Truck	1	2	0.5	75	0.32

SOLAR FARM CONSTRUCTION NOISE IMPACTS
INSTALLATION OF ARRAY SUPPORT POSTS

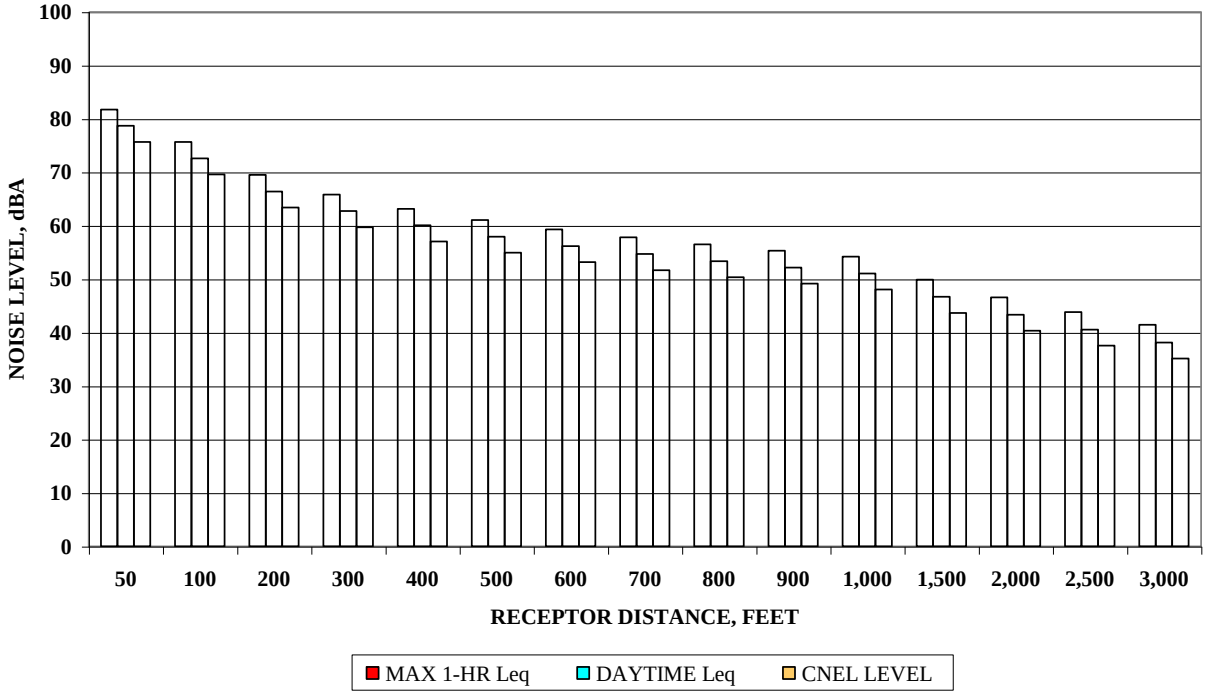


Trenching and Underground Cable Phase

Table E1-4.
Equipment Group Analyzed for the Trenching and Underground Cable Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Trencher	1	8	6.8	73	0.50
Backhoe-Loader	1	4	3.4	80	0.50
Cable Plow	1	8	6.8	80	0.75
ATVs	1	8	5.2	70	0.50
Water Truck	1	3	1.3	80	0.50
Dump Truck	1	4	1.0	80	0.32
Flatbed Truck	1	1	0.25	75	0.32
Forklift	1	1	0.65	80	0.50

SOLAR FARM CONSTRUCTION NOISE IMPACTS
TRENCHING AND UNDERGROUND CABLE INSTALLATION

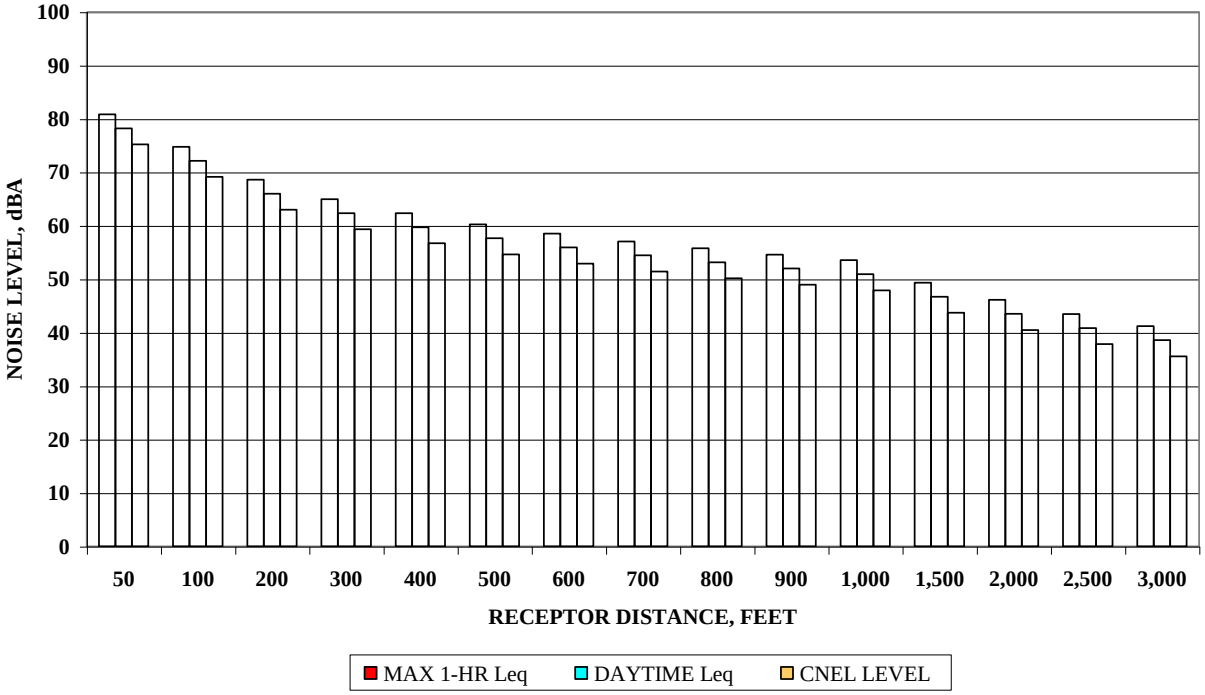


Soil Compaction Phase

Table E1-5.
Equipment Group Analyzed for the Soil Compaction Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Roller-Compactor	2	6	5.1	77	0.45
ATVs	1	8	5.2	70	0.50
Water Truck	1	8	5.2	80	0.50

SOLAR FARM CONSTRUCTION NOISE IMPACTS
SOIL COMPACTION PHASE



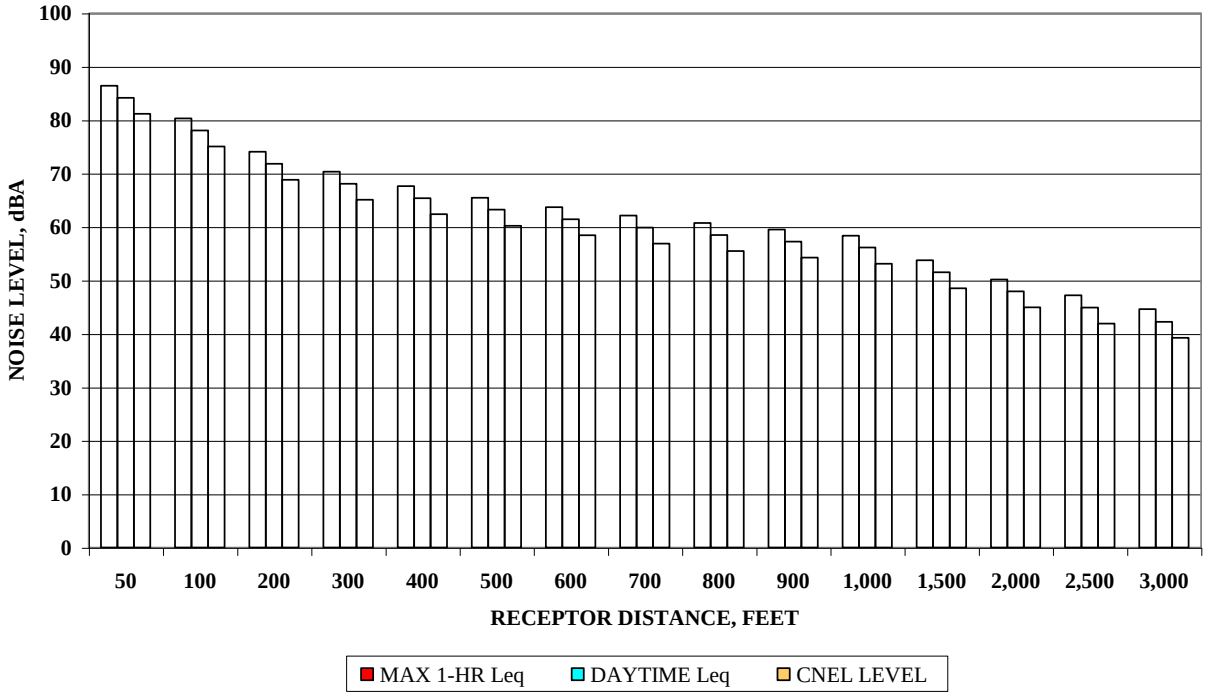
GEN-TIE LINE CONSTRUCTION

Site Preparation Phase

Table E1-6.
Equipment Group Analyzed for the Site Preparation Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Tracked Dozer	1	8	6.8	86	0.75
Grader	1	2	1.7	82	0.75
Roller-Compactor	1	6	5.1	73	0.45
Wheeled Loader	1	4	3.0	78	0.50
Water Truck	1	4	2.6	80	0.50
Dump Truck	1	1	0.25	80	0.32

GEN-TIE LINE CONSTRUCTION NOISE IMPACTS
SITE PREPARATION PHASE



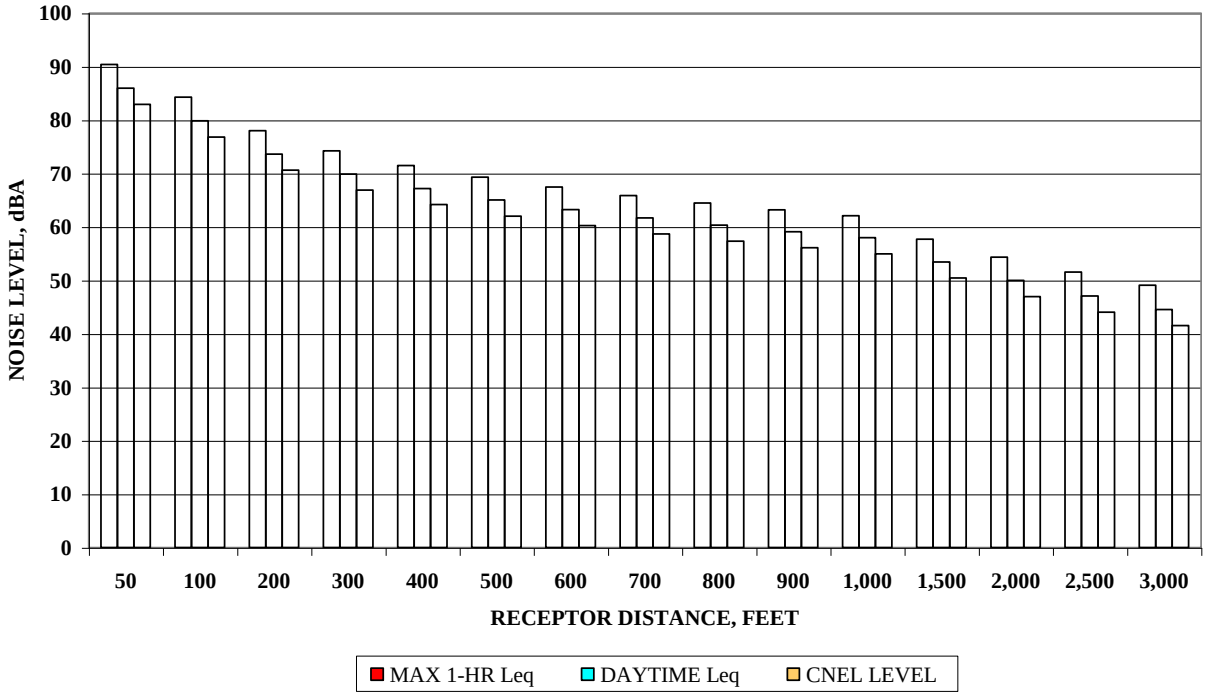
Tower Foundation Phase

Table E1-7.
Equipment Group Analyzed for the Tower Foundation Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Tracked Dozer	1	2	1.7	86	0.75
Wheeled Loader	1	4	3.0	78	0.50
Backhoe-Loader	1	2	1.7	80	0.50
Fork Lift	1	4	2.6	80	0.50
Mobile Crane	1	4	2.6	82	0.50
Mobile Crane	1	2	1.3	82	0.50
Auger Rig	1	2	0.9	85	0.66

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Drill Rig	1	4	4.0	87	0.66
Compressor	1	4	4.0	81	0.66
Pump	1	2	2.0	83	0.41
Portable Mixer	1	2	1.8	82	0.50
Jackhammer	1	2	1.5	90	1.36
Cement Mixer Truck	1	2	0.8	80	0.50
Dump Truck	1	5	0.88	80	0.32
Slurry Truck	1	2	1.3	80	0.50
Specialty Truck	1	2	1.3	75	0.32
Water Truck	1	2	1.3	80	0.50

GEN-TIE LINE CONSTRUCTION NOISE IMPACTS
TOWER FOUNDATIONS PHASE

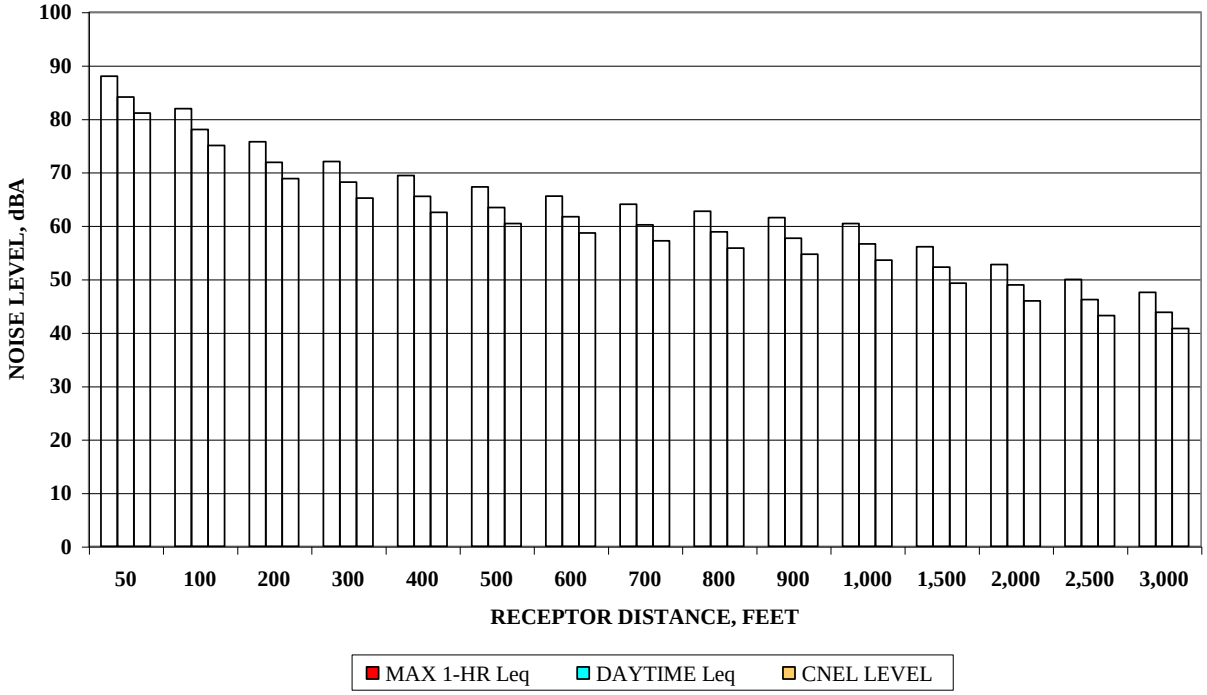


Tower Assembly and Erection Phase

Table E1-8
Equipment Group Analyzed for the Tower Assembly and Erection Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Forklift	2	4	2.6	80	0.50
Mobile Crane	2	6	3.9	82	0.50
Compressor	2	4	4.0	81	0.66
Flatbed Truck	1	4	1.0	75	0.32
Flatbed Truck	1	4	1.0	75	0.32
Water Truck	1	8	5.2	80	0.50

GEN-TIE LINE CONSTRUCTION NOISE IMPACTS
TOWER ASSEMBLY PHASE



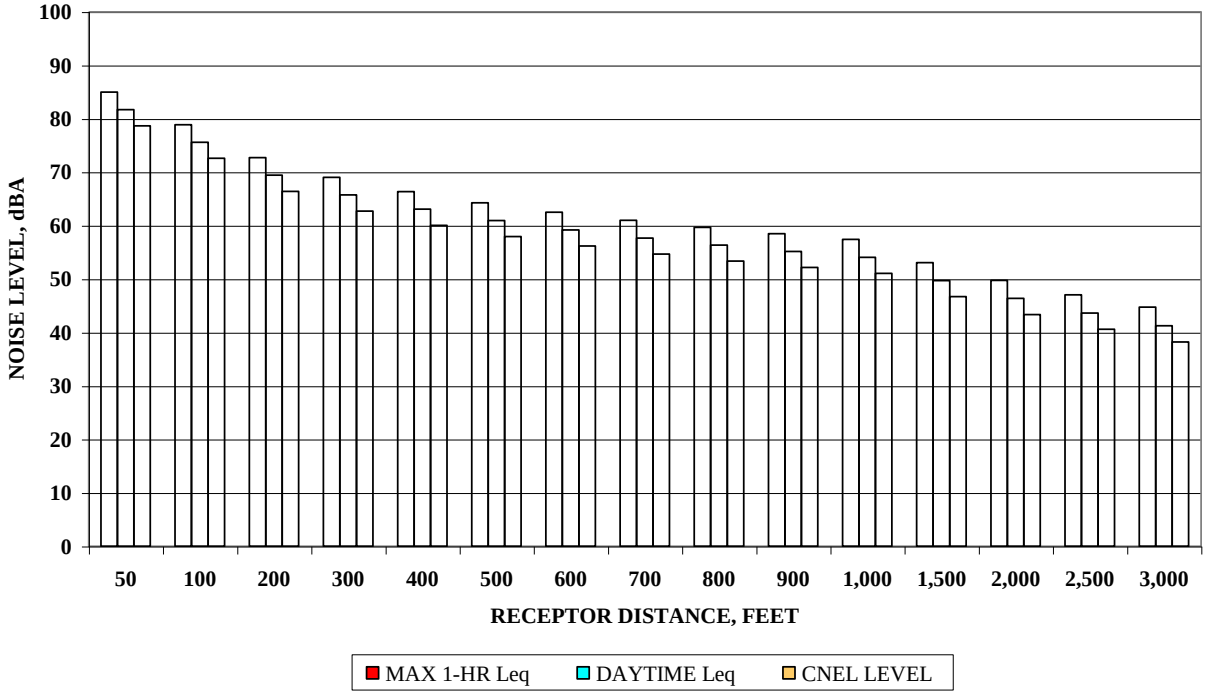
Line Stringing Phase

Table E1-9
Equipment Group Analyzed for the Line Stringing Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Tracked Dozer	1	2	1.7	86	0.75
Backhoe-Loader	1	6	5.1	80	0.50
Compressor	1	4	4.0	81	0.66
Line Puller	1	4	3.0	81	0.81
Mixed Trucks	1	2	0.5	80	0.32
Specialty Truck	2	5	3.25	75	0.32
Specialty	2	4	2.6	75	0.32

Truck					
Water Truck	1	4	2.6	80	0.50

GEN-TIE LINE CONSTRUCTION NOISE IMPACTS
LINE STRINGING PHASE

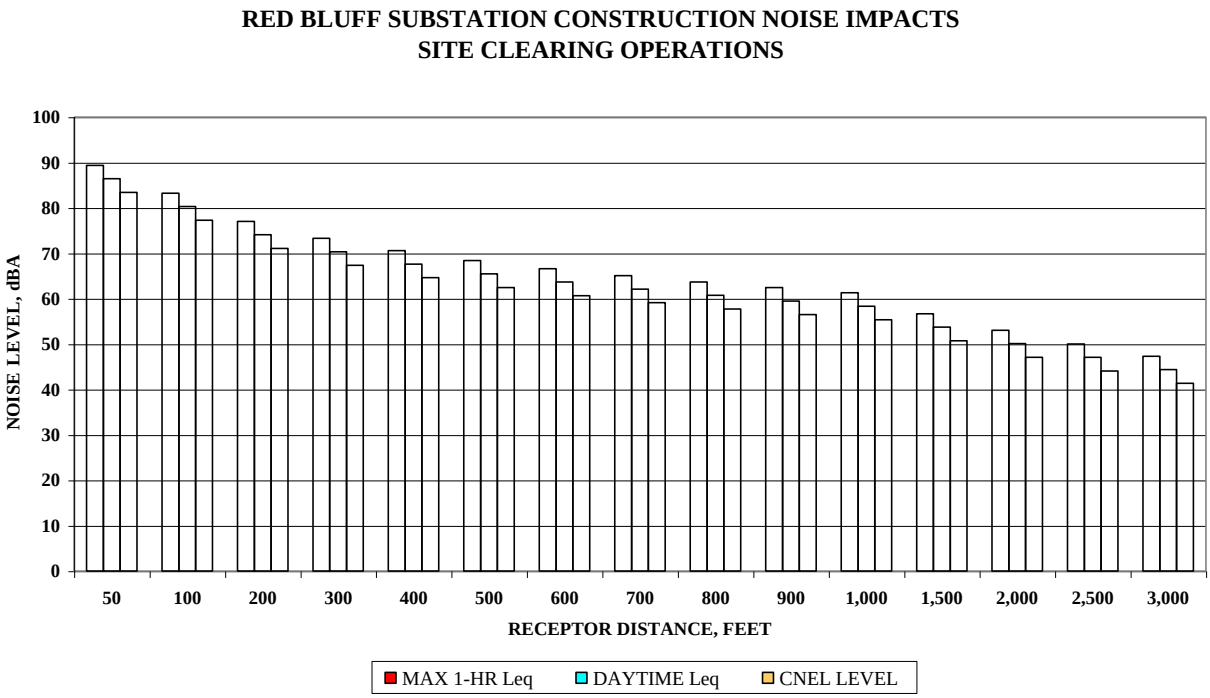


RED BLUFF SUBSTATION CONSTRUCTION

Site Clearing Phase

Table E1-10.
Equipment Group Analyzed for the Site Clearing Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Brush Cutters	2	8	6.8	81	0.75
Tracked Dozer	1	8	6.8	88	0.75
Wheeled Tractor	1	8	6.8	80	0.75
Wheeled Loader	1	4	3.0	80	0.50
Wood Chipper	1	4	2.6	91	0.75
Water Truck	1	4	2.6	80	0.50

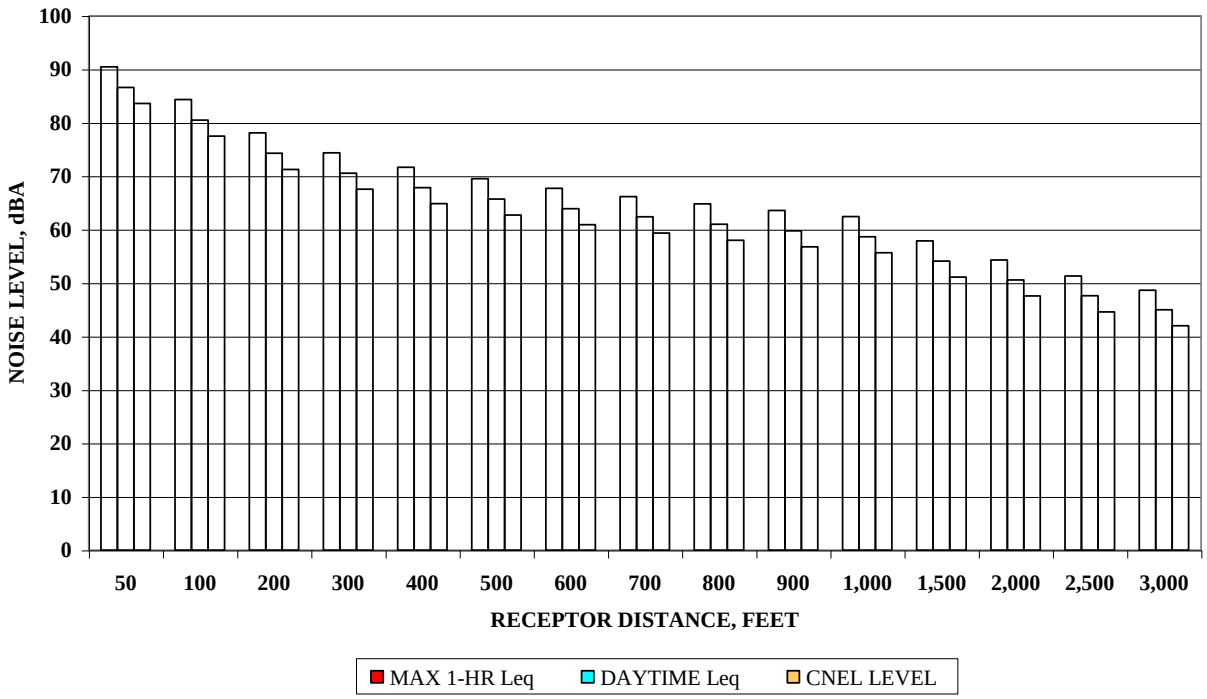


Site Grading and Compaction Phase

Table E1-11.
Equipment Group Analyzed for the Site Grading and Compaction Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Scraper	1	7	5.1	85	0.75
Tracked Dozer	1	7	3.4	88	0.75
Grader	1	7	3.4	82	0.75
Roller-Compactor	1	8	6.8	75	0.45
Wheeled Loader	1	8	6.0	80	0.50
Backhoe-Loader	1	8	6.8	80	0.50
Water Truck	1	4	2.6	80	0.50

RED BLUFF SUBSTATION CONSTRUCTION NOISE IMPACTS
SITE GRADING AND COMPACTION OPERATIONS



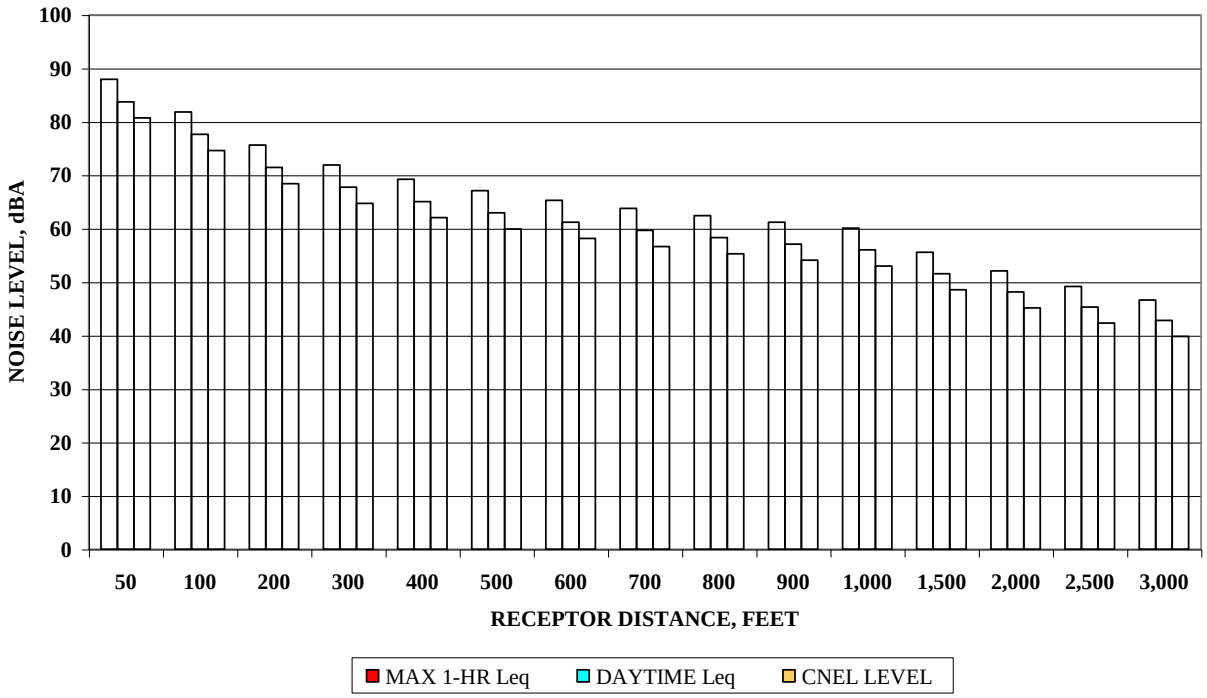
Trenching and Foundations Phase

Table E1-12.
Equipment Group Analyzed for the Trenching and Foundations Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Excavator	1	6	3.4	80	0.75
Backhoe-Loader	1	6	5.1	80	0.50
Skid-Steer Loader	1	6	4.5	70	0.50
Wheeled Loader	1	6	4.5	80	0.50
Auger Rig	1	6	2.25	85	0.66

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Tracked Dozer	1	2	1.7	88	0.75
Cement Mixer Truck	1	2	0.8	80	0.50
Water Truck	1	6	3.9	80	0.50

RED BLUFF SUBSTATION CONSTRUCTION NOISE IMPACTS
TRENCHING AND FOUNDATIONS PHASE

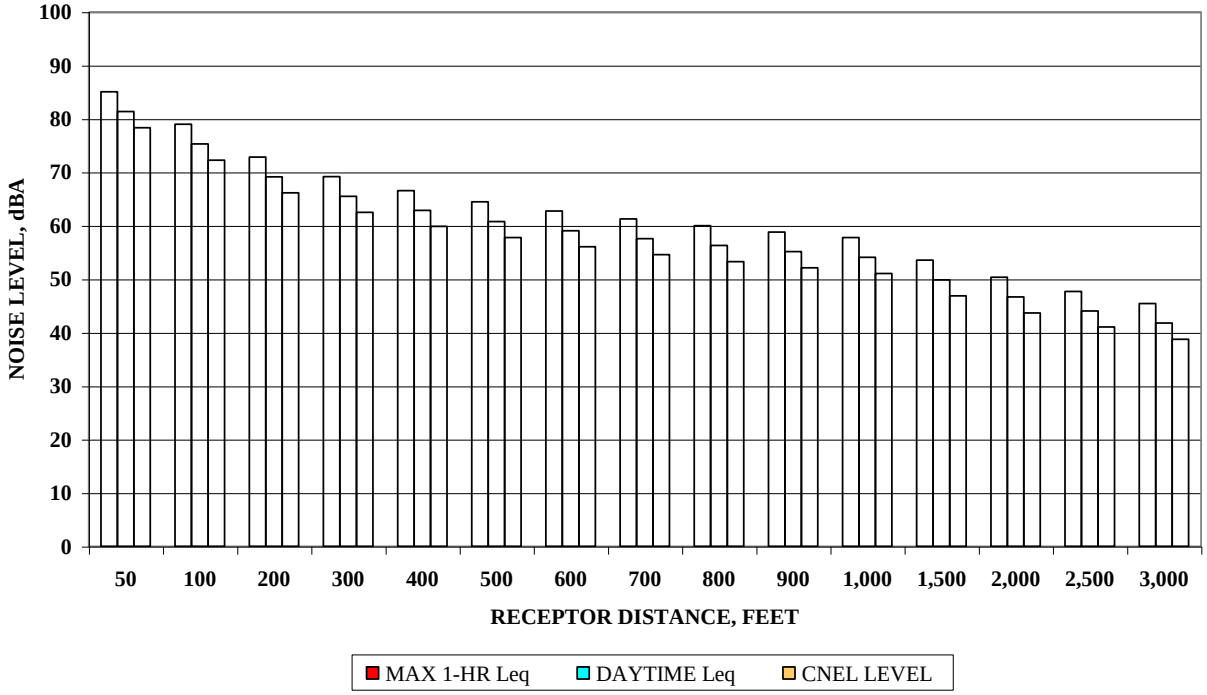


Equipment Pads Phase

Table E1-13.
Equipment Group Analyzed for the Equipment Pads Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Wheeled Loader	1	6	3.0	80	0.50
Mobile Crane	1	2	1.3	82	0.50
Forklift	1	6	2.6	80	0.50
Flatbed Truck	1	2	0.5	75	0.32
Dump Truck	2	6	1.5	80	0.32
Cement Mixer Truck	2	6	2.4	80	0.50
Water Truck	1	6	3.9	80	0.50

RED BLUFF SUBSTATION CONSTRUCTION NOISE IMPACTS
EQUIPMENT PADS PHASE



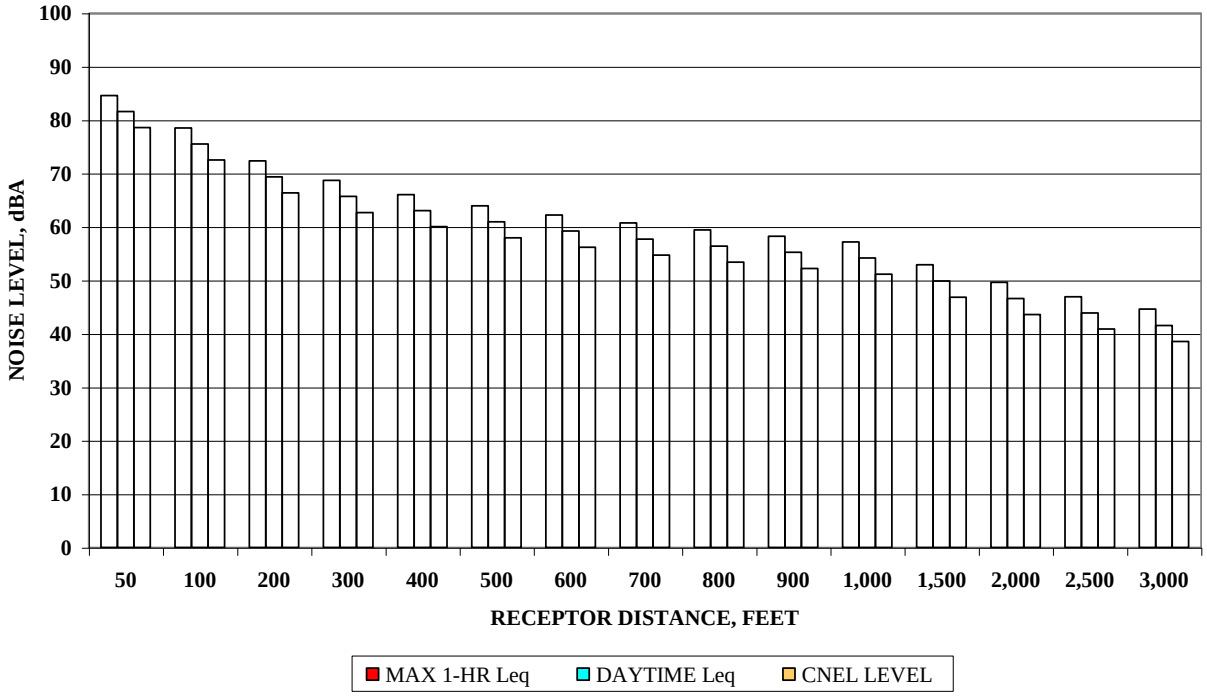
Substation Equipment Installation Phase

Table E1-14.
Equipment Group Analyzed for the Substation Equipment Installation Phase

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Compressor	1	8	8.0	81	0.66
Mobile Crane	1	2	1.3	82	0.50
Forklift	1	8	5.2	80	0.50
Wheeled Loader	1	7	4.5	80	0.50
Dump Truck	1	6	1.0	80	0.32
Specialty Truck	1	6	3.9	75	0.32
	1	6	3.9	80	0.50

Equipment Item	Number Active at One Time	Active Hours Per Day	Net Daily Operating Hours Per Item	Noise Level at 50 Feet (dBA)	Atmospheric Absorption, dB per 100 Meters
Water Truck					

RED BLUFF SUBSTATION CONSTRUCTION NOISE IMPACTS
EQUIPMENT INSTALLATION PHASE



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APPENDIX E-2

ADDITIONAL TRAFFIC NOISE ANALYSIS INFORMATION

OVERVIEW OF THE FHWACNEL MODEL

Noise impacts from local highway traffic have been estimated using a spreadsheet model (FHWACNEL) originally designed as a batch mode implementation of the 1978 Federal Highway Administration (FHWA) traffic noise prediction model (subsequently released as the STAMINA model). The FHWA STAMINA model and the more recent FHWA TNM traffic noise model are designed to analyze noise levels from highway traffic for a single hour, using highway geometrics and traffic condition data input on a lane-by-lane basis. In contrast, the FHWACNEL spreadsheet model used for this analysis is designed to model traffic noise on an hourly basis over a 24-hour period, providing a direct calculation of CNEL or Ldn noise levels. In addition, the FHWACNEL spreadsheet model is designed to accommodate highway segments defined on either a single lane or a multi-lane basis.

The FHWACNEL spreadsheet model has been programmed using Lotus 1-2-3 spreadsheet software, which allows spreadsheet programming using sophisticated keystroke macros. The spreadsheet allows users to select from the original FHWA noise algorithms, alternative algorithms developed by the California Department of Transportation (Caltrans), alternative algorithms developed by the Ontario Department of Transportation, or the Caltrans algorithms with supplemental correction factors that adjust model results to values that are consistent with the more recent FHWA TNM traffic noise model. The Caltrans algorithms with TNM correction factors provide the default setup for the FHWACNEL model.

The FHWA traffic noise models define vehicle types according to the number of axles and tires on the vehicle. The 1978 FHWA traffic noise prediction model used three vehicle classes (light duty vehicles, medium trucks, and heavy trucks). The more recent TNM model uses five vehicle classes: light duty vehicles, motorcycles, medium trucks, buses, and heavy trucks. Light duty vehicles are all vehicles with two axles and four tires. Motorcycles are vehicles with two axles, either two or three tires, and an open driver compartment. Medium trucks are cargo vehicles with two axles and six tires. Buses are vehicles which have either two or three axles and which are designed to carry 9 or more passengers. Heavy trucks are cargo vehicles with three or more axles. For use in the FHWACNEL model, the TNM classes of light duty vehicles and motorcycles are merged, and the TNM classes of medium trucks and buses are merged. For practical purposes, motor homes are presently treated as buses in the FHWACNEL model.

The FHWACNEL model incorporates separate sets of TNM correction factors for light duty vehicles, medium duty trucks, and heavy duty trucks. The TNM correction factors for each vehicle type vary based on vehicle speed and receptor distance. The TNM correction factor values were derived from parallel analyses using the TNM 2.5 Lookup program and the FHWACNEL spreadsheet with the original Caltrans algorithms. The TNM correction factors cover a speed range of 0 to 75 mph and a receptor distance range of 50 to 950 feet. The default TNM correction factors assume that 3.7% of light duty vehicles are motorcycles (the California statewide average) and that 37.1% of medium duty trucks are buses and motor homes (the

California statewide average). A separate spreadsheet generates replacement TNM correction factor values for user-specified motocycle and bus/motor home percentages.

The FHWACNEL model analyzes hourly traffic volumes over a 24-hour period for a road network of up to 30 highway segments (single or multi-lane, one-way or bi-directional) and up to 40 receptor locations. Users input the receptor coordinates, highway segment centerline coordinates, highway width, average daily traffic volume, nominal free-flow speed, and hourly vehicle capacity for each highway segment. In addition, users input an hourly distribution pattern for the daily traffic (either project-specific or from a library of typical patterns), the hourly percentage of medium duty trucks (either project-specific or from a library of typical patterns), and the hourly percentage of heavy duty trucks (either project-specific or from a library of typical patterns). The FHWACNEL spreadsheet includes a database of hourly traffic volume and hourly truck percentage patterns for an array of roadway types that can be used directly or modified to provide hourly traffic estimates based on known or predicted ADT values. A spreadsheet macro automatically processes hourly traffic patterns for each highway segment and all receptor locations. The FHWACNEL model adjusts hourly vehicle speeds according to the volume:capacity ratio. The model automatically creates a separate output file for each highway segment; the output files summarize the highway segment contributions to hourly Leq and daily CNEL or Ldn levels at each receptor location. A separate spreadsheet program (LINKSUM) automatically combines results from each highway segment output file to produce total hourly Leq and daily CNEL or Ldn estimates at each receptor location. The LINKSUM spreadsheet automates the creation of summary tables for CNEL, Ldn, maximum hourly Leq, or Leq by clock hour for each receptor across all modeled highway segment. The LINKSUM spreadsheet can also generate a matrix of receptor distances to each highway segment.

ANALYSES FOR THE PROPOSED PROJECT AND ALTERNATIVES

Modeled Roadways

Roadways incorporated into the traffic noise modeling analysis included segments of I-10 east and west of the Highway 177 interchange, Highway 177 from I-10 to Kaiser Road, and Kaiser Road between Highway 177 and the solar farm site. For simplicity, I-10 was treated as an east-west roadway and Highway 177 and Kaiser Road were treated as north-south roadways.

Modeled Receptor Locations

Receptors for the traffic noise modeling analysis were established along three sets of receptor transects perpendicular to Kaiser Road or Highway 177. Each receptor transect had six receptor points east of the relevant roadway and six receptor points west of the relevant roadway. Receptor points were located at distances of 50 feet, 100 feet, 250 feet, 500 feet, 750 feet, and 1,000 feet from the roadway centerline. The southernmost transects were located in Desert Center east and west of Highway 177, south of Ragsdale Road and 550 feet north of the point where the centerlines of Highway 177 and I-10 intersect. The central transects were located east and west of Kaiser Road in the Lake Tamarisk area, about 600 feet north of Oasis Road. The northernmost transects were located east and west of Kaiser Road about midway between the Lake Tamarisk development and the solar farm site.

Modeled Traffic Volumes

Existing traffic volumes for Kaiser Road were based on the 24-hour traffic counts provided in the traffic study (Hernandez, Kroone & Associates 2010). The traffic count was conducted north of the Lake Tamarisk development, and showed a daily total volume of 108 vehicles. Existing traffic volumes for the portion of Kaiser Road south of the Lake Tamarisk development were estimated by increasing the daily volume to 150 vehicles. Baseline traffic conditions for Highway 177 and I-10 were developed from 2008 traffic count data and 2007 truck count data downloaded from the Caltrans website (Caltrans 2007, 2008). The traffic count data for Kaiser Road provided hourly auto and truck volume patterns. The hourly auto and truck volume patterns for Highway 177 and I-10 were extrapolated from daily volumes and hourly distribution patterns adjusted to match reported peak hour conditions.

Traffic conditions for 2011 and 2012 were developed by adding project-related traffic volumes to the baseline traffic volumes for each roadway segment. Construction-related traffic would include construction worker commute traffic and heavy truck traffic bringing equipment and materials to the construction sites. Construction worker and construction truck traffic volumes for each alternative were based on estimates generated by the construction emissions model (see Appendices D-1 and D-2). The two solar farm alternatives would have somewhat different construction worker commute volumes and somewhat different construction truck traffic volumes. For analysis purposes, all Gen-Tie Line alternatives were assumed to generate the same volumes of construction worker and construction truck traffic. The traffic volumes for Gen Tie Line A-1 were used for all alternatives. Construction traffic for the two Red Bluff Substation alternatives was not included in the analysis because that traffic would not use Highway 177 or Kaiser Road.

Table E2-1 summarizes the traffic conditions used for the traffic noise modeling analysis.

Table E2-1.
Traffic Conditions Used for Traffic Noise Modeling.

Road Segment	Parameter	Existing Conditions	Alt 1 & 2, 2011	Alt 1 & 2, 2012	Alt 3, 2011	Alt 3, 2012
I-10 West of Highway 177	Modeled Road Length, ft	5,000	5,000	5,000	5,000	5,000
	Combined Traffic Lane Widths, ft	56	56	56	56	56
	Light Vehicle Speed, mph	65	65	65	65	65
	Medium Truck Speed, mph	65	65	65	65	65
	Heavy Truck Speed, mph	65	65	65	65	65

Road Segment	Parameter	Existing Conditions	Alt 1 & 2, 2011	Alt 1 & 2, 2012	Alt 3, 2011	Alt 3, 2012
	ADT	23,000	23,278	23,157	23,271	23,145
	Medium Truck % of ADT	5.16%	5.5%	5.5%	5.5%	5.5%
	Heavy Truck % of ADT	34.29%	35.4%	35.4%	35.3%	35.4%
	Peak Hour Volume	3,000	2,998	2,994	2,997	2,994
	Hourly Capacity	4,000	4,000	4,000	4,000	4,000
	Drop-off Rate, dBA per doubling of distance	4.5	4.5	4.5	4.5	4.5
I-10 East of Highway 177	Modeled Road Length, ft	5,000	5,000	5,000	5,000	5,000
	Combined Traffic Lane Widths, ft	56	56	56	56	56
	Light Vehicle Speed, mph	65	65	65	65	65
	Medium Truck Speed, mph	65	65	65	65	65
	Heavy Truck Speed, mph	65	65	65	65	65
	ADT	21,400	21,598	21,485	21,591	21,481
	Medium Truck % of ADT	5.61%	6.0%	6.0%	6.0%	6.0%
	Heavy Truck % of ADT	37.79%	40.2%	40.3%	40.2%	40.3%
	Peak Hour Volume	2,800	2,790	2,786	2,789	2,786
	Hourly Capacity	4,000	4,000	4,000	4,000	4,000
	Drop-off Rate, dBA per doubling of distance	4.5	4.5	4.5	4.5	4.5
Highway 177 south of Kaiser Road	Modeled Road Length, ft	1,429	1,429	1,429	1,429	1,429
	Combined Traffic Lane Widths, ft	24	24	24	24	24
	Light Vehicle Speed, mph	50	50	50	50	50

Road Segment	Parameter	Existing Conditions	Alt 1 & 2, 2011	Alt 1 & 2, 2012	Alt 3, 2011	Alt 3, 2012
	Medium Truck Speed, mph	50	50	50	50	50
	Heavy Truck Speed, mph	50	50	50	50	50
	ADT	2,250	2,613	2,475	2,596	2,451
	Medium Truck % of ADT	4.4%	5.8%	5.7%	5.7%	5.5%
	Heavy Truck % of ADT	9.6%	10.9%	9.5%	10.4%	9.2%
	Peak Hour Volume	290	304	298	303	296
	Hourly Capacity	1,200	1,200	1,200	1,200	1,200
	Drop-off Rate, dBA per doubling of distance	4.5	4.5	4.5	4.5	4.5
Kaiser Road south of Tamarisk Lake	Modeled Road Length, ft	9,029	9,029	9,029	9,029	9,029
	Combined Traffic Lane Widths, ft	24	24	24	24	24
	Light Vehicle Speed, mph	45	45	45	45	45
	Medium Truck Speed, mph	45	45	45	45	45
	Heavy Truck Speed, mph	45	45	45	45	45
	ADT	150	510	372	493	358
	Medium Truck % of ADT	20.4%	20.1%	24.8%	20.0%	24.1%
	Heavy Truck % of ADT	6.5%	25.4%	21.5%	23.1%	22.5%
	Peak Hour Volume	17	140	95	139	88
	Hourly Capacity	1,200	1,200	1,200	1,200	1,200
	Drop-off Rate, dBA per doubling of distance	4.5	4.5	4.5	4.5	4.5
Kaiser Road	Modeled Road Length, ft	23,133	23,133	23,133	23,133	23,133

Road Segment	Parameter	Existing Conditions	Alt 1 & 2, 2011	Alt 1 & 2, 2012	Alt 3, 2011	Alt 3, 2012
north of Tamarisk Lake	Combined Traffic Lane Widths, ft	24	24	24	24	24
	Light Vehicle Speed, mph	45	45	45	45	45
	Medium Truck Speed, mph	45	45	45	45	45
	Heavy Truck Speed, mph	45	45	45	45	45
	ADT	108	468	330	451	316
	Medium Truck % of ADT	20.4%	20.1%	24.8%	20.0%	24.1%
	Heavy Truck % of ADT	6.5%	25.4%	21.5%	23.1%	22.5%
	Peak Hour Volume	12	135	90	134	83
	Hourly Capacity	1,200	1,200	1,200	1,200	1,200
	Drop-off Rate, dBA per doubling of distance	4.5	4.5	4.5	4.5	4.5

Table E2-2 summarizes hourly vehicle percentage patterns used in the traffic noise model for I-10 west of Highway 177 under Alternatives 1 and 2.

Table E2-2.
Hourly Traffic Distributions Used for Traffic Noise Modeling: I-10 West of Highway 177

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.1%	1.0%	5.0%	0.1%	0.0%	4.3%	0.1%	0.0%	4.3%
1:00 AM	0.1%	1.5%	6.0%	0.1%	0.0%	4.3%	0.1%	0.0%	4.3%
2:00 AM	0.2%	2.0%	7.0%	0.2%	2.2%	6.5%	0.2%	2.2%	6.5%
3:00 AM	0.2%	3.0%	9.0%	0.2%	2.2%	8.7%	0.2%	2.2%	8.7%
4:00 AM	0.4%	3.0%	12.0%	0.4%	3.3%	12.0%	0.4%	3.3%	12.0%
5:00 AM	0.6%	4.5%	16.0%	0.6%	4.3%	15.9%	0.6%	4.3%	15.9%
6:00 AM	1.5%	5.0%	24.0%	1.9%	9.8%	18.5%	1.8%	9.8%	20.4%
7:00 AM	3.5%	5.5%	30.0%	3.5%	5.4%	30.5%	3.5%	5.4%	30.3%

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
8:00 AM	6.0%	5.8%	38.0%	6.0%	5.8%	38.3%	6.0%	5.8%	38.2%
9:00 AM	7.0%	6.0%	47.0%	7.0%	6.0%	47.4%	7.0%	6.0%	47.2%
10:00 AM	8.0%	6.6%	50.0%	8.0%	6.5%	50.3%	8.0%	6.6%	50.1%
11:00 AM	9.0%	6.4%	51.0%	8.9%	6.3%	51.3%	9.0%	6.4%	51.1%
12:00 PM	10.5%	6.1%	47.0%	10.4%	6.1%	47.2%	10.4%	6.1%	47.1%
1:00 PM	13.0%	5.8%	42.0%	12.9%	5.8%	42.2%	12.9%	5.8%	42.1%
2:00 PM	9.0%	5.6%	37.0%	8.9%	5.6%	37.2%	9.0%	5.6%	37.1%
3:00 PM	8.0%	5.5%	27.0%	8.4%	6.6%	25.6%	8.2%	6.5%	26.1%
4:00 PM	7.5%	5.0%	22.0%	7.4%	5.0%	22.0%	7.4%	5.0%	22.0%
5:00 PM	6.0%	4.0%	17.0%	5.9%	4.0%	17.0%	6.0%	4.0%	17.0%
6:00 PM	3.5%	3.0%	15.0%	3.5%	3.0%	15.0%	3.5%	3.0%	15.0%
7:00 PM	2.0%	2.2%	14.0%	2.0%	2.2%	13.9%	2.0%	2.2%	13.9%
8:00 PM	1.7%	1.8%	12.0%	1.7%	1.8%	12.0%	1.7%	1.8%	12.0%
9:00 PM	1.0%	1.6%	8.0%	1.0%	1.7%	7.8%	1.0%	1.7%	7.8%
10:00 PM	0.7%	1.5%	7.0%	0.7%	1.2%	6.8%	0.7%	1.2%	6.8%
11:00 PM	0.5%	1.0%	5.0%	0.5%	0.9%	5.2%	0.5%	0.9%	5.2%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

Table E2-3 summarizes hourly vehicle percentage patterns used in the traffic noise model for I-10 east of Highway 177 under Alternatives 1 and 2.

Table E2-3.
Hourly Traffic Distributions Used for Traffic Noise Modeling: I-10 East of Highway 177

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.1%	1.0%	6.0%	0.1%	0.0%	4.8%	0.1%	0.0%	4.8%
1:00 AM	0.1%	1.5%	7.0%	0.1%	0.0%	4.8%	0.1%	0.0%	4.8%
2:00 AM	0.2%	2.0%	8.0%	0.2%	2.3%	7.0%	0.2%	2.3%	7.0%
3:00 AM	0.2%	3.0%	10.0%	0.2%	2.3%	9.3%	0.2%	2.3%	9.3%
4:00 AM	0.4%	3.5%	16.0%	0.4%	3.5%	16.3%	0.4%	3.5%	16.3%
5:00 AM	0.6%	4.5%	21.0%	0.6%	4.7%	21.1%	0.6%	4.7%	21.1%
6:00 AM	1.5%	5.0%	29.0%	1.8%	6.5%	24.2%	1.6%	6.9%	26.8%
7:00 AM	3.5%	5.5%	35.0%	3.5%	5.4%	35.4%	3.5%	5.5%	35.2%
8:00 AM	6.0%	6.0%	43.0%	6.0%	6.0%	43.3%	6.0%	6.0%	43.2%
9:00 AM	7.0%	6.5%	52.0%	7.0%	6.4%	52.4%	7.0%	6.5%	52.2%

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
10:00 AM	8.0%	7.0%	55.0%	8.0%	7.0%	55.3%	8.0%	7.0%	55.2%
11:00 AM	9.0%	7.2%	56.0%	9.0%	7.2%	56.3%	9.0%	7.2%	56.1%
12:00 PM	10.5%	7.0%	52.0%	10.5%	7.0%	52.2%	10.5%	7.0%	52.1%
1:00 PM	13.0%	6.8%	47.0%	12.9%	6.8%	47.2%	13.0%	6.8%	47.1%
2:00 PM	9.0%	6.5%	42.0%	8.9%	6.5%	42.2%	9.0%	6.5%	42.1%
3:00 PM	8.0%	6.0%	32.0%	8.2%	6.3%	30.9%	8.1%	6.4%	31.5%
4:00 PM	7.5%	5.4%	27.0%	7.4%	5.4%	27.0%	7.5%	5.4%	27.0%
5:00 PM	6.0%	4.9%	22.0%	5.9%	4.9%	22.0%	6.0%	4.9%	22.0%
6:00 PM	3.5%	3.9%	19.0%	3.5%	3.9%	19.0%	3.5%	3.9%	19.0%
7:00 PM	2.0%	3.0%	17.0%	2.0%	3.0%	17.1%	2.0%	3.0%	17.1%
8:00 PM	1.7%	2.0%	15.0%	1.7%	1.9%	15.1%	1.7%	1.9%	15.1%
9:00 PM	1.0%	1.6%	10.0%	1.0%	1.4%	9.8%	1.0%	1.4%	9.8%
10:00 PM	0.7%	1.5%	9.0%	0.7%	1.3%	9.3%	0.7%	1.3%	9.3%
11:00 PM	0.5%	1.0%	6.0%	0.5%	0.9%	5.6%	0.5%	0.9%	5.6%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

Table E2-4 summarizes hourly vehicle percentage patterns used in the traffic noise model for Highway 177 south of Kaiser Road under Alternatives 1 and 2.

Table E2-4.
Hourly Traffic Distributions Used for Traffic Noise Modeling: Highway 177 South of Kaiser Road

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.1%	0.3%	2.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
1:00 AM	0.1%	0.3%	2.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
2:00 AM	0.2%	0.4%	2.3%	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%
3:00 AM	0.2%	0.5%	2.8%	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%
4:00 AM	0.4%	0.6%	3.0%	0.3%	0.0%	0.0%	0.4%	0.0%	0.0%
5:00 AM	0.6%	1.5%	3.5%	0.5%	0.0%	0.0%	0.6%	0.0%	0.0%
6:00 AM	1.5%	2.0%	7.0%	6.0%	23.4%	1.3%	4.6%	27.4%	1.8%
7:00 AM	3.5%	4.0%	9.0%	3.4%	3.4%	19.1%	3.4%	3.5%	15.3%
8:00 AM	6.0%	4.0%	10.0%	5.7%	3.4%	18.8%	5.8%	3.5%	15.4%
9:00 AM	7.0%	4.5%	11.0%	6.7%	4.0%	19.0%	6.7%	4.2%	15.6%
10:00 AM	8.0%	5.0%	9.0%	7.5%	4.6%	16.3%	7.6%	4.8%	13.2%

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
11:00 AM	9.0%	5.3%	7.5%	8.4%	5.0%	14.2%	8.6%	5.2%	11.3%
12:00 PM	10.5%	4.8%	9.0%	9.6%	4.4%	14.7%	9.9%	4.5%	12.2%
1:00 PM	12.9%	5.0%	8.0%	11.6%	4.9%	12.2%	12.0%	5.0%	10.4%
2:00 PM	9.1%	3.5%	7.0%	8.2%	3.3%	11.2%	8.5%	3.3%	9.5%
3:00 PM	8.0%	3.0%	6.0%	11.6%	13.5%	3.6%	10.5%	13.5%	4.2%
4:00 PM	7.5%	2.0%	7.2%	6.5%	1.8%	7.1%	6.8%	1.8%	7.1%
5:00 PM	6.0%	1.5%	7.8%	5.2%	1.5%	7.4%	5.5%	1.5%	7.4%
6:00 PM	3.5%	1.0%	7.3%	3.0%	1.3%	7.6%	3.2%	1.3%	7.6%
7:00 PM	2.0%	0.6%	5.0%	1.7%	0.0%	4.4%	1.8%	0.0%	4.4%
8:00 PM	1.7%	0.4%	3.0%	1.5%	0.0%	2.6%	1.5%	0.0%	2.6%
9:00 PM	1.0%	0.3%	2.5%	0.9%	0.0%	4.3%	0.9%	0.0%	4.3%
10:00 PM	0.7%	0.3%	2.0%	0.6%	0.0%	0.0%	0.6%	0.0%	0.0%
11:00 PM	0.5%	0.3%	2.0%	0.4%	0.0%	0.0%	0.4%	0.0%	0.0%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

Table E2-5 summarizes hourly vehicle percentage patterns used in the traffic noise model for Kaiser Road south of Lake Tamarisk under Alternatives 1 and 2.

Table E2-5.
Hourly Traffic Distributions Used for Traffic Noise Modeling: Kaiser Road South of Lake Tamarisk

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5:00 AM	2.8%	33.3%	0.0%	0.6%	33.3%	0.0%	0.9%	33.3%	0.0%
6:00 AM	8.3%	22.2%	0.0%	28.4%	28.6%	0.0%	26.7%	36.4%	0.0%
7:00 AM	9.3%	20.0%	0.0%	4.3%	10.0%	50.0%	4.8%	12.5%	37.5%
8:00 AM	2.8%	0.0%	0.0%	3.6%	0.0%	82.4%	3.3%	0.0%	72.7%
9:00 AM	5.6%	16.7%	0.0%	4.7%	4.5%	72.7%	4.5%	6.7%	60.0%
10:00 AM	8.3%	33.3%	11.1%	5.3%	12.0%	68.0%	5.5%	16.7%	55.6%
11:00 AM	8.3%	44.4%	11.1%	5.3%	16.0%	68.0%	5.5%	22.2%	55.6%

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 PM	5.6%	33.3%	16.7%	4.7%	9.1%	77.3%	4.5%	13.3%	66.7%
1:00 PM	11.1%	25.0%	8.3%	5.6%	11.5%	57.7%	6.1%	15.0%	45.0%
2:00 PM	8.3%	11.1%	11.1%	4.1%	5.3%	57.9%	4.5%	6.7%	46.7%
3:00 PM	10.2%	18.2%	0.0%	28.8%	28.1%	0.0%	27.3%	35.6%	0.0%
4:00 PM	6.5%	0.0%	0.0%	1.5%	0.0%	0.0%	2.1%	0.0%	0.0%
5:00 PM	2.8%	0.0%	0.0%	0.6%	0.0%	0.0%	0.9%	0.0%	0.0%
6:00 PM	5.6%	0.0%	0.0%	1.3%	0.0%	0.0%	1.8%	0.0%	0.0%
7:00 PM	1.9%	50.0%	0.0%	0.4%	50.0%	0.0%	0.6%	50.0%	0.0%
8:00 PM	0.9%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.0%	0.0%
9:00 PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10:00 PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11:00 PM	1.9%	0.0%	100.0%	0.4%	0.0%	100.0%	0.6%	0.0%	100.0%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

Table E2-6 summarizes hourly vehicle percentage patterns used in the traffic noise model for Kaiser Road Between Lake Tamarisk and the solar farm site under Alternatives 1 and 2.

Table E2-6.
Hourly Traffic Distributions Used for Traffic Noise Modeling: Kaiser Road Between Lake Tamarisk and the Solar Farm Site

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5:00 AM	2.8%	33.3%	0.0%	0.6%	33.3%	0.0%	0.9%	33.3%	0.0%
6:00 AM	8.3%	22.2%	0.0%	28.4%	28.6%	0.0%	26.7%	36.4%	0.0%
7:00 AM	9.3%	20.0%	0.0%	4.3%	10.0%	50.0%	4.8%	12.5%	37.5%
8:00 AM	2.8%	0.0%	0.0%	3.6%	0.0%	82.4%	3.3%	0.0%	72.7%
9:00 AM	5.6%	16.7%	0.0%	4.7%	4.5%	72.7%	4.5%	6.7%	60.0%
10:00 AM	8.3%	33.3%	11.1%	5.3%	12.0%	68.0%	5.5%	16.7%	55.6%
11:00 AM	8.3%	44.4%	11.1%	5.3%	16.0%	68.0%	5.5%	22.2%	55.6%

Start of Hour	Existing Conditions			Alt 1 & 2 Conditions, 2011			Alt 1 & 2 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 PM	5.6%	33.3%	16.7%	4.7%	9.1%	77.3%	4.5%	13.3%	66.7%
1:00 PM	11.1%	25.0%	8.3%	5.6%	11.5%	57.7%	6.1%	15.0%	45.0%
2:00 PM	8.3%	11.1%	11.1%	4.1%	5.3%	57.9%	4.5%	6.7%	46.7%
3:00 PM	10.2%	18.2%	0.0%	28.8%	28.1%	0.0%	27.3%	35.6%	0.0%
4:00 PM	6.5%	0.0%	0.0%	1.5%	0.0%	0.0%	2.1%	0.0%	0.0%
5:00 PM	2.8%	0.0%	0.0%	0.6%	0.0%	0.0%	0.9%	0.0%	0.0%
6:00 PM	5.6%	0.0%	0.0%	1.3%	0.0%	0.0%	1.8%	0.0%	0.0%
7:00 PM	1.9%	50.0%	0.0%	0.4%	50.0%	0.0%	0.6%	50.0%	0.0%
8:00 PM	0.9%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.0%	0.0%
9:00 PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10:00 PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11:00 PM	1.9%	0.0%	100.0%	0.4%	0.0%	100.0%	0.6%	0.0%	100.0%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles

Table E2-7 summarizes hourly vehicle percentage patterns used in the traffic noise model for I-10 west of Highway 177 under Alternative 3.

Table E2-7.
Hourly Traffic Distributions Used for Traffic Noise Modeling: I-10 West of Highway 177

Start of Hour	Existing Conditions			Alt 3 Conditions, 2011			Alt 3 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.1%	1.0%	5.0%	0.1%	0.0%	4.3%	0.1%	0.0%	4.3%
1:00 AM	0.1%	1.5%	6.0%	0.1%	0.0%	4.3%	0.1%	0.0%	4.3%
2:00 AM	0.2%	2.0%	7.0%	0.2%	2.2%	6.5%	0.2%	2.2%	6.5%
3:00 AM	0.2%	3.0%	9.0%	0.2%	2.2%	8.7%	0.2%	2.2%	8.7%
4:00 AM	0.4%	3.0%	12.0%	0.4%	3.3%	12.0%	0.4%	3.3%	12.0%
5:00 AM	0.6%	4.5%	16.0%	0.6%	4.3%	15.9%	0.6%	4.3%	15.9%
6:00 AM	1.5%	5.0%	24.0%	1.9%	9.6%	18.5%	1.7%	9.2%	20.7%
7:00 AM	3.5%	5.5%	30.0%	3.5%	5.4%	30.5%	3.5%	5.4%	30.3%
8:00 AM	6.0%	5.8%	38.0%	6.0%	5.8%	38.3%	6.0%	5.8%	38.2%
9:00 AM	7.0%	6.0%	47.0%	7.0%	6.0%	47.3%	7.0%	6.0%	47.2%
10:00 AM	8.0%	6.6%	50.0%	7.9%	6.5%	50.3%	8.0%	6.6%	50.1%
11:00 AM	9.0%	6.4%	51.0%	8.9%	6.3%	51.3%	9.0%	6.4%	51.1%
12:00 PM	10.5%	6.1%	47.0%	10.4%	6.1%	47.2%	10.5%	6.1%	47.1%
1:00 PM	13.0%	5.8%	42.0%	12.9%	5.8%	42.1%	12.9%	5.8%	42.1%
2:00 PM	9.0%	5.6%	37.0%	8.9%	5.6%	37.1%	9.0%	5.6%	37.1%

Start of Hour	Existing Conditions			Alt 3 Conditions, 2011			Alt 3 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
3:00 PM	8.0%	5.5%	27.0%	8.4%	6.5%	25.6%	8.2%	6.4%	26.2%
4:00 PM	7.5%	5.0%	22.0%	7.4%	5.0%	22.0%	7.5%	5.0%	22.0%
5:00 PM	6.0%	4.0%	17.0%	5.9%	4.0%	17.0%	6.0%	4.0%	17.0%
6:00 PM	3.5%	3.0%	15.0%	3.5%	3.0%	15.0%	3.5%	3.0%	15.0%
7:00 PM	2.0%	2.2%	14.0%	2.0%	2.2%	13.9%	2.0%	2.2%	13.9%
8:00 PM	1.7%	1.8%	12.0%	1.7%	1.8%	12.0%	1.7%	1.8%	12.0%
9:00 PM	1.0%	1.6%	8.0%	1.0%	1.7%	7.8%	1.0%	1.7%	7.8%
10:00 PM	0.7%	1.5%	7.0%	0.7%	1.2%	6.8%	0.7%	1.2%	6.8%
11:00 PM	0.5%	1.0%	5.0%	0.5%	0.9%	5.2%	0.5%	0.9%	5.2%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

Table E2-8 summarizes hourly vehicle percentage patterns used in the traffic noise model for I-10 east of Highway 177 under Alternative 3.

Table E2-8.
Hourly Traffic Distributions Used for Traffic Noise Modeling: I-10 East of Highway 177

Start of Hour	Existing Conditions			Alt 3 Conditions, 2011			Alt 3 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.1%	1.0%	6.0%	0.1%	0.0%	4.8%	0.1%	0.0%	4.8%
1:00 AM	0.1%	1.5%	7.0%	0.1%	0.0%	4.8%	0.1%	0.0%	4.8%
2:00 AM	0.2%	2.0%	8.0%	0.2%	2.3%	7.0%	0.2%	2.3%	7.0%
3:00 AM	0.2%	3.0%	10.0%	0.2%	2.3%	9.3%	0.2%	2.3%	9.3%
4:00 AM	0.4%	3.5%	16.0%	0.4%	3.5%	16.3%	0.4%	3.5%	16.3%
5:00 AM	0.6%	4.5%	21.0%	0.6%	4.7%	21.1%	0.6%	4.7%	21.1%
6:00 AM	1.5%	5.0%	29.0%	1.8%	6.5%	24.2%	1.6%	6.7%	27.0%
7:00 AM	3.5%	5.5%	35.0%	3.5%	5.4%	35.4%	3.5%	5.5%	35.2%
8:00 AM	6.0%	6.0%	43.0%	6.0%	6.0%	43.3%	6.0%	6.0%	43.2%
9:00 AM	7.0%	6.5%	52.0%	7.0%	6.4%	52.3%	7.0%	6.5%	52.2%
10:00 AM	8.0%	7.0%	55.0%	8.0%	7.0%	55.3%	8.0%	7.0%	55.2%
11:00 AM	9.0%	7.2%	56.0%	9.0%	7.2%	56.3%	9.0%	7.2%	56.1%
12:00 PM	10.5%	7.0%	52.0%	10.5%	7.0%	52.2%	10.5%	7.0%	52.1%
1:00 PM	13.0%	6.8%	47.0%	12.9%	6.8%	47.1%	13.0%	6.8%	47.1%
2:00 PM	9.0%	6.5%	42.0%	8.9%	6.5%	42.1%	9.0%	6.5%	42.1%
3:00 PM	8.0%	6.0%	32.0%	8.2%	6.3%	30.9%	8.1%	6.3%	31.6%
4:00 PM	7.5%	5.4%	27.0%	7.4%	5.4%	27.0%	7.5%	5.4%	27.0%
5:00 PM	6.0%	4.9%	22.0%	5.9%	4.9%	22.0%	6.0%	4.9%	22.0%
6:00 PM	3.5%	3.9%	19.0%	3.5%	3.9%	19.0%	3.5%	3.9%	19.0%

Start of Hour	Existing Conditions			Alt 3 Conditions, 2011			Alt 3 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
7:00 PM	2.0%	3.0%	17.0%	2.0%	3.0%	17.1%	2.0%	3.0%	17.1%
8:00 PM	1.7%	2.0%	15.0%	1.7%	1.9%	15.1%	1.7%	1.9%	15.1%
9:00 PM	1.0%	1.6%	10.0%	1.0%	1.4%	9.8%	1.0%	1.4%	9.8%
10:00 PM	0.7%	1.5%	9.0%	0.7%	1.3%	9.3%	0.7%	1.3%	9.3%
11:00 PM	0.5%	1.0%	6.0%	0.5%	0.9%	5.6%	0.5%	0.9%	5.6%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

Table E2-9 summarizes hourly vehicle percentage patterns used in the traffic noise model for Highway 177 south of Kaiser Road under Alternative 3.

Table E2-9.
Hourly Traffic Distributions Used for Traffic Noise Modeling: Highway 177 South of Kaiser Road

Start of Hour	Existing Conditions			Alt 3 Conditions, 2011			Alt 3 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.1%	0.3%	2.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
1:00 AM	0.1%	0.3%	2.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
2:00 AM	0.2%	0.4%	2.3%	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%
3:00 AM	0.2%	0.5%	2.8%	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%
4:00 AM	0.4%	0.6%	3.0%	0.3%	0.0%	0.0%	0.4%	0.0%	0.0%
5:00 AM	0.6%	1.5%	3.5%	0.5%	0.0%	0.0%	0.6%	0.0%	0.0%
6:00 AM	1.5%	2.0%	7.0%	6.0%	22.3%	1.3%	4.3%	26.4%	1.9%
7:00 AM	3.5%	4.0%	9.0%	3.4%	3.4%	18.2%	3.4%	3.6%	14.3%
8:00 AM	6.0%	4.0%	10.0%	5.7%	3.4%	17.7%	5.8%	3.5%	14.8%
9:00 AM	7.0%	4.5%	11.0%	6.6%	4.1%	18.0%	6.8%	4.2%	15.1%
10:00 AM	8.0%	5.0%	9.0%	7.5%	4.6%	15.5%	7.7%	4.8%	12.8%
11:00 AM	9.0%	5.3%	7.5%	8.4%	5.1%	13.4%	8.6%	5.2%	10.9%
12:00 PM	10.5%	4.8%	9.0%	9.6%	4.4%	14.0%	10.0%	4.5%	11.9%
1:00 PM	12.9%	5.0%	8.0%	11.6%	5.0%	11.6%	12.1%	5.1%	9.8%
2:00 PM	9.1%	3.5%	7.0%	8.2%	3.3%	10.3%	8.5%	3.3%	8.6%
3:00 PM	8.0%	3.0%	6.0%	11.7%	12.9%	3.6%	10.3%	12.7%	4.4%
4:00 PM	7.5%	2.0%	7.2%	6.5%	1.8%	7.1%	6.9%	1.8%	7.1%
5:00 PM	6.0%	1.5%	7.8%	5.2%	1.5%	7.4%	5.5%	1.5%	7.4%
6:00 PM	3.5%	1.0%	7.3%	3.0%	1.3%	7.6%	3.2%	1.3%	7.6%
7:00 PM	2.0%	0.6%	5.0%	1.7%	0.0%	4.4%	1.8%	0.0%	4.4%
8:00 PM	1.7%	0.4%	3.0%	1.5%	0.0%	2.6%	1.6%	0.0%	2.6%
9:00 PM	1.0%	0.3%	2.5%	0.9%	0.0%	4.3%	0.9%	0.0%	4.3%

Start of Hour	Existing Conditions			Alt 3 Conditions, 2011			Alt 3 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
10:00 PM	0.7%	0.3%	2.0%	0.6%	0.0%	0.0%	0.7%	0.0%	0.0%
11:00 PM	0.5%	0.3%	2.0%	0.4%	0.0%	0.0%	0.4%	0.0%	0.0%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

Table E2-10 summarizes hourly vehicle percentage patterns used in the traffic noise model for Kaiser Road south of Lake Tamarisk under Alternative 3.

Table E2-10.
Hourly Traffic Distributions Used for Traffic Noise Modeling: Kaiser Road South of Lake Tamarisk

Start of Hour	Existing Conditions			Alt 3 Conditions, 2011			Alt 3 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5:00 AM	2.8%	33.3%	0.0%	0.7%	33.3%	0.0%	0.9%	33.3%	0.0%
6:00 AM	8.3%	22.2%	0.0%	29.3%	27.3%	0.0%	25.6%	35.8%	0.0%
7:00 AM	9.3%	20.0%	0.0%	4.2%	10.5%	47.4%	5.1%	12.5%	37.5%
8:00 AM	2.8%	0.0%	0.0%	3.3%	0.0%	80.0%	3.5%	0.0%	72.7%
9:00 AM	5.6%	16.7%	0.0%	4.4%	5.0%	70.0%	4.7%	6.7%	60.0%
10:00 AM	8.3%	33.3%	11.1%	5.1%	13.0%	65.2%	5.7%	16.7%	55.6%
11:00 AM	8.3%	44.4%	11.1%	5.1%	17.4%	65.2%	5.7%	22.2%	55.6%
12:00 PM	5.6%	33.3%	16.7%	4.4%	10.0%	75.0%	4.7%	13.3%	66.7%
1:00 PM	11.1%	25.0%	8.3%	5.3%	12.5%	54.2%	6.3%	15.0%	45.0%
2:00 PM	8.3%	11.1%	11.1%	3.8%	5.9%	52.9%	4.7%	6.7%	46.7%
3:00 PM	10.2%	18.2%	0.0%	29.7%	26.9%	0.0%	26.3%	34.9%	0.0%
4:00 PM	6.5%	0.0%	0.0%	1.6%	0.0%	0.0%	2.2%	0.0%	0.0%
5:00 PM	2.8%	0.0%	0.0%	0.7%	0.0%	0.0%	0.9%	0.0%	0.0%
6:00 PM	5.6%	0.0%	0.0%	1.3%	0.0%	0.0%	1.9%	0.0%	0.0%
7:00 PM	1.9%	50.0%	0.0%	0.4%	50.0%	0.0%	0.6%	50.0%	0.0%
8:00 PM	0.9%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.0%	0.0%
9:00 PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10:00 PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11:00 PM	1.9%	0.0%	100.0%	0.4%	0.0%	100.0%	0.6%	0.0%	100.0%

VPH = vehicles per hour

ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

Table E2-11 summarizes hourly vehicle percentage pattens used in the traffic noise model for Kaiser Road Between Lake Tamarisk and the solar farm site under Alternative 3.

Table E2-11.
Hourly Traffic Distributions Used for Traffic Noise Modeling: Kaiser Road Between Lake Tamarisk and the Solar Farm Site

Start of Hour	Existing Conditions			Alt 3 Conditions, 2011			Alt 3 Conditions, 2012		
	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH	VPH % ADT	MT % VPH	HT % VPH
12:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4:00 AM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5:00 AM	2.8%	33.3%	0.0%	0.7%	33.3%	0.0%	0.9%	33.3%	0.0%
6:00 AM	8.3%	22.2%	0.0%	29.3%	27.3%	0.0%	25.6%	35.8%	0.0%
7:00 AM	9.3%	20.0%	0.0%	4.2%	10.5%	47.4%	5.1%	12.5%	37.5%
8:00 AM	2.8%	0.0%	0.0%	3.3%	0.0%	80.0%	3.5%	0.0%	72.7%
9:00 AM	5.6%	16.7%	0.0%	4.4%	5.0%	70.0%	4.7%	6.7%	60.0%
10:00 AM	8.3%	33.3%	11.1%	5.1%	13.0%	65.2%	5.7%	16.7%	55.6%
11:00 AM	8.3%	44.4%	11.1%	5.1%	17.4%	65.2%	5.7%	22.2%	55.6%
12:00 PM	5.6%	33.3%	16.7%	4.4%	10.0%	75.0%	4.7%	13.3%	66.7%
1:00 PM	11.1%	25.0%	8.3%	5.3%	12.5%	54.2%	6.3%	15.0%	45.0%
2:00 PM	8.3%	11.1%	11.1%	3.8%	5.9%	52.9%	4.7%	6.7%	46.7%
3:00 PM	10.2%	18.2%	0.0%	29.7%	26.9%	0.0%	26.3%	34.9%	0.0%
4:00 PM	6.5%	0.0%	0.0%	1.6%	0.0%	0.0%	2.2%	0.0%	0.0%
5:00 PM	2.8%	0.0%	0.0%	0.7%	0.0%	0.0%	0.9%	0.0%	0.0%
6:00 PM	5.6%	0.0%	0.0%	1.3%	0.0%	0.0%	1.9%	0.0%	0.0%
7:00 PM	1.9%	50.0%	0.0%	0.4%	50.0%	0.0%	0.6%	50.0%	0.0%
8:00 PM	0.9%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.0%	0.0%
9:00 PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10:00 PM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11:00 PM	1.9%	0.0%	100.0%	0.4%	0.0%	100.0%	0.6%	0.0%	100.0%

VPH = vehicles per hour
ADT = average daily traffic
MT = medium trucks (2 axles, 6 wheels)
HT = heavy trucks (3 or more axles)

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