San Joaquin Solar (08-AFC-12)
Data Request Workshop Action Items Response

Discipline Area	Action Item	Status
Air Quality	Provide ERC discussion to SJVAPCD and send a copy to CEC staff.	**Complete.**
Air Quality	Prepare a figure (land use map) with crop distribution or type to confirm the delivery distance and provide to CEC.	**Complete.**
Air Quality	Provide an analysis of commissioning overlap with operations.	Please see the attached discussion on commissioning analysis.
Air Quality	Provide the latest WSAC TDS, cycles and associated PM emissions.	Please see the attached revised discussion on WSAC PM emissions**.**
Haz Mat handling	Identify the storage location and manner for the HTF impacted soil.	**Complete.**
Land Use	Provide schedule and documentation of the Williamson Act cancellation process.	**Complete.**
Public health	Provide copies of back up (source) documents for TAC emission factors.	**Complete.**
Public health	Research if dioxins and furans in the fly ash from wood burners are significant or even present.	Please see the attached discussion on fly ash dioxins and furans.
Public health	Research whether pesticides on agricultural wood contribute to the generation of dioxins when the wood is combusted.	Please see the attached discussion on fly ash dioxins and furans.
Public health	Provide contact name at SJVAPCD for TAC Emission factors, Leland's contact info.	**Complete.**
Public health	Provide emission factor spreadsheets from Leland.	**Complete.**
Public health	Provide a qualitative analysis of diesel particulate matter in the I-5 corridor. URS will obtain the paper Dr Greenberg provided and see if it is relevant.	Please see the attached discussion on DPM in the I-5 corridor.

Discipline Area	Action Item	Status
Public health	Coordinate with CARB or SJVAPCD to document evidence of absence of dioxins and furan in ash.	Please see the attached discussion on fly ash dioxins and furans.
Visual	Prepare and analyze a new KOP the southern route transmission line crossing I-5. A new visual simulation will not be necessary.	Please see the attached KOP and analysis.
Visual	Characterize the biomass handling for visual resources.	**Complete.**
Visual	Identify the purpose of the preserve located north of Jayne Avenue (i.e. public use) for glint/glare consideration.	**Complete.**
Water Resources	Provide copies of SWPPP, construction SWPPP, and DESP to CEC.	**Complete.**
Water Resources	Update (with more detail) the existing water use table to include daily max and average water use for operations and construction (including hydrostatic testing etc.).	**Complete.**
Water Resources	Provide further information on water supply: reliability.	Please see the attached discussion on water reliability.
Water Resources	Provide the CEC with contact information for RWQCB.	**Complete.**
Waste/Worker Safety	Provide further characterization of the site (limited Phase II Site Assessment)	**Complete.**
Worker Safety	Confirm a second access for emergency vehicles.	**Complete.**

Attachments

Commissioning overlap with operations

SJS1&2 will commission each combustor individually, and may start operating each combustor after its commissioning is complete. To examine the possible impacts to air quality from the combustor commissioning activities along with the normal combustor operations, an AERMOD analysis was conducted. Since commissioning activities will last a few hours to a few days, only impacts from pollutants with short-term averages were examined. From a review of the existing analyses of commissioning and operations, it was noted that combining the peak impacts from SO_2 and CO emissions from these analyses, even though they occur at different locations, would lead to impacts well below the AAQS. The impacts from these combined analyses are presented in Table 2.

To estimate the NO_x 1-hour and $PM_{10}/PM_{2.5}$ 24-hour impacts new AERMOD modeling was conducted. In the modeling analysis, 1 combustor operated with commissioning parameters and emissions, and 3 combustors were operated with normal operating parameters and emissions. The most southerly combustor was predicted to have the highest commissioning impact of all combustors, so this combustor was selected to be in the commissioning mode in the model. Stack parameters from case 3 were associated with normal NOx emissions and from case 1 with the PM emissions. All other sources onsite were included in the modeling. The results of the AERMOD analyses are presented in Table 2. Table 2 demonstrates that when the maximum incremental commissioning plus operations impacts are added to applicable background concentrations and compared with the most stringent state or national ambient standards, no violations of the applicable standards for these pollutants are predicted to occur. Maximum PM_{10} and $PM_{2.5}$ impacts for this commissioning time period may add to existing violations of the applicable ambient standards, but project emissions of these pollutants will need to be offset with approved emission reduction credits.

Table 2 AERMOD Results for commissioning overlapping with operations

Pollutant	Averaging Period	Maximum Predicted Impact	Background Concentration (red ones mean old numbers, need update)	Total Concentration	NAAQS	CAAQS	Above AAQS Significance Thresholds?
		(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m3)	(µg/m3)	
NO_2	1-hour	**191.14**	137.24	**328.38**	NA	339	No
SO_2	1-hour	**29.77**	23.49	**53.26**	NA	655	No
	3-hour	**9.97**	15.66	**25.63**	1,300	NA	No
	24-hour	**3.91**	10.44	**14.35**	365	105	No
CO	1-hour	**192.43**	5016	**5208.43**	40,000	23,000	No
	8-hour	**17.03**	3773	**3790.43**	10,000	10,000	No
PM_{10}	24-hour	**31.55**	255	**286.55**	150	50	(Background is already above)
$PM_{2.5}$	24-hour	**31.55**	143.2	**174.75**	35	NA	(Background is already above)

Revised WSAC Drift Calculation

The particulate matter emissions from the WSACs have been revised to incorporate the maximum TDS level of 1850 ppm expected in the make-up water, 5 cycles of concentration, a slightly higher daily maximum circulating water rate, and a drift rate due to an eliminator control of **0.0005%.** Particulate emissions from all WSACs associated with SJS1&2 were estimated to be 39.84 lb/day and 6.19 ton/year. Table DR-74 presents these revised emissions and the data integral to these calculations.

Table DR-74 WSAC Drift Calculation

Total Project SJS 1&2

Annual average design circulating water rate			61,000	gallons/min
Maximum daily design circulating water rate			71,680	gallons/min
Cycles of concentration			5	
TDS			1850	mg/liter
			15.44	lb/1000 gallons
Drift Eliminator Control	0.000005	=	0.0005	%
Operating hours per year			8760	hr/yr
number of WSACs			2	
Number of cells in each WSAC			4	

	Total SJS 1&2	Each WSAC	each cell	each cell (g/s)
Annual PM emissions (ton/year)	6.19	3.09	0.773	0.02227
Maximum daily PM emissions (lb/day)	39.84	19.92	4.979	0.02616

Note: Drift Eliminator Control guaranteed by Chuck Marchetta of Niagara Blower, Wet Surface Air Cooler Division

Discussion on Dioxins and Furans

Combustion Fly Ash:
The combustor engineers, EPI, do not have any data on the content of dioxins or furans in the fly ash.

During a phone conversation between the Applicant and Leland Villalvazo of SJVAPCD on June 9, 2009, the Applicant was informed that SJVAPCD and ARB do not require testing for dioxins and furans in the fly ash from wood burners. Mr. Villalvazo stated that this testing is not required since the quantities of dioxins and furans in fly ash are negligible. URS could not find testing requirements for TACs in fly ash from either SJVAPCD or ARB. The following are the only tests discovered that may be remotely applicable:

- California Health and Safety Code 25143.5 states that fly ash from combustion processes needs to be tested for hazardous vs. non-hazardous properties to determine the proper disposal method, but does not specifically reference TACs.
- CARB has Test Method 428 for determining dioxins and furans from stationary sources, although the method does not specifically address the testing of fly ash. This is the method recommended for testing the airborne toxics (including in the fly ash) from medical waste incinerators (CARB Division 3, Chapter 1, Subchapter 7.5).

During the CEC data request public meeting, Dr. Greenberg recommended an article that discusses dioxins and furans in residue from wood combustion. URS obtained this article by Samuel Wunderli. Wunderli investigated the formation of PCDD/PCDF in solid residues from the combustion of native and waste woods. In waste wood fly ash he measured a median international toxicity equivalent (I-TEQ) of 2,800 µg/tonne ash and in native wood a median I-TEQ of 2.6 µg/tonne ash. Wunderli found that the production of PCDD/PCDF from waste wood can be significant if combustion is incomplete. No data were provided regarding the completeness of the combustion process or emission control technologies applied to the combustors for any of his samples.

In United Nations Environmental Programme's *Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases*, a range of emission factors from a number of sources are provided. Table 4 presents PCDD/PCDF emission factors from waste wood biomass incineration and shows a range of emission factors from incineration with no pollution controls to incineration with full modern air pollution control (APC) equipment. It should be noted that the PCDD/PCDF emissions decrease radically with the implementation of APC equipment and SJS1&2 will implement all currently available APC equipment. Table 5 presents PCDD/PCDF emission factors from clean wood biomass power generation. These biomass power generators used a variety of pollution control techniques, which are not specifically called out in the document.

Table 4 Emission Factors for polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (PCDD/PCDF) in fly ash from waste wood biomass incineration

	µg TEQ/tonne Biomass Burned Released to Air	µg TEQ/tonne Biomass Burned in Residue (Fly Ash Only)
1. Older furnaces, batch type operation, no APC equipment	100	1,000
2. Updated, continuously operated and controlled facilities, some APC equipment	10	10
3. Modern state-of-the-art facilities, continuous controlled operation, full APCS	1	0.2

(Table 21 from the "UNEP, Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases 2003")

Discussion on Dioxins and Furans (cont.)

Table 5 Emission Factors for polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (PCDD/PCDF) in fly ash from clean wood biomass based power generation

	µg TEQ/TJ of Biomass Burned Released to Air	µg TEQ/TJ of Biomass Burned in Residue
Clean wood fired power boilers	50	15

(Table 38 from the "UNEP, Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases 2003")

Formation during Combustion:

There are a number of techniques used to minimize the production of PCDD/PCDF during combustion. These include:

- Keeping oxygen levels low (especially for reactions in fly ash) (Evaluation of Conversion 90-91) - excess air ratio <1.5–2 (Mobbs)
- Keeping combustion temperatures higher than 800°C – see below for details.
    - PCDD/PCDF form homogeneously between 400°C and 800°C when present with precursors such as chlorine substances [gaseous or ash-bound inorganic (Altarawneh)], propene, quinones, catechol, permethrin, tebuconazole and potentially other substances (Altarawneh), or
    - PCDD/PCDF form homogeneously from precursors in the presence of oxygen and cooled rapidly from high temperatures (Altarawneh).
    - PCDD/PCDF form heterogeneously between 200°C and 400°C in the presence of oxygen and organic carbon (Altarawneh), or
    - PCDD/PCDF form heterogeneously between 200°C and 400°C with catalytic assistance of transition metals (most notably copper) and precursors (Altarawneh). The formation is suppressed in the presence of alkali earth metals (Altarawneh).
- Suppressing formation by addition of inhibitors, such as sulfur and nitrogen agents (Lavric)
- Having complete combustion (Lavric)
- Use of particulate removal devices and other air pollution control devices (Lavric)
- Having proper mixing of gases (Evaluation of Conversion)
- Limiting oxygen, chlorine and transition metals (especially copper) (Evaluation of Conversion)
- Cold-quenching and/or catalytic/thermal combustion (Evaluation of Conversion)
- Limiting water content or dry solid fuel prior to combustion (Mobbs)
- Sufficient residence time of flue gases in the hot zone of the furnace (Mobbs)
- Use of dry sorbent injection (for minimization of hydrogen chloride) – limestone, lime and hydrated lime (Mobbs)
- Use of activated carbon (for minimization of PCDD/PCDF) (Mobbs)
- Use of selective catalytic reduction (Mobbs)
- Use of efficient dust abatement (Mobbs)

The biomass combustors selected for the SJS 1&2 Project will operate within the temperature range that limits PCDD/PCDF formation. The nature of the fluidized bed causes complete turbulence which contributes to complete combustion of the fuel. Additionally, SJS1&2 intends to implement most of the PCDD/PCDF minimization techniques listed above, thus limiting PCDD/PCDF formation in the biomass exhaust, and ultimately limiting formation in the fly ash.

Dr. Greenberg asked if pesticides in the agricultural trimmings contribute to the formation of dioxins. The answer depends on the substances in the particular pesticides. If any of the pesticides applied to the agricultural trimmings to be burned at the Project contain the substances listed above, such as chlorine or copper, PCDD/PCDF formation may occur when burned. Pesticides currently in use generally have a short life span after application to the crop (due to a short half-life), and most pesticide residue is gone after a few months of application. The amount of pesticide that might remain on the trimmings before burning is expected to be minimal. No articles specifically discussing dioxin formation from wood treated with pesticides were identified.

Discussion on Dioxins and Furans (cont.)

The following outlines the emission controls that will be installed for each biomass combustor:

- Limestone will be added to the fluidized bed combustor to control acid gas emissions;
- A selective non-catalytic reduction (SNCR) system in the combustor to reduce NO_x emissions;
- A multi-clone and baghouse for reduction of particulate emissions;
- A dry scrubber to reduce hydrogen chloride emissions;
- A selective catalytic reduction (SCR) system to further reduce NO_x emissions; and
- A wet scrubber for additional reduction of hydrogen chloride and SO_x emissions.

These extensive pollution controls will not only control emissions of the criteria pollutants, but limit the PCDD/PCDF formation in the biomass and thus limit the formation in the fly ash. PCDD/PCDF content in the fly ash is expected to be negligible.

References

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Mobbs, Chris. "Booklet 10: Firing Installations for Wood and Other Biomass Fuels." *Stockholm Convention on Persistent Organic Pollutants (POPs)*. Stockholm Secretariat, 13 Apr. 2006. Web. 19 Aug. 2009. <http://74.125.155.132/search?q=cache:MJH2hfnsJBYJ:www.pops.int/documents/batbep_advance/intersessional_work/Book%252012%2520wood%2520and%2520biomass.doc+%22fly+ash%22+%22emission+factor%22+%22pcdd%22+biomass&cd=3&hl=en&ct=clnk&gl=us>.

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DPM I5 Corridor Analysis

During the August 6, 2009 meeting, it was noted that the cancer risk due to diesel particulate matter (DPM) along the I-5 corridor near the Project site was low compared to the cancer risk along the Highway 99 corridor and other parts of California. URS found that the estimated cancer risk due to DPM in the San Joaquin Valley Air Basin for year 2000 was 390 in a million (http://www.arb.ca.gov/ch/aq_result/fresno/fresno.htm).

The potential cancer risk from diesel delivery trucks traveling to the SJS1&2 Project was estimated based on the percentage of Project related diesel truck trips along I-5, as shown in Table 3, multiplied by the total cancer risk in the vicinity of I-5. This rough estimate shows that potential the cancer risk due to Project related DPM along the I-5 corridor near the Project might be as high as 8 in a million. This is a very conservative estimate as there are DPM emissions from sources other than vehicles traveling along I-5 that contribute to the basin wide cancer risk. It is also conservative as the expected lifespan of the Project is 30 years, significantly less than the 70 year exposure that is used in the cancer risk analysis. Even with many conservative assumptions, this worst-case cancer risk associated with the Project's diesel delivery trucks is less than the significance level of 10 in a million, thus the potential cancer risk from the diesel delivery trucks along I-5 is not significant.

Table 3 Project Related and Total Traffic Volumes Along I-5 Near SJS1&2

Roadway	Segment	Daily I-5 Traffic Volume	Existing I-5 Truck Percentile	Existing I-5 Daily Truck Volume	Project Operations Daily Truck Trips on I-5	Percentage of Project Related Daily Truck Trips Along I-5
I-5 Freeway	North of W Jayne Avenue	33,416	31%	10,359	96	0.93%
	South of W Jayne Avenue	33,436	31%	10,365	118	1.14%

Note: Freeway volume based on Annual Average Daily Traffic (AADT) totals

Visual - New KOP 6 Analysis

Interstate 5 (I-5) is located approximately 3.3 miles east of the Project site (within the VSOI identified for the Project). While travelers on the I-5/West Jayne Avenue overpass may have distant and partially obscured views to the Project, travelers along I-5 would not have views to the Project site. This is largely due to distance, as well as agricultural and commercial operations located between the highway and the Project site. However, travelers along I-5 (both northbound and southbound) would have views of the proposed overhead transmission line crossing over the I-5. As stated in Section 5.13, Visual Resources, of the Project AFC, traffic flow was examined for I-5 within the VSOI. Road counts are approximately 36,000 average daily trips ("ADT") along I-5 in the vicinity of the Project site.

FHWA and Caltrans standards do not identify I-5 as a designated scenic highway. However, according to the Conservation and Open Space Element of the County of Fresno General Plan (*October 2000, page 5-36*), the entire length of I-5 within Fresno County is a Fresno County Designated Scenic Highway. Natural amenities adjacent to I-5, have been visually impacted because of the presence of the highway itself (and traffic on the highway), multiple existing transmission system/networks crossing the highway both north and south of the Project site, intensive agricultural production operations, and other cultural modifications in the immediate vicinity. Views along I-5 have therefore been considered to have moderate/low sensitivity.

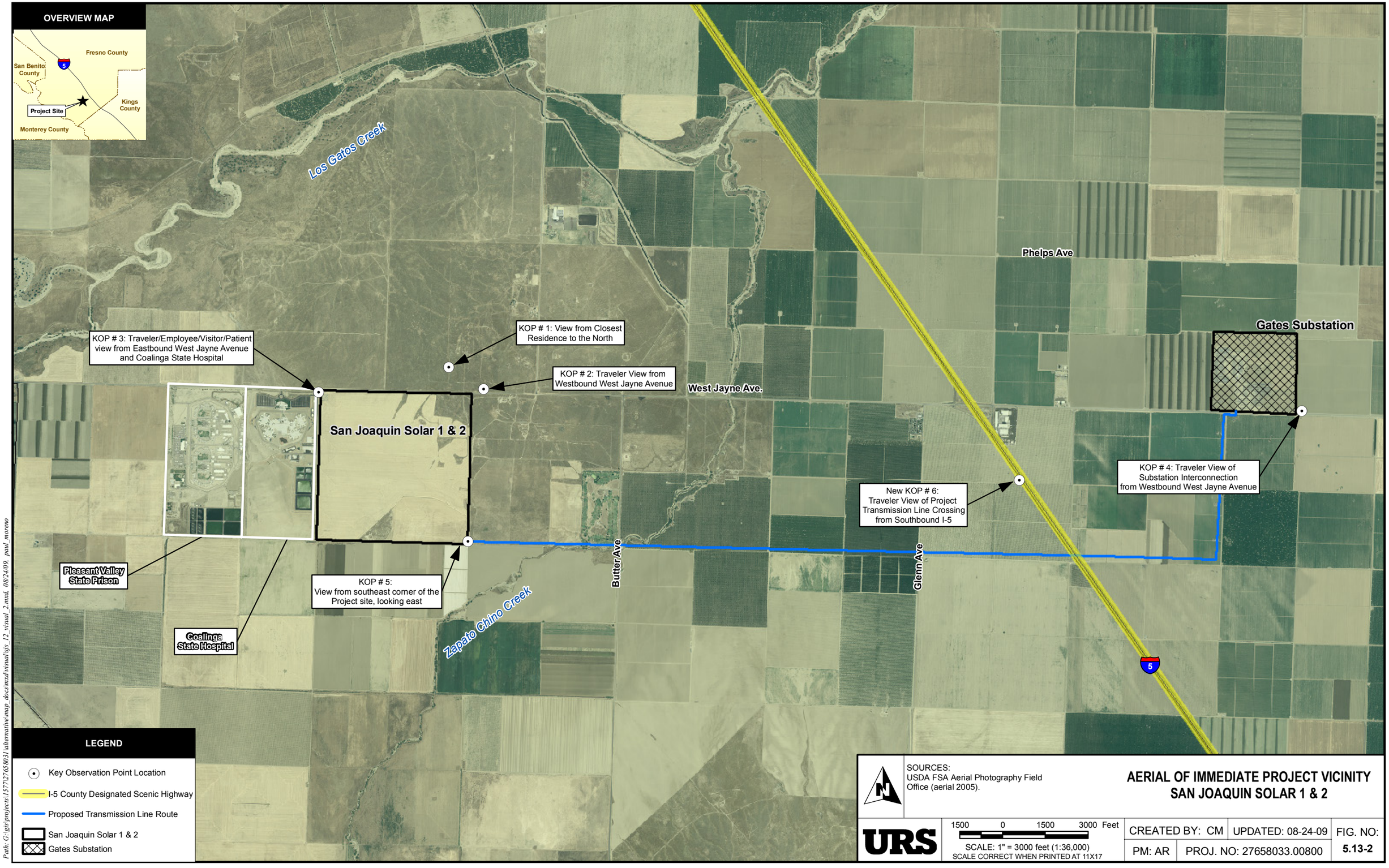
For travelers along I-5, this KOP location (KOP#6) represents the most unobscured view to the proposed overhead transmission line crossing over the I-5. Due to the presence of multiple existing transmission system/networks crossing the I-5 both north and south of the Project's proposed transmission line (see Figure 2) viewer sensitivity to the presence of additional overhead transmission lines is reduced. Also, it is likely that I-5 travelers would be unable to distinguish the presence of an additional transmission line crossing at this location. Further, this view is consistent with short viewing durations (*i.e.*, from travelers focusing on the road). Motorists along I-5 are traveling at a high rate of speed perpendicular to the proposed Project transmission line, which provides for short viewing durations, and reduces visibility and sensitivity. No nighttime lighting is proposed for the transmission line.

Visual impact susceptibility from this location is characterized as low. Visual impact severity from this location is characterized as low. Therefore, aesthetic impact significance from this location is classified as less than significant.

New KOP 6: Existing Traveler View of Project Transmission Line Crossing from Southbound I-5 (approximately 3.3 miles east of Project site; and 0.5-mile north of proposed Transmission line Crossing).

EXISTING VIEW OF PROJECT T-LINE CROSSING FROM NEW KOP #6
SAN JOAQUIN SOLAR 1&2

URS	NO SCALE	CREATED BY: AG	DATE: 08-21-09	FIG. NO: 2
		PM: AR	PROJ. NO: 27658033.00800	



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San Joaquin Solar 1 & 2 Hybrid Project

Technical Area: Soil and Water Resources

Topic: Reliability

During the August 6, 2009 Data Response/Issues Resolution Workshop the topic of system reliability in terms of water supply was discussed in terms of how long the project could sustain normal operations if one or both proposed project water supply sources should temporarily not be available for some reason. The Applicant is not aware of any requirement that the SJS 1&2 Project have a redundant water supply. Accordingly, Applicant believes this data request is irrelevant. Nonetheless, Applicant provides the following information in response.

Response:

The current water balance diagram shows the following three water storage tanks that could be used to supply water to the project during times of temporary groundwater or City water supply outages:

1. Groundwater Raw Water/Fire Suppression Tank: Total tank size is 2 million gallons (1.5 million gallons raw water and 0.5 million gallons fire suppression)
2. Gray Water Storage: 1 million gallons

Three scenarios were analyzed to estimate the length of time the project could operate under normal full load operating conditions during temporary water supply source outages:

Scenario	Reliability
Scenario 1: Both City and groundwater well supply sources are temporarily unavailable	31hours
Scenario 2: Groundwater source temporarily unavailable	65 hours
Scenario 3: City water supply source temporarily unavailable	97 hours

Assumptions

- Average daily project water use = 1,330 gallons per minute (gpm)
- Total water available at time of water supply outage equals maximum storage tank capacity = 2.5 million gallons
- Maximum sustained groundwater well supply = 900 gpm (constant rate aquifer test rate)
- City wastewater inflow is 1,000,000 gallons per day = 694 gpm
- Calculations:

  Scenario 1: 1,330 gpm use - 0 inflow = 1,330 gpm (flow required from tanks)
  2,500,000 gallons/1,330 gpm = 1879 minutes = 31.3 hours

  Scenario 2: 1,330 gpm use - 694 gpm inflow = 636 gpm (flow required from tanks)
  2,500,000 gallons/636 gpm = 3931 minutes = 65.5 hours

  Scenario 3: 1,330 gpm use - 900 gpm inflow = 430 gpm (flow required from tanks)
  2,500,000 gallons/430 gpm = 5814 minutes = 96.9 hours

Additionally, if one water source temporarily becomes unavailable, plant operation can be modified (electrical production reduced) to increase the length of operation based on the reduced supply of water.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT
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APPLICATION FOR CERTIFICATION
FOR THE *SAN JOAQUIN SOLAR UNITS 1 AND 2*
LICENSING PROJECT

Docket No. 08-AFC-12

PROOF OF SERVICE
(Revised 7/23/2009)

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Declaration of Service

I, Anne Runnalls, declare that on August 26, 2009, I served and filed copies of the attached Remaining Data Response Workshop Action Items. The original document, filed with the Docket Unit, is accompanied by a opy of the most recent Proof of Service list, located on the web page for this project at: [http://www.energy.ca.gov/sitingcases/sjsolar/index.html]. The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(C*heck all that Apply*)

For service to all other parties:

__X__sent electronically to all email addresses on the Proof of Service list;

_____by personal delivery or by depositing in the United States mail at _____ with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses NOT marked "email preferred."

AND

For filing with the Energy Commission:

__X__sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (preferred method);

OR

_____depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-12
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.