Magnolia Power Station Level II Visibility Modeling
Class I Areas
Cucamonga Wilderness Area

Formulas:

σ_y (meters) =465.11628(x)tan(TH)

TH =0.017453293[c-d ln(x)]

σ_z (meters) =ax^b

x= 50 distance to class I area (km)

Shaded areas below represent wind speed/stability conditions not needed for this analysis.
(see page 45 in "Workbook for Plume Visual Impact Screening and Analysis, EPA-450/4-88-019; updated 10-92)

Stability Class	a (meters)	b	c[8]	d[8]	TH	σ_y	σ_z	$\sigma_y\sigma_z u$ for various wind speeds (meters/second) 1	2	3	4	5	6	7	8
A	** [1]	** [1]	24.167	2.5334	0.248819048	5908.938392	5000	2.95E+07	5.91E+07	8.86E+07	1.18E+08	1.48E+08	1.77E+08	2.07E+08	2.36E+08
B	109.300 [2]	1.09710 [2]	18.333	1.8096	0.196415924	4627.473917	5000	2.31E+07	4.63E+07	6.94E+07	9.25E+07	1.16E+08	1.39E+08	1.62E+08	1.85E+08
C	61.141 [3]	0.91465 [3]	12.5	1.0857	0.144037081	3373.058487	2189.250472	1.35E+06	1.48E+07	2.82E+07	2.95E+07	3.69E+07	4.43E+07	5.17E+07	5.91E+07
D	44.053 [4]	0.51179 [4]	8.333	0.72382	0.096017538	2239.853572	326.2055514	7.31E+05	1.46E+06	2.19E+06	2.92E+06	3.65E+06	4.38E+06	5.11E+06	5.85E+06
E	47.618 [5]	0.29592 [5]	6.25	0.54287	0.072017175	1677.719514	151.5410717	2.54E+05	5.08E+05	7.63E+05	1.02E+06	1.27E+06	1.53E+06	1.78E+06	2.03E+06
F	27.074 [6]	0.27436 [6]	4.1667	0.36191	0.048012259	1117.422926	79.1920955	8.85E+04	1.77E+05	2.65E+05	3.54E+05	4.42E+05	5.31E+05	6.19E+05	7.08E+05
							Travel Time (hours)[7]	27.8	9.3	5.6	4.0	3.1	2.5	2.1	1.9

[1] If x is >3.11 km, thenσz = 5,000 meters
[2] for "x" > 0.4 kilometers.
[3] all distances
[4] for "x" > 30.00 kilometers.
[5] for "x" > 40.00 kilometers.
[6] for "x" 30.01 - 60.00 kilometers.
[7] wind speed used to calculate travel time are the average ws within a ws category. (1-2 uses 1.5 m/s; ws category of 3-4 uses 3.5 m/s)
[8] Table 1-1 in ISC2 Volume II Users Guide

Condition No.	1981 Meteorological Data Stability Class	Wind Speed	$\sigma_y\sigma_z u$	Travel Time (hours)	Frequency of Occurance Hour of day 1-6	7-12	13-18	19-24
1	F	0-1	8.8491E+04	27.8	267	31	2	118
2	F	1-2	1.7698E+05	9.3	7	1	0	22
3	E	0-1	2.5424E+05	27.8	11	49	2	6
4	F	2-3	2.6547E+05	5.6	6	0	1	11
5	E	1-2	5.0849E+05	9.3	1	2	1	6
6	D	0-1	7.3065E+05	27.8	11	48	6	2
7	E	2-3	7.6273E+05	5.6	0	0	1	1
8	E	3-4	1.0170E+06	4.0	2	0	0	2
10	E	4-5	1.2712E+06	3.1	0	0	0	3
9	D	1-2	1.4613E+06	9.3	4	14	4	6
11	D	2-3	2.1920E+06	5.6	0	1	8	1
12	D	3-4	2.9226E+06	4.0	0	2	10	0
13	D	4-5	3.6533E+06	3.1	1	0	3	1
14	D	5-6	4.3839E+06	4.0	0	0	1	0
15	D	6-7	5.1146E+06	2.1	0	2	2	0
16	D	7-8	5.8452E+06	1.9	0	1	0	0
	Cumulative frequencies for stability classes E,F&D per time period:				311	151	42	179
	Cumulative frequencies for stability classes A,B&C per time period:				0	97	26	0
	Includes all stability classes:				311	248	68	179
	hours in met year:				2190	2190	2190	2190

1981 Meteorological Data Stability Class	Wind Speed	Frequency of Occurance Hour of day 1-6 f	1-6 cf	7-12 f	7-12 cf	13-18 f	13-18 cf	19-24 f	19-24 cf
F	0-1		0.000%		0.000%		0.000%		0.000%
F	1-2	0.320%	0.320%	0.046%	0.046%	0.000%	0.000%	1.005%	1.005%
E	0-1		0.320%		0.046%		0.000%		1.005%
F	2-3	0.274%	0.594%	0.000%	0.046%	0.046%	0.046%	0.502%	1.507%
E	1-2	0.046%	0.639%	0.091%	0.137%	0.046%	0.091%	0.274%	1.781%
D	0-1		0.639%		0.137%		0.091%		1.781%
E	2-3	0.000%	0.639%	0.000%	0.137%	0.046%	0.137%	0.046%	1.826%
E	3-4	0.091%	0.731%	0.000%	0.137%	0.000%	0.137%	0.091%	1.918%
E	4-5	0.000%	0.731%	0.000%	0.137%	0.000%	0.137%	0.137%	2.055%
D	1-2	0.183%	0.913%	0.639%	0.776%	0.183%	0.320%	0.274%	2.329%
D	2-3	0.000%	0.913%	0.046%	0.822%	0.365%	0.685%	0.046%	2.374%
D	3-4	0.000%	0.913%	0.091%	0.913%	0.457%	1.142%	0.000%	2.374%
D	4-5	0.046%	0.959%	0.000%	0.913%	0.137%	1.279%	0.046%	2.420%
D	5-6	0.000%	0.959%	0.000%	0.913%	0.046%	1.324%	0.000%	2.420%
D	6-7	0.000%	0.959%	0.091%	1.005%	0.091%	1.416%	0.000%	2.420%
D	7-8	0.000%	0.959%	0.046%	1.050%	0.000%	1.416%	0.000%	2.420%

Magnolia Power Station Level II Visibility Modelin
Class I Areas
San Gabriel Wilderness Area

Formulas:

σ_y (meters) =465.11628(x)tan(TH)

TH =0.017453293[c-d ln(x)]

σ_z (meters) =ax^b

Shaded areas below represent wind speed/stability conditions not needed for this analysis.
(see page 45 in "Workbook for Plume Visual Impact Screening and Analysis, EPA-450/4-88-019; updated 10-92)

x= 29 distance to class I area (km)

Stability Class	a (meters)	b	c[8]	d[6]	TH	σ_y	σ_z	$\sigma_y\sigma_z u$ for various wind speeds (meters/second) 1	2	3	4	5	6	7	8
A	** [1]	** [1]	24.1670	2.5334	0.272904799	3775.232859	5000	1.89E+07	3.78E+07	5.66E+07	7.55E+07	9.44E+07	1.13E+08	1.32E+08	1.51E+08
B	109.300 [2]	1.09710 [2]	18.3330	1.8096	0.213620303	2926.034673	4395.588267	1.29E+07	2.57E+07	3.86E+07	5.14E+07	6.43E+07	7.72E+07	9.00E+07	1.03E+08
C	61.141 [3]	0.91465 [3]	12.5000	1.0857	0.154359138	2098.74882	1330.193638	2.79E+06	5.58E+06	8.36E+06	1.12E+07	1.40E+07	1.68E+07	1.95E+07	2.23E+07
D	36.650 [4]	0.56589 [4]	8.3330	0.7238	0.102899099	1392.860787	246.3941441	3.43E+05	6.86E+05	1.03E+06	1.37E+06	1.72E+06	2.06E+06	2.40E+06	2.75E+06
E	35.420 [5]	0.37615 [5]	6.2500	0.5429	0.077178394	1043.08276	125.6983462	1.31E+05	2.62E+05	3.93E+05	5.24E+05	6.56E+05	7.87E+05	9.18E+05	1.05E+06
F	22.651 [6]	0.32681 [6]	4.1667	0.3619	0.05145304	694.6308534	68.07907868	4.73E+04	9.46E+04	1.42E+05	1.89E+05	2.36E+05	2.84E+05	3.31E+05	3.78E+05
							Travel Time (hours)[7]	16.1	5.4	3.2	2.3	1.8	1.5	1.2	1.1

[1] If x is >3.11 km, then σz = 5,000 meters
[2] for "x" > 0.40 meters.
[3] all distances
[4] for "x" 10.01 - 30.00 meters.
[5] for "x" 20.01 - 40.00 meters.
[6] for "x" 15.01 - 30.00 meters.
[7] wind speed used to calculate travel time are the average ws within a ws category. (1-2 uses 1.5 m/s; ws category of 3-4 uses 3.5 m/s)
[8] Table 1-1 in ISC2 Volume II Users Guide

Condition No.	1994-98 Meteorological Data Stability Class	Wind Speed	$\sigma_y\sigma_z u$	Travel Time (hours)	Frequency of Occurance Hour of day 1-6	7-12	13-18	19-24	1981 Meteorological Data Stability Class	Wind Speed	Frequency of Occurance Hour of day 1-6 f	1-6 cf	7-12 f	7-12 cf	13-18 f	13-18 cf	19-24 f	19-24 cf
1	F	0-1	4.7290E+04	16.1	135	12	2	79	F	0-1		0.000%		0.000%		0.000%		0.000%
2	F	1-2	9.4580E+04	5.4	6	0	0	17	F	1-2	0.274%	0.274%	0.000%	0.000%	0.000%	0.000%	0.776%	0.776%
3	E	0-1	1.3111E+05	16.1	11	43	5	3	E	0-1		0.274%		0.000%		0.000%		0.776%
4	F	2-3	1.4187E+05	3.2	2	0	0	3	F	2-3	0.091%	0.365%	0.000%	0.000%	0.000%	0.000%	0.137%	0.913%
5	E	1-2	2.6223E+05	5.4	2	4	3	4	E	1-2	0.091%	0.457%	0.183%	0.183%	0.137%	0.137%	0.183%	1.096%
6	D	0-1	3.4319E+05	16.1	17	43	3	12	D	0-1		0.457%		0.183%		0.137%		1.096%
7	E	2-3	3.9334E+05	3.2	1	0	1	1	E	2-3	0.046%	0.502%	0.000%	0.183%	0.046%	0.183%	0.046%	1.142%
8	E	3-4	5.2446E+05	2.3	1	0	0	2	E	3-4	0.046%	0.548%	0.000%	0.183%	0.000%	0.183%	0.091%	1.233%
9	E	4-5	6.5557E+05	1.8	0	0	0	1	E	4-5	0.000%	0.548%	0.000%	0.183%	0.000%	0.183%	0.046%	1.279%
10	D	1-2	6.8639E+05	5.4	8	15	3	6	D	1-2	0.365%	0.913%	0.685%	0.868%	0.137%	0.320%	0.274%	1.553%
11	D	2-3	1.0296E+06	3.2	0	2	3	2	D	2-3	0.000%	0.913%	0.091%	0.959%	0.137%	0.457%	0.091%	1.644%
12	D	3-4	1.3728E+06	2.3	0	0	1	0	D	3-4	0.000%	0.913%	0.000%	0.959%	0.046%	0.502%	0.000%	1.644%
13	D	4-5	1.7160E+06	1.8	0	0	0	0	D	4-5	0.000%	0.913%	0.000%	0.959%	0.000%	0.502%	0.000%	1.644%
14	D	5-6	2.0592E+06	2.3	0	0	0	0	D	5-6	0.000%	0.913%	0.000%	0.959%	0.000%	0.502%	0.000%	1.644%
15	D	6-7	2.4023E+06	1.2	0	0	0	0	D	6-7	0.000%	0.913%	0.000%	0.959%	0.000%	0.502%	0.000%	1.644%
16	D	7-8	2.7455E+06	1.1	0	0	0	0	D	7-8	0.000%	0.913%	0.000%	0.959%	0.000%	0.502%	0.000%	1.644%
	Cumulative frequencies for stability classes E,F&D per time period:				173	119	21	130										
	Cumulative frequencies for stability classes A,B&C per time period:				0	78	25	0										
	Includes all stability classes:				173	197	46	130										
	hours in five years:				2190	2190	2190	2190										

Offset Calcuations for the Worst-Case Month

Basis

NOx, CO, VOC	
Days per month	30
Hours per day of duct firing	12
Hot-starts per week	1
Warm-starts per week	1
Shutdowns per week	2

Remaining time as non-duct firing (41 F)

PM10, SO2	
Days per month	30
Hours per day of duct firing	12
Hours per day of non-duct firing	12

Given:

Hot-start duration	1.5 hrs
Warm-start duration	2.1 hrs
Shutdown duration	0.5 hrs

Emission Rates

Source	Pollutant	Duct Firing (lb/hr)	Non-Duct Firing (lb/hr)	Hot Start (lb/event)	Warm Start (lb/event)	Shutdown (lb/event)
CT	NOx	18.1	13.7	34.5	48	25
CT	CO	30.9	23.4	428	300	120
CT	VOC	17.74	2.83	30	20	17
CT	PM10[1]	18	12	- -	- -	- -
CT	SO2[1]	1.47	1.12	- -	- -	- -
CTWR	PM10	NA	0.3018	- -	- -	- -

[1] Hourly mass emission rates for PM10 and SO2 during startups are less than the hourly emission rates for non-startup scenarios. Emissions estimates for PM10 and SO2 do not include the effects of startups.

Monthly Emissions Calculations

NOx, CO, VOC

Hours per month for hot-starts	6.0 hrs
Hours per month for warm-starts	8.4 hrs
Hours per month for shutdowns	4.0 hrs
Hours per month for duct-firing	360.0 hrs
Hours per month for non-duct firing	341.6 hrs

Monthly Emissions

Pollutant	CTWR (lb/mo)	Duct Firing (lb/mo)	Non-Duct Firing (lb/mo)	Hot-Start (lb/mo)	Warm-Start (lb/mo)	Shutdown (lb/mo)	Total (lb/mo)	Avg (lb/day)
NOx	- -	6516	4680	138	192	200	11726	390.9
CO	- -	11124	7994	1712	1200	960	22990	766.3
VOC	- -	6387	967	120	80	136	7690	256.3

PM10, SO2

Hours per month for hot-starts	- -
Hours per month for warm-starts	- -
Hours per month for shutdowns	- -
Hours per month for duct-firing	360.0 hrs
Hours per month for non-duct firing	360.0 hrs

Monthly Emissions

Pollutant	CTWR (lb/mo)	Duct Firing (lb/mo)	Non-Duct Firing (lb/mo)	Hot-Start (lb/mo)	Warm-Start (lb/mo)	Shutdown (lb/mo)	Total (lb/mo)	Avg (lb/day)
PM10	218	6480	4320	- -	- -	- -	11018	367.3
SO2	- -	530	404	- -	- -	- -	934	31.1