Appendix 5.1D
Ambient Air Quality Modeling Analysis

Table 5.1D-1
Building Dimensions Used for Modeling Hidden Hills
Solar Electric Generating System

	Dimensions (meters)		
Structure	**Height**	**Length**	**Width**
Common Area			
Administration, Warehouse and Shop Building	9.8	37.2	61.6
Fire Water Pump House	3.0	3.7	11.0
Emergency Diesel Generator Enclosure	3.0	3.7	5.5
	Height	**Diameter**	
Fire/Service Water Storage Tank	4.6	7.6	
Power Blocks			
Steam Turbine Generator Enclosure	15.8	33.5	14.0
Air Cooled Condenser	36.6	91.4	67.1
Deaerator/Feedwater Heater Structure	24.4	17.1	20.1
Emergency Diesel Generator Enclosure	3.7	3.7	9.8
Plant Service Building	4.9	17.1	30.5
ACC Power Distribution Center – East	4.9	4.3	15.2
ACC Power Distribution Center – West	4.9	4.3	15.2
Fire Water Pump House	3.7	11.0	3.7
Demineralized Water Metering Shed	3.0	7.9	4.6
Boiler Pump Power Distribution Center	4.9	15.2	4.3
Water Treatment Plant Distribution Center	4.9	9.1	4.3
Mirror Wash Vehicle Refueling Area Canopy	7.3	22.6	35.4
Mirror Wash Vehicle Storage Area Canopy - East	6.1	12.2	56.1
Mirror Wash Vehicle Storage Area Canopy - West	5.5	51.8	12.2
Fin Fan Cooler	4.3	19.8	18.3
Wet Surface Air Cooler	4.3	38.0	35.0
Aux Boiler 1 Enclosure	5.9	19.5	13.8
Aux Boiler 2 Enclosure	5.9	19.5	13.8
Aux Boiler 3 Enclosure	5.9	19.5	13.8
Startup Boiler Enclosure	4.8	19.2	12.6
Nighttime Boiler Enclosure	3.5	9.1	7.7
	Height	**Diameter**	
Solar Tower including Solar Receiver Steam Generator	228.6	21.9	
Demineralized Water Storage Tank	7.9	7.9	
Fire/Service Water Storage Tank	9.1	12.2	
Mirror Wash Water Storage Tank	6.4	7.6	
Waste Water Storage Tank	7.0	7.6	

FIGURE 5.1D-1
Structures and Emission Sources in the Common Area

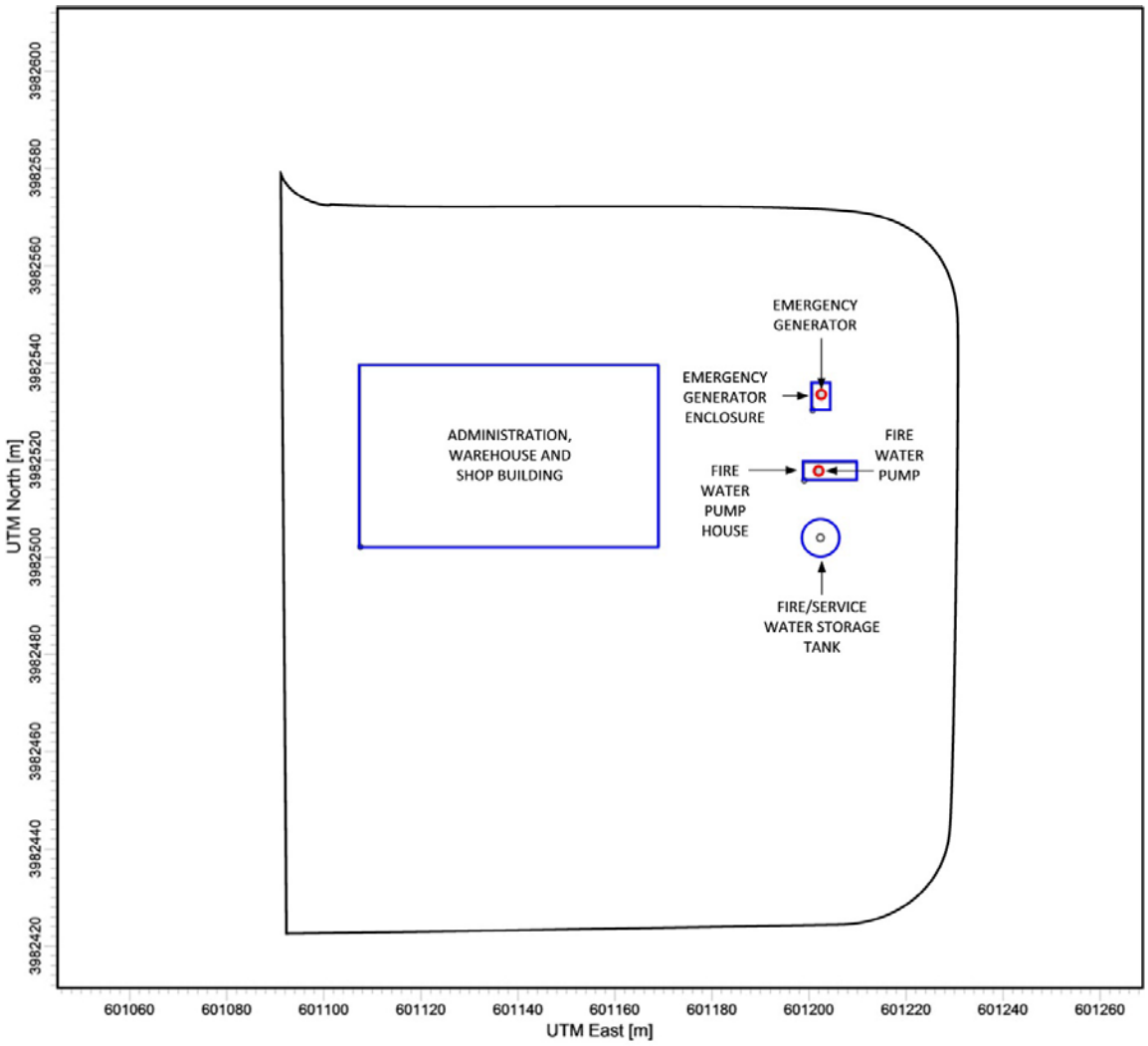

FIGURE 5.1D-2
Structures and Emission Sources in the Power Blocks

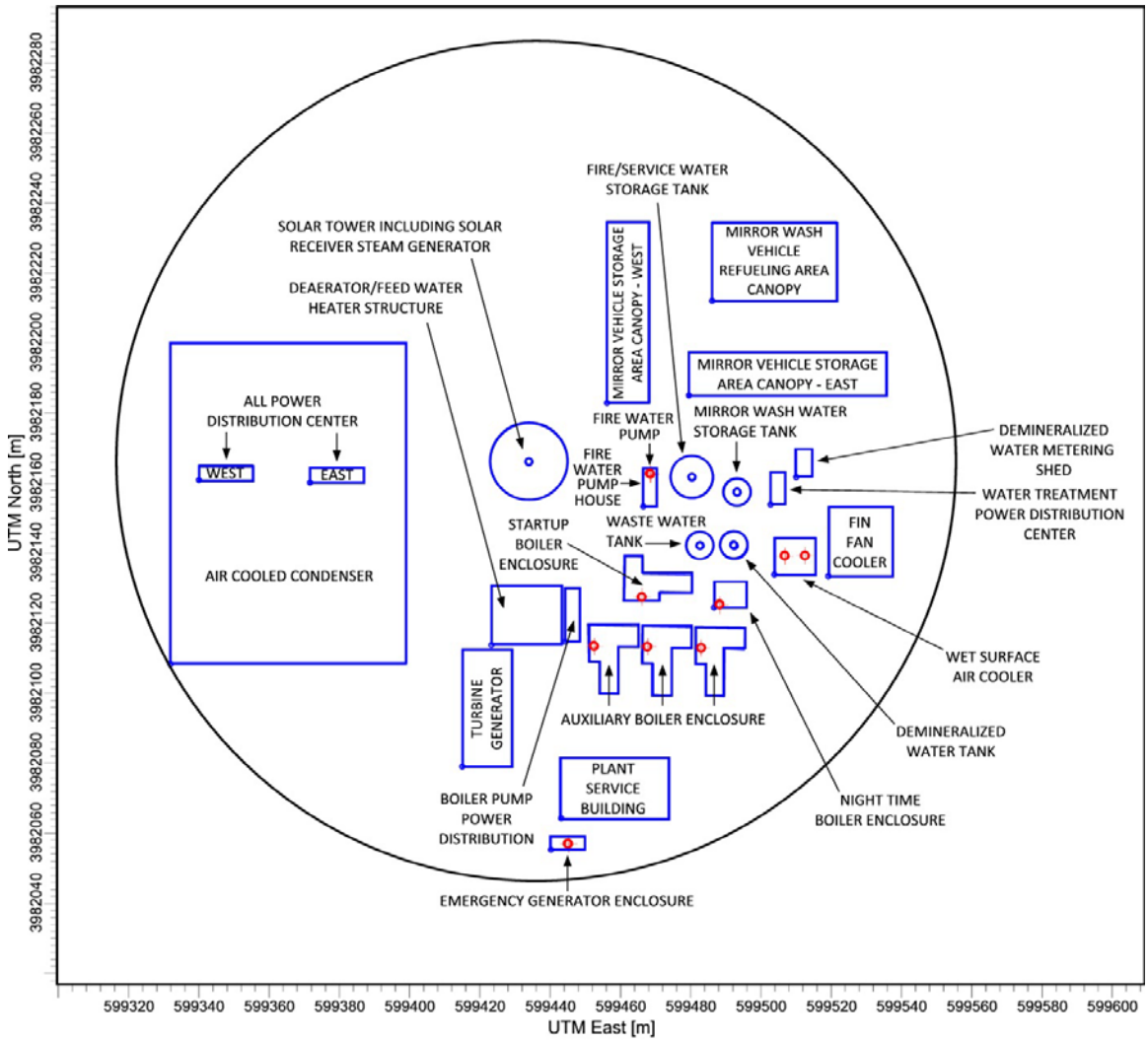

Table 5.1D-2
Emission Rates and Stack Parameters for Refined Modeling
Hidden Hills Solar Electric Generating System

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
Averaging Period: One hour, boiler operations									
Aux Boilers	2.083	36.576	455.22	73.952	21.705	0.6811	0.1324	2.304	n/a
Startup Boilers	1.524	36.576	455.22	36.829	20.189	0.3392	6.591E-02	0.5736	n/a
Nighttime Preservation Boilers	0.508	27.432	435.78	1.736	8.567	1.668E-02	3.242E-03	5.643E-02	n/a
Averaging Period: One hour, engine testing									
PB emergency generators (each)	0.508	5.486	717.11	9.657	47.644	2.553	2.316E-03	0.3680	n/a
PB fire pump engines (each)	0.102	3.962	856.89	0.748	92.209	8.281E-02	1.852E-04	5.333E-02	n/a
Common Area em generator	0.178	5.486	729.61	1.058	42.626	1.393E-01	2.567E-04	1.677E-02	n/a
Common Area fire pump engine	0.102	3.962	829.11	0.721	88.891	7.119E-02	1.588E-04	4.586E-02	n/a
Averaging Period: Three hours, boiler operations									
Aux Boilers	2.083	36.576	455.22	73.952	21.705	n/a	1.324E-01	n/a	n/a
Startup Boilers	1.524	36.576	455.22	36.829	20.189	n/a	4.394E-02	n/a	n/a
Nighttime Preservation Boilers	0.508	27.432	435.78	1.736	8.567	n/a	3.242E-03	n/a	n/a
Averaging Period: Three hours, engine testing									
PB emergency generators (each)	0.508	5.486	717.11	9.657	47.644	n/a	7.719E-04	n/a	n/a
PB fire pump engines (each)	0.102	3.962	856.89	0.748	92.209	n/a	6.175E-05	n/a	n/a
Common Area em generator	0.178	5.486	729.61	1.058	42.626	n/a	8.557E-05	n/a	n/a
Common Area fire pump engine	0.102	3.962	829.11	0.721	88.891	n/a	5.293E-05	n/a	n/a
Averaging Period: Eight hours, boiler operations									
Aux Boilers	2.083	36.576	717.11	73.952	21.705	n/a	n/a	2.016	n/a
Startup Boilers	1.524	36.576	455.22	36.829	20.189	n/a	n/a	1.434E-01	n/a
Nighttime Preservation Boilers	0.508	27.432	435.78	1.736	8.567	n/a	n/a	5.643E-02	n/a

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
Averaging Period: Eight hours, engine testing									
PB emergency generators (each)	0.508	5.486	717.11	9.657	47.644	n/a	n/a	4.600E-02	n/a
PB fire pump engines (each)	0.102	3.962	856.89	0.748	92.209	n/a	n/a	6.667E-03	n/a
Common Area em generator	0.178	5.486	729.61	1.058	42.626	n/a	n/a	2.096E-03	n/a
Common Area fire pump engine	0.102	3.962	829.11	0.721	88.891	n/a	n/a	5.732E-03	n/a
Averaging Period: 24-hours, boiler operation									
Aux Boilers	2.083	36.576	455.22	73.952	21.705	n/a	3.860E-02	n/a	9.188E-02
Startup Boilers	1.524	36.576	455.22	36.829	20.189	n/a	5.493E-03	n/a	1.307E-02
Nighttime Preservation Boilers	0.508	27.432	435.78	1.736	8.567	n/a	1.081E-03	n/a	2.572E-03
WSACs (2 cells, per cell)	3.658	4.826	308.00	122.706	11.678	n/a	0	n/a	1.032E-04
Averaging Period: 24 hours, engine testing, no aux boiler operation									
Startup Boilers	1.524	36.576	455.22	36.829	20.189	n/a	5.493E-03	n/a	1.307E-02
Nighttime Preservation Boilers	0.508	27.432	435.78	1.736	8.567	n/a	1.081E-03	n/a	2.572E-03
PB emergency generators (each)	0.508	5.486	717.11	9.657	47.644	n/a	9.648E-05	n/a	9.705E-04
PB fire pump engines (each)	0.102	3.962	856.89	0.748	92.209	n/a	7.719E-06	n/a	1.851E-04
Common Area em generator	0.178	5.486	729.61	1.058	42.626	n/a	1.070E-05	n/a	1.553E-04
Common Area fire pump engine	0.102	3.962	829.11	0.721	88.891	n/a	6.616E-06	n/a	1.591E-04
WSACs (2 cells, per cell)	3.658	4.826	308.00	122.706	11.678	n/a	0	n/a	1.032E-04
Averaging Period: Annual									
Aux Boilers	2.083	36.576	455.22	73.952	21.705	3.499E-02	6.134E-03	n/a	1.482E-02
Startup Boilers	1.524	36.576	455.22	36.829	20.189	3.360E-02	6.088E-03	n/a	1.462E-02
Nighttime Preservation Boilers	0.508	27.432	435.78	1.736	8.567	7.714E-03	1.483E-03	n/a	3.534E-03
PB emergency generators (each)	0.508	5.486	717.11	9.657	47.644	2.914E-02	2.643E-05	n/a	2.659E-04
PB fire pump engines (each)	0.102	3.962	856.89	0.748	92.209	1.590E-03	2.930E-06	n/a	4.254E-05
Common Area em generator	0.178	5.486	729.61	1.058	42.626	9.453E-04	2.115E-06	n/a	5.070E-05
Common Area fire pump engine	0.102	3.962	829.11	0.721	88.891	8.127E-04	1.813E-06	n/a	4.359E-05
WSACs (2 cells, per cell)	3.658	4.826	308.00	122.706	11.678	n/a	n/a	n/a	4.710E-05

Table 5.1D-3
Emission Rates and Stack Parameters for Boilers in Startup
Hidden Hills Solar Electric Generating System

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
Auxiliary Boilers in startup (one unit at each power block)									
Averaging Period: One hour									
Aux Boiler	2.083	36.576	446.89	10.039	2.946	0.7095	1.656E-02	1.728	n/a
Averaging Period: Three hours									
Aux Boiler	2.083	36.576	446.89	10.039	2.946	n/a	1.656E-02	n/a	n/a
Averaging Period: Eight hours									
Aux Boiler	2.083	36.576	446.89	10.039	2.946	n/a	n/a	1.728	n/a
Startup Boilers in startup; Nighttime preservation boilers in operation									
Averaging Period: One hour									
Startup Boiler	1.524	36.576	446.89	4.999	2.741	0.3533	9.281E-03	0.860	n/a
Nighttime Pres. Boiler	0.508	27.432	435.78	1.736	8.567	0.0167	3.242E-03	0.056	n/a
Averaging Period: Three hours									
Startup Boiler	1.524	36.576	446.89	4.999	2.741	n/a	9.281E-03	n/a	n/a
Nighttime Pres. Boiler	0.508	27.432	435.78	1.736	8.567	n/a	3.242E-03	n/a	n/a
Averaging Period: Eight hours									
Startup Boiler	1.524	36.576	446.89	4.999	2.741	n/a	n/a	0.860	n/a
Nighttime Pres. Boiler	0.508	27.432	435.78	1.736	8.567	n/a	n/a	0.056	n/a
Nighttime Preservation Boilers in startup									
Averaging Period: One hour									
Nighttime Pres. Boiler	0.508	27.432	421.89	0.232	1.145	0.0162	4.052E-04	0.039	n/a
Averaging Period: Three hours									
Nighttime Pres. Boiler	0.508	27.432	421.89	0.232	1.145	n/a	4.052E-04	n/a	n/a
Averaging Period: Eight hours									
Nighttime Pres. Boiler	0.508	27.432	421.89	0.232	1.145	n/a	n/a	0.039	n/a

Table 5.1D-4
Emission Rates and Stack Parameters for Aux Boilers on Hot Standby
Hidden Hills Solar Electric Generating System

	Stack Diam, m	Release Height m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s			
						NOx	SO2	CO	PM10
Averaging Period: One hour, all aux boilers on hot standby									
Aux Boilers	2.083	36.576	455.22	8.319	2.442	0.3784	6.624E-03	0.576	n/a
Averaging Period: Three hours, all aux boilers on hot standby									
Aux Boilers	2.083	36.576	455.22	8.319	2.442	n/a	6.624E-03	n/a	n/a
Averaging Period: Eight hours, all aux boilers on hot standby									
Aux Boilers	2.083	36.576	455.22	8.319	2.442	n/a	n/a	0.576	n/a

Table 5.1D-5
Calculation of Inversion Fumigation Impacts
Hidden Hills Solar Electric Generating System

Boiler Emission Rates, g/s

Unit	NOx	SO2	CO	PM10	# of Units
Auxiliary Boilers	0.681	0.132	2.304	9.188E-02	6
Startup Boilers	0.339	6.591E-02	0.574	1.307E-02	2
Nighttime Preservation Boilers	1.668E-02	3.242E-03	5.643E-02	2.572E-03	2

Flat Terrain Modeling Results from SCREEN3

Unit	Unit Impact, ug/m3 per g/s	Distance to Maximum (m)
Auxiliary Boilers	2.58	1005
Startup Boilers	4.98	818
Nighttime Preservation Boilers	41.62	280

Inversion Breakup Modeling Results from SCREEN3

	Unit Impact, ug/m3 per g/s	Distance to Maximum (m)
Auxiliary Boilers	3.07	8278
Startup Boilers	4.76	5987
Nighttime Preservation Boilers	0	n/a

Adjust 1-hour impacts for longer averaging periods to account for 90-minute duration of fumigation

	1-hr unit	3-hr unit	8-hr unit	24-hr unit
Auxiliary Boilers	3.07	2.54	1.87	1.04
Startup Boilers	4.98	4.49	3.49	1.99
Nighttime Preservation Boilers	41.62	37.46	29.13	16.65

Calculation of Fumigation Impacts

Case/Avg Period	NOx	SO2	CO	PM10
One-Hour				
Auxiliary Boilers	12.6	2.44	42.46	-
Startup Boilers	3.38	0.66	5.72	-
Nighttime Preservation Boilers[a]	1.39	0.27	4.70	-
Total	17.3	3.4	52.9	-
3 Hours				
Auxiliary Boilers	-	2.02	-	-
Startup Boilers	-	0.59	-	-
Nighttime Preservation Boilers[a]	-	0.24	-	-
Total	-	2.9	-	-
8 Hours				
Auxiliary Boilers	-	-	25.9	-
Startup Boilers	-	-	4.00	-
Nighttime Preservation Boilers[a]	-	-	3.29	-
Total	-	-	33.1	-
24 Hours				
Auxiliary Boilers	-	0.83	-	0.58
Startup Boilers	-	0.26	-	0.05
Nighttime Preservation Boilers[a]	-	0.11	-	0.09
Total	-	1.2	-	0.7

a Although inversion breakup fumigation impacts from the nighttime preservation boilers is zero, flat terrain impacts were included to ensure that the evaluation is conservative.