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Environmental Engineering ■ Impact Assessment ■ Compliance Services

Tamarack
ENERGY

COOLING TOWER IMPACTS ANALYSIS

WATERTOWN RENEWABLE POWER PROJECT
Echo Lake Road
Watertown, CT

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October 2007

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1.0 INTRODUCTION

The Watertown Renewable Power (WRP) Project will employ a mechanical draft evaporative cooling tower to remove waste heat from the steam condenser cooling water at the proposed biomass power plant. Mechanical draft cooling towers can produce some adverse environmental effects due to the liquid water plume coming directly from the tower (known as "drift"), as well as from the secondary liquid water formation caused by the condensation of water vapor ("fogging"). These adverse effects include: local shading of the sun due to a visible plume, fogging at ground level and ice build-up, and deposition of dissolved salt particles.

A detailed modeling analysis of cooling tower impacts was performed to evaluate the potential for these impacts from operation of the WRP Project using the Seasonal/Annual Cooling Tower Impact (SACTI) model (Version 11-01-90). The SACTI model was funded by the Electric Power Research Institute (EPRI). It is based on studies conducted by Argonne National Laboratory that evaluated the theory and performance of over 30 cooling tower plume and drift models. The SACTI model was used for this analysis because it is a validated cooling tower plume and drift model that has been widely used in preparing environmental assessments of cooling towers for regulatory purposes.

The SACTI model was used to evaluate the following types of annual cooling tower impacts:

1. The frequency of occurrence of cooling tower plume heights, plume lengths, and plume radii;
2. The frequency of occurrence and spatial distribution of ground-level fogging and rime ice deposition;
3. The spatial distribution and rate of salt deposition; and
4. The frequency and extent of plume shadowing effects.

2.0 INPUT PARAMETERS

The SACTI model uses cooling tower design and operational data along with hourly meteorological data to predict the impact of cooling tower plumes. The input to SACTI is summarized in Table 1.

Table 1 - Input parameters for the SACTI model

Input Parameter	Value Provided by Vendor(1)	Value in SACTI-required Units
Type	Mechanical Draft	Linear Mechanical Draft
Number of tower housings	1	1
Number of cells	2	2
Tower Height	40.34 feet	12.30 meters
Tower Width	42.67 feet	13.01 meters
Tower Length	96.67 feet	29.47 meters
Exit Diameter of Fans	22.6 feet	6.89 meters
Effective Diameter(2)	31.96 feet	9.74 meters
Maximum heat dissipation rate	190 MMBtu/hr	55.68 MW
Maximum total input air flow rate	2,118,000 acfm	1119.0 kg/s(3)
Design circulating water flow rate	20,000 gpm	----
Drift loss rate(4)	0.001%	12.61 g/s
Salt Concentration	560 ppm TDS/TSS	0.00056 g/g
Site Latitude	41.61^0 N	41.61^0 N
Site Longitude	73.08^0 W	73.08^0 W
Surface roughness height	Grassland with scattered trees, brushland, scrub growth	5 cm
Orientation of Tower (Angle measured East of North)	169 degrees	169 degrees

Notes:

(1) Final vendor for cooling tower has not been selected. All listed parameters obtained from potential vendor proposal and preliminary design data based on current performance parameters for the project.

(2) The effective diameter is calculated as $D_{eff} = D*(N)^{1/2}$, where D is the cell diameter and N is the number of cells.

(3) Assuming an exit air density of 0.06986 lb/ft^3.

(4) The drift rate is calculated as (% drift)/100 * circulation rate * density of water.

The default density of 2.17 g/cc of salt was used. The drift droplet sizes were obtained from the potential vendor and appear in Table 2. Other input data required by the model is the specification of representative wind directions and a wind equivalence array. Representative wind directions are selected to account for the symmetry in the modeling. For example, if a 1 by 2 linear cooling tower is oriented directly along the X-axis (or East-West direction); the plume generated from the merging of the two plumes will be the same for winds coming from the east as it would be for winds coming from the west. The user can choose up to 5 wind directions and specify what wind directions will be equivalent to each other based on the symmetry. These parameters were developed following the recommendations in the SACTI model User's Manual and they are presented in Tables 3 and 4.

Table 2 - Drift Droplet Sizes

Mass in Particles (%)		Droplet Size (Microns)
0.2	Larger Than	525
1.0	Larger Than	375
5.0	Larger Than	230
10.0	Larger Than	170
20.0	Larger Than	115
40.0	Larger Than	65
60.0	Larger Than	35
80.0	Larger Than	15
88.0	Larger Than	10

Note: It was assumed there were no droplets larger than 725 μm and none smaller than 2 μm.

Table 3 - Representative Wind Directions Used in SACTI Modeling

Wind Direction ID	Wind Direction (Deg)
1	169.0
2	34.0
3	79.0

Table 4 - Wind Direction Equivalences for the 16 Wind Directions Used in SACTI

Wind Direction (Deg.)	Equivalent Wind Direction ID
0	1
22.5	2
45	2
67.5	3
90	3
112.5	2
135	2
157.5	1
180	1
202.5	2
225	2
247.5	3
270	3
292.5	2
315	2
337.5	1

The SACTI modeling analysis was performed using the same meteorological data used in the dispersion modeling analysis in support of WRP's CTDEP air permit application: five years (July 1, 2002 through June 30, 2007) of hourly surface observations from Waterbury Oxford Airport in Oxford, Connecticut and the same five years of mixing height data from Albany County Airport in Albany, New York. Since the SACTI model is not capable of reading years greater than 1999, the years were changed to be 1992 through 1997 on the files. The first part of 2007 was combined with the last part of 2002 to make up a full year. Rural conditions were assumed. The data had 3.4% missing (after filling) and 18.1% calms. The windrose for the 5 years of raw Oxford Data appears in Figure 1. The other meteorological parameters required by SACTI include monthly clearness index and total average daily insolation values which were obtained from the data for Hartford, Connecticut that is presented in Appendix A of the SACTI User's Manual.

The SACTI model uses a polar receptor grid with the origin located at the center of the cooling tower housing. SACTI uses receptors that are located on 16 wind direction radials spaced at 22.5-degree intervals. For fogging and icing simulations, the default receptors are spaced along each radial at 100-meter intervals out to 1,600 meters. Plume shadowing impacts were modeled out to a distance of 8,000 meters with a distance between the receptors of 200 meters. Visible plume and salt deposition calculations were modeled out to a distance of 10,000 meters with a distance between the receptors of 100 m. These default downwind distances and receptor intervals were used in the modeling.

The SACTI model includes the treatment of aerodynamic downwash effects of the cooling tower housing on the cooling tower plume. SACTI also has the capability to evaluate downwash effects of additional structures using the "external plate" option; this option was not used. Additional wake structures will enhance the turbulent mixing of the plume and increases the dilution of the cooling tower vapor plume. In order to be conservative, only the downwash effects from the cooling tower itself were considered. The SACTI model assumes flat terrain. The User's Manual gives guidelines for adjusting the results to complex terrain. Since flat terrain is expected to yield the most conservative result, no complex terrain adjustments were made to the SACTI model results.

3.0 COOLING TOWER PLUME DIMENSION STATISTICS

The SACTI modeling results are summarized in Appendix A for the total 5 years of modeled meteorology. The annual statistics for the cooling tower plume (plume height, length and radius frequencies) show that the visible plume will typically have the following dimensions: 100 meters in length; 30 to 40 meters in height above the tower with about a 15 meter radius. These are considered typical dimensions since the frequency of these plume dimensions occurring summed over all wind directions is greater than 50 percent of the time. Tables A-1 through A-3 summarize the annual average plume dimensional data (average of five years). It can be seen in Table A-1, for example, that the plume length extends to 100 meters for 100 percent of the time (when the 16 wind directions are summed). Therefore, the plume will typically be contained on-site. The results indicate that the plume will extend offsite approximately 10 percent of the time.

Since nighttime hours were included in this study, the plume is expected to be visible only half of that value, or 5 percent of the time.

The sections that follow will discuss the frequency and extent of icing, fogging, salt deposition and plume shadowing due to the cooling tower plume. Note that nighttime hours, hours of precipitation and low visibility were not removed from meteorological data set. During these times, visibility cannot be further reduced. Therefore, the impacts are considered conservatively overstated.

4.0 PLUME FOGGING

The total hours of fog as a function of downwind distance and direction were estimated using the SACTI model for each of the 5 years of meteorological data input. A table containing the totaled data (sum of five years) appears in Appendix A (see Table A-4). Each individual year can be viewed in the SACTI output files, which are available upon request. The maximum hours of fogging in any one location are estimated by SACTI to be 12.6 for the 5-year period (or 2.5 hours per year on average – or about 0.03 percent of the time). The contour plot of total hours of fog for the five-year period is presented in Figure 2. The predominant location of the fogging is to the southwest of the tower, extending to a maximum distance of approximately 1 km. Fogging associated with the Project's cooling tower is expected to be insignificant.

5.0 RIME ICING

Total hours of rime icing as a function of downwind distance and direction were estimated using the SACTI model for each of the 5 years. A table containing the totaled data (sum of five years) appears in Appendix A (see Table A-5). Each individual year can be viewed in the SACTI output files, which are available upon request. The maximum hours of icing are calculated by SACTI to be 5.0 hours for the entire 5-year period in any one location (1.0 hour per year on average). The contour plot of total hours of rime icing for the 5-year period is presented in Figure 3. The hours of icing are shown to occur over Echo Lake Road, with the road experiencing between 0.5 and 1.0 hours of icing over 5 years. The predicted hours are very small and so are highly unlikely to occur. Therefore, there will be little to no concern for rime icing due to the proposed cooling tower.

6.0 SALT DEPOSITION

Average salt deposition rate as a function of downwind distance and direction were estimated using the SACTI model for each of the 5 years. A table containing the annual average data (average of five years) appears in Appendix A (see Table A-6). Each individual year can be viewed in the SACTI output files, which are available upon request. A contour plot of the average deposition over the 5-year time period is shown in Figure 4. The majority of salt is deposited within 200 meters of the tower. The maximum deposition rate is 2.47 kg/km^2-month which was modeled for the year 2003 and occurred 200 meters east of the tower. These impacts are not considered to be significant.

7.0 PLUME SHADOWING

The SACTI model predicts plume shadowing in terms of both hours of plume shadowing, as well as energy loss (MJ/m^2). The total number of hours of plume shadowing over the 5-year period is shown in Table A-7 of Appendix A as a function of radial direction and downwind distance. The maximum potential impact of plume shadowing in any one location over the 5 year period was 549 hours (or on average 110 hours per year) which occurred approximately 200 meters west from the tower. A contour plot of the total hours of plume shadowing is shown in Figure 5. The maximum impacts are seen within a 200 meter radius of the cooling tower. The neighborhood approximately 1 mile south of the proposed site experiences an estimated 50 hours of plume shadowing over the 5 years modeled (or on average, 10 hours per year). This represents an annual percentage of 0.1 % of the time. These impacts are considered minimal. Figure 6 shows the contour levels of energy loss (annual average of 5 years). Tabular results from SACTI are presented in Table A-8 (annual average). A similar south-western impact pattern given by hours of plume shadowing is also observed for energy loss. Plume shadowing is not expected to be significant for the proposed cooling tower.

8.0 SUMMARY AND CONCLUSIONS

The Watertown Renewable Power Project cooling tower was evaluated for adverse environmental impacts using the SACTI model. Based on this analysis, no adverse off-site environmental effects are expected.

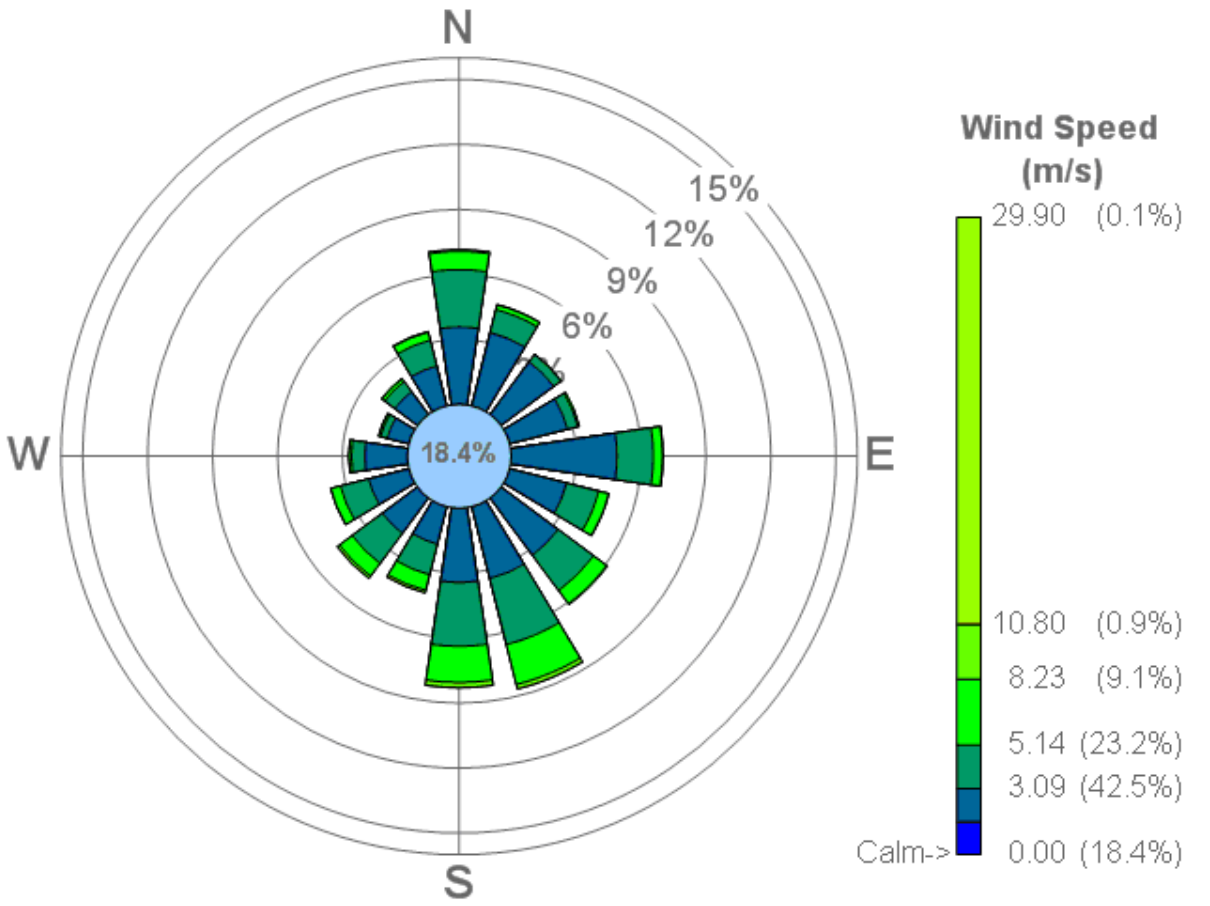

Figure 1 - 5-year Windrose for Waterbury Oxford Airport

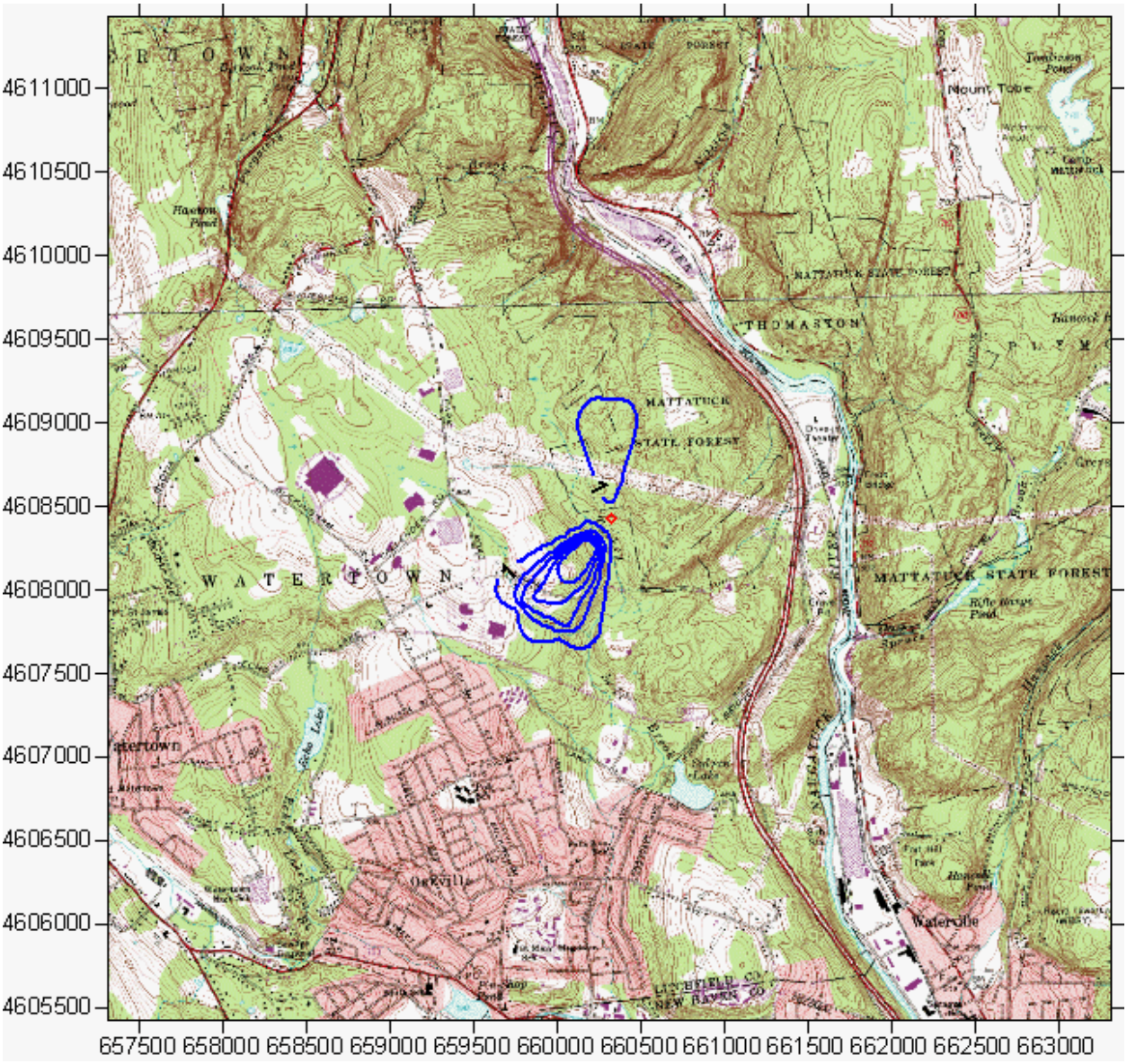

Figure 2 - Total Hours of Fog for 5 years

(Contours are 1, 4, 6, 8 and 10 hours)

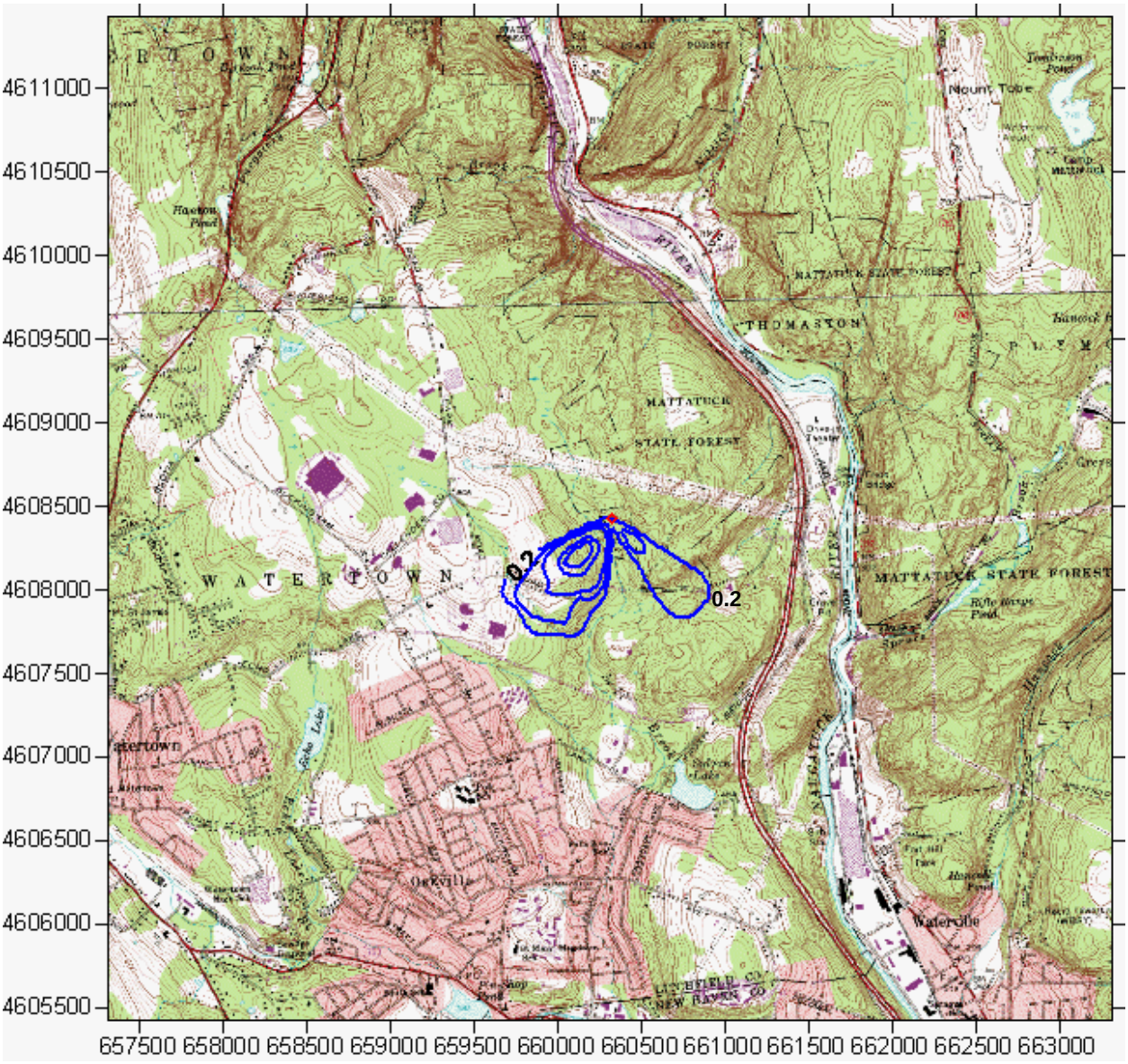

Figure 3 - Total Hours of Rime Ice for 5 years

(Contours are from 0.2, 0.5, 1, 3 and 4 hours)

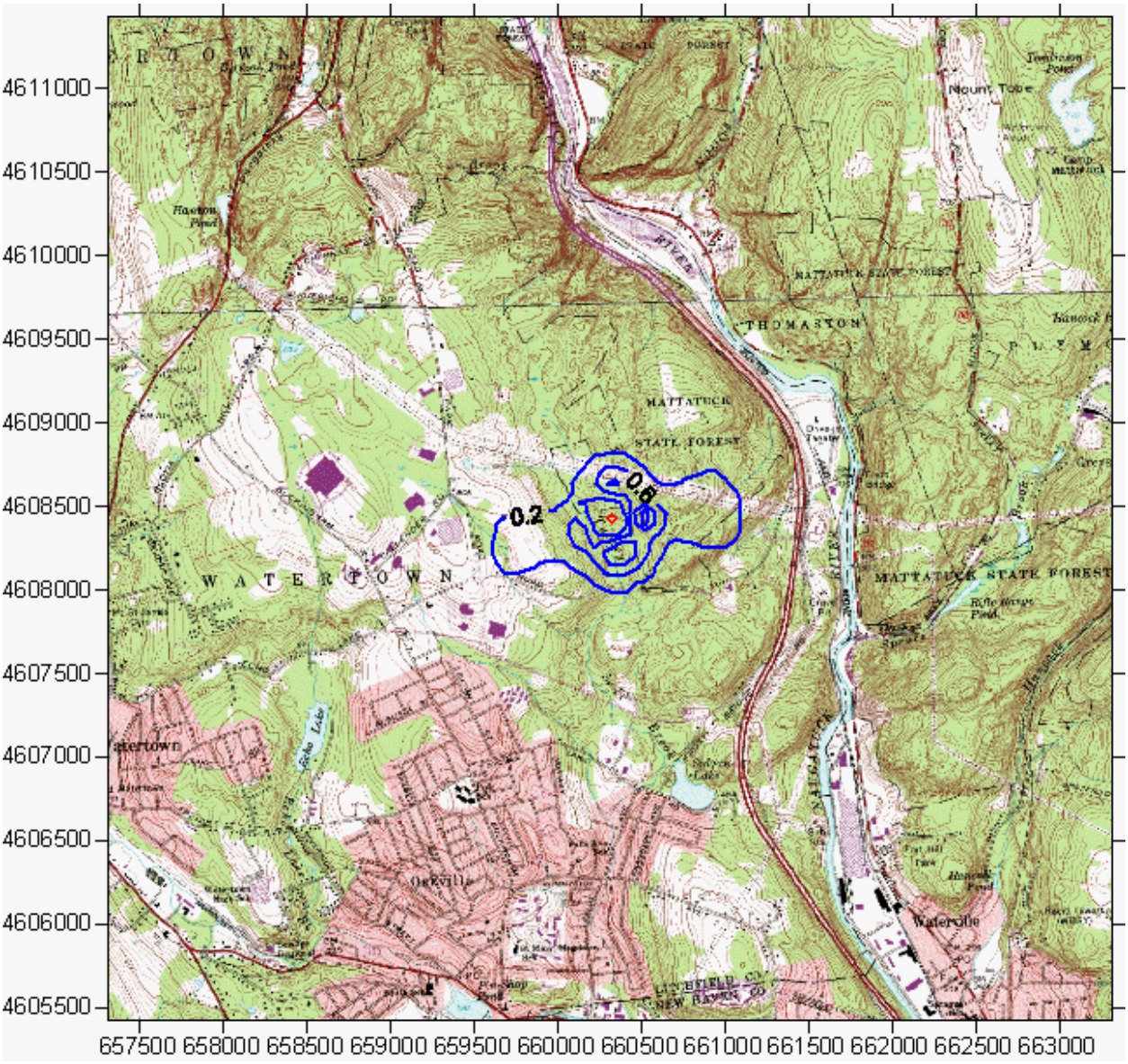

Figure 4 - Annual Average Salt Deposition Over 5 years

(Contours are from 0.2, 0.6, 1 and 1.4 kg/km^2-month)

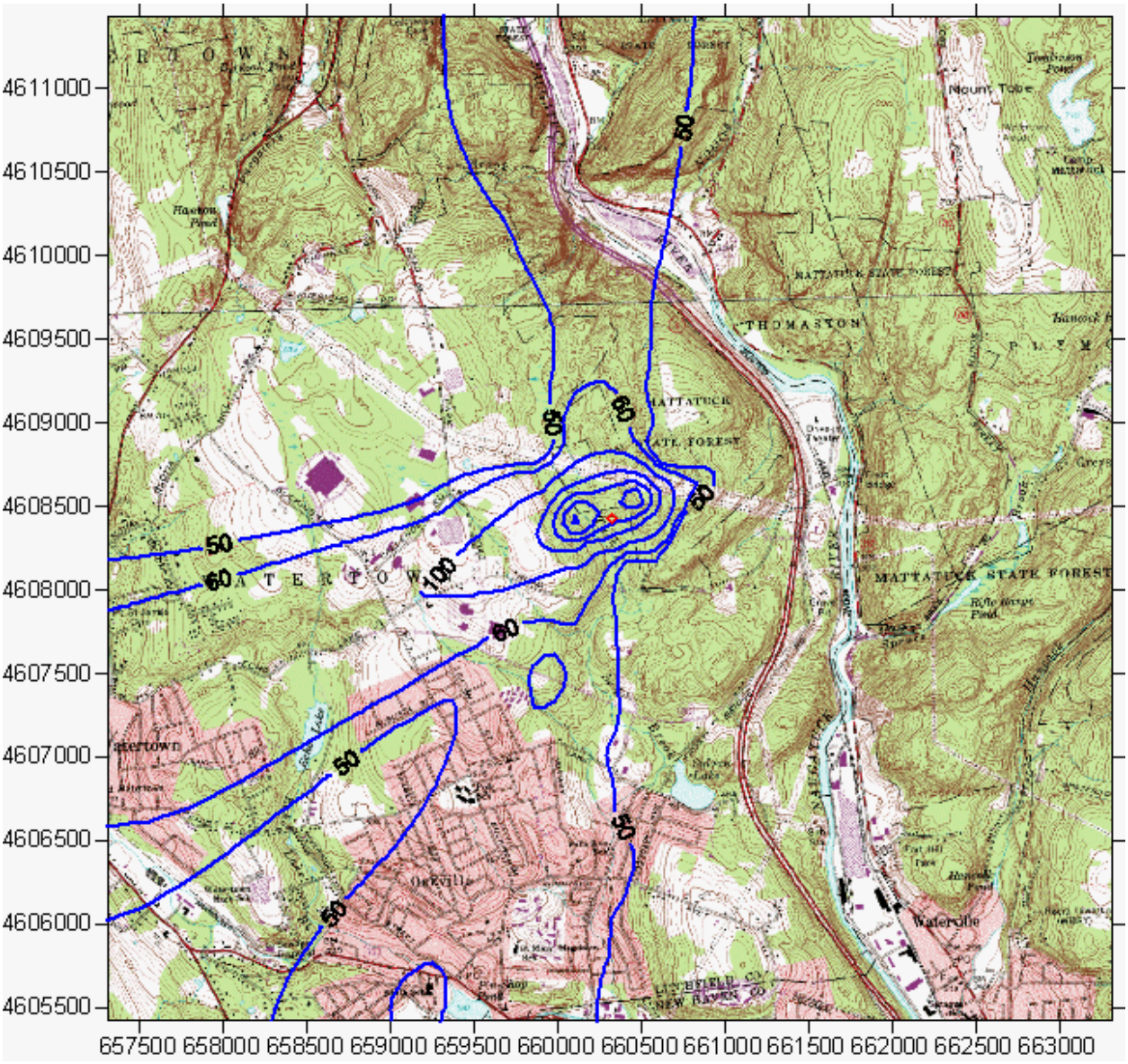

Figure 5 - Total Hours of Shadowing for 5 years

(Contours are 50, 60, 100, 200, 300, 400 and 500 hours)

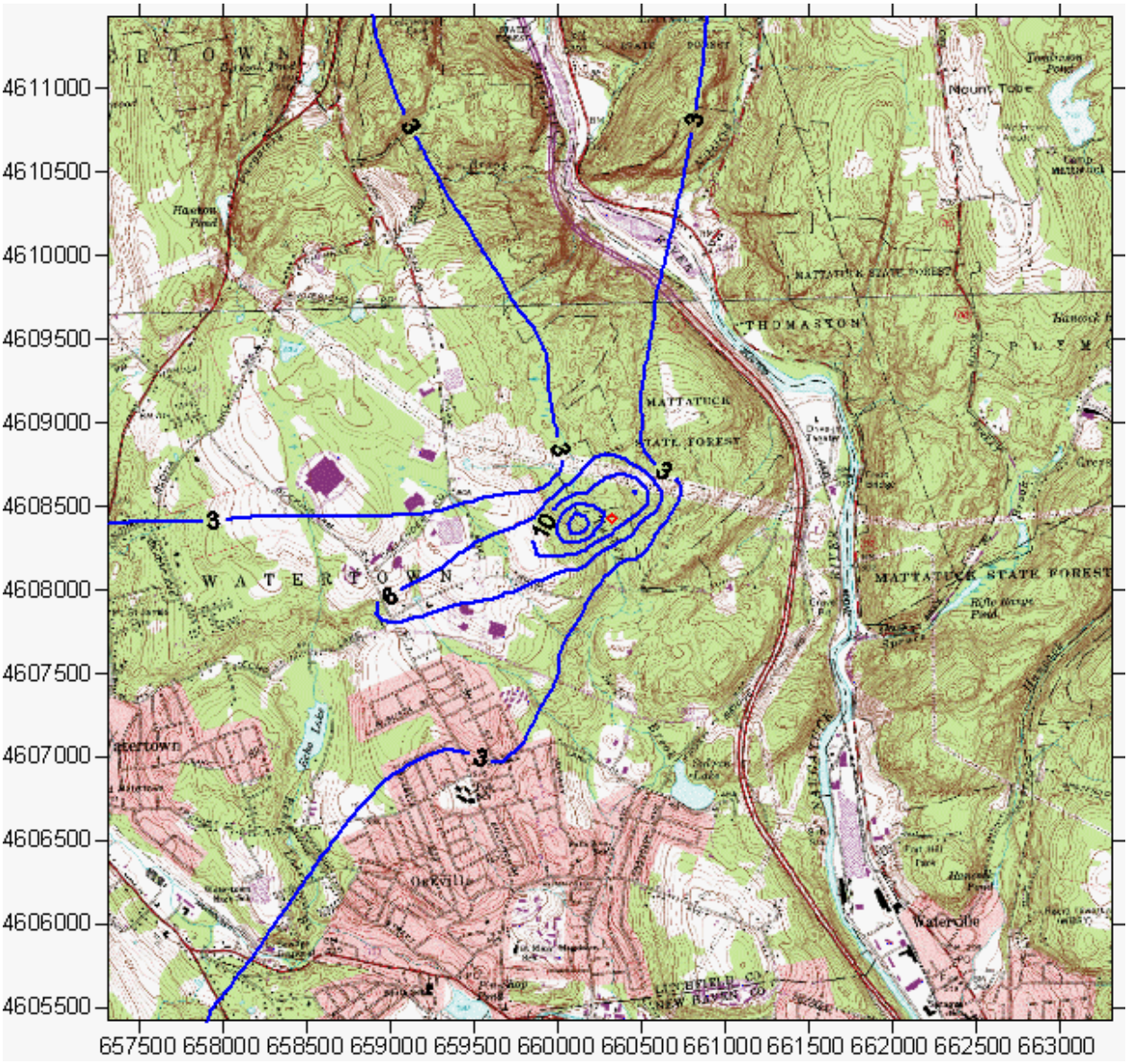

Figure 6 - Annual Average Energy Loss Due to Shadowing in MJ/m^2

(Contours are 3, 6, 10, 15 and 20 MJ/m^2)

Appendix A

SACTI Model Results Summary Tables

Table A-1. Plume Length Frequency (%) (Average of 5 years: July 1, 2002 - June 30, 2007)

Distance from the Tower (m)	WIND FROM: N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
	PLUME HEADED: S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
100	10.998	5.362	5.92	4.424	3.252	1.698	2.48	4.4	9.53	6.802	5.174	4.652	9.218	6.086	8.276	11.732	100
200	2.95	1.784	2.482	3.122	2.152	0.716	1.006	1.308	1.98	1.022	0.736	1.716	4.148	0.904	1.406	2.576	30.008
300	1.778	1.152	1.736	2.328	1.46	0.508	0.718	0.952	1.294	0.674	0.456	0.658	1.468	0.492	0.754	1.554	17.974
400	1.388	0.916	1.484	2.002	1.242	0.396	0.592	0.79	1.118	0.592	0.378	0.436	0.962	0.35	0.588	1.176	14.404
500	1.224	0.818	1.372	1.73	1.064	0.356	0.574	0.744	1.074	0.576	0.35	0.35	0.692	0.304	0.55	1.062	12.84
600	1.152	0.756	1.246	1.642	1.03	0.324	0.52	0.704	1.036	0.53	0.314	0.32	0.63	0.264	0.486	1.026	11.978
700	1.016	0.7	1.22	1.548	0.988	0.302	0.492	0.682	0.99	0.504	0.294	0.274	0.592	0.252	0.47	0.95	11.278
800	1.016	0.662	1.156	1.48	0.928	0.292	0.468	0.682	0.99	0.492	0.284	0.23	0.52	0.246	0.446	0.95	10.842
900	1.016	0.658	1.152	1.48	0.928	0.292	0.468	0.682	0.99	0.49	0.284	0.23	0.52	0.246	0.446	0.95	10.834
1000	1.016	0.658	1.152	1.412	0.888	0.292	0.468	0.682	0.99	0.49	0.284	0.218	0.502	0.246	0.446	0.95	10.698
1100	1.016	0.658	1.152	1.412	0.888	0.292	0.468	0.682	0.99	0.49	0.284	0.218	0.502	0.246	0.446	0.95	10.698
1200	1.016	0.634	1.128	1.412	0.888	0.29	0.466	0.682	0.99	0.448	0.264	0.218	0.502	0.22	0.414	0.95	10.526
1300	0.958	0.634	1.128	1.412	0.888	0.29	0.466	0.648	0.944	0.448	0.264	0.218	0.502	0.22	0.414	0.894	10.332
1400	0.958	0.634	1.126	1.412	0.888	0.29	0.466	0.648	0.944	0.448	0.264	0.218	0.502	0.22	0.414	0.894	10.33
1500	0.958	0.634	1.126	1.412	0.888	0.29	0.466	0.648	0.944	0.448	0.264	0.218	0.502	0.22	0.414	0.894	10.33
1600	0.958	0.634	1.126	1.412	0.888	0.29	0.466	0.648	0.944	0.448	0.264	0.218	0.502	0.22	0.414	0.894	10.33
1700	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
1800	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
1900	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2000	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2100	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2200	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2300	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2400	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2500	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2600	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2700	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2800	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
2900	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
3000	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
3100	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
3200	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
3300	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
3400	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
3500	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
3600	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
3700	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
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3900	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4000	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4100	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4200	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4300	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4400	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4500	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4600	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4700	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4800	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
4900	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5000	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5100	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5200	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5300	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5400	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5500	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5600	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5700	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5800	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
5900	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6000	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6100	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072

Table A-1. Plume Length Frequency (%) (Average of 5 years: July 1, 2002 - June 30, 2007)

Distance from the Tower (m)	N (WIND FROM) / S (PLUME HEADED)	NNE / SSW	NE / SW	ENE / WSW	E / W	ESE / WNW	SE / NW	SSE / NNW	S / N	SSW / NNE	SW / NE	WSW / ENE	W / E	WNW / ESE	NW / SE	NNW / SSE	ALL / SUM
6200	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6300	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6400	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6500	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6600	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6700	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6800	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
6900	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7000	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7100	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7200	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7300	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7400	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7500	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7600	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7700	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7800	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
7900	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8000	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8100	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8200	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8300	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8400	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8500	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8600	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8700	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8800	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
8900	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
9000	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
9100	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
9200	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
9300	0.958	0.634	1.126	1.338	0.822	0.29	0.466	0.648	0.944	0.448	0.264	0.198	0.404	0.22	0.414	0.894	10.072
9400	0.914	0.634	1.126	1.338	0.822	0.29	0.466	0.634	0.91	0.448	0.264	0.198	0.404	0.22	0.414	0.834	9.916
9500	0.914	0.634	1.126	1.338	0.822	0.29	0.466	0.634	0.91	0.448	0.264	0.198	0.404	0.22	0.414	0.834	9.916
9600	0.914	0.634	1.126	1.338	0.822	0.29	0.466	0.634	0.91	0.448	0.264	0.198	0.404	0.22	0.414	0.834	9.916
9700	0.914	0.634	1.126	1.338	0.822	0.29	0.466	0.634	0.91	0.448	0.264	0.198	0.404	0.22	0.414	0.834	9.916
9800	0.914	0.634	1.126	1.338	0.822	0.29	0.466	0.634	0.91	0.448	0.264	0.198	0.404	0.22	0.414	0.834	9.916
9900	0.914	0.634	1.126	1.338	0.822	0.29	0.466	0.634	0.91	0.448	0.264	0.198	0.404	0.22	0.414	0.834	9.916
10000	0.734	0.498	0.978	1.338	0.822	0.248	0.352	0.49	0.816	0.39	0.242	0.198	0.404	0.18	0.358	0.69	8.734

Table A-2. Plume Height Frequency (%) (Average of 5 years: July 1, 2002 - June 30, 2007)

Height Above the Tower (m)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
	WIND FROM																
	PLUME HEADED																
	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
10	10.998	5.362	5.92	4.424	3.252	1.698	2.48	4.4	9.53	6.802	5.174	4.652	9.218	6.086	8.276	11.732	100
20	10.618	5.326	5.888	4.412	3.244	1.698	2.474	4.362	9.404	6.766	5.17	4.648	9.164	6.034	8.208	11.404	98.822
30	5.76	3.18	3.774	3.794	2.69	1.024	1.446	2.088	3.8	2.866	2.512	3.232	6.502	2.276	3.63	5.534	54.106
40	4.486	2.6	3.176	3.53	2.456	0.976	1.322	1.754	2.704	1.724	1.366	2.742	5.722	1.88	2.734	4.018	43.198
50	3.408	2.072	2.76	2.948	2.006	0.808	1.126	1.438	2.25	1.22	0.962	1.558	3.576	1.18	1.854	2.982	32.156
60	2.478	1.438	2.148	2.464	1.598	0.634	0.87	1.172	1.678	0.852	0.632	0.868	1.968	0.662	1.04	2.11	22.622
70	1.986	1.272	1.904	2.152	1.36	0.564	0.784	1.05	1.404	0.746	0.526	0.54	1.19	0.594	0.892	1.746	18.71
80	1.612	1.032	1.608	1.918	1.164	0.44	0.66	0.9	1.24	0.626	0.416	0.392	0.922	0.416	0.682	1.354	15.382
90	1.458	0.864	1.442	1.66	0.982	0.376	0.582	0.796	1.128	0.508	0.328	0.278	0.558	0.302	0.502	1.23	12.998
100	1.12	0.796	1.366	1.564	0.944	0.332	0.534	0.704	0.994	0.47	0.284	0.232	0.518	0.242	0.428	0.958	11.494
110	1.08	0.796	1.366	1.44	0.888	0.332	0.534	0.686	0.98	0.47	0.284	0.18	0.438	0.242	0.428	0.914	11.058
120	1.01	0.622	1.164	1.44	0.888	0.268	0.452	0.66	0.95	0.404	0.224	0.18	0.438	0.176	0.332	0.86	10.072
130	0.82	0.622	1.164	1.422	0.856	0.268	0.452	0.608	0.88	0.404	0.224	0.17	0.406	0.176	0.332	0.754	9.562
140	0.82	0.622	1.164	1.422	0.856	0.268	0.452	0.608	0.88	0.404	0.224	0.17	0.406	0.176	0.332	0.754	9.562
150	0.82	0.584	1.1	1.354	0.816	0.258	0.428	0.608	0.88	0.392	0.214	0.158	0.39	0.17	0.31	0.754	9.236
160	0.82	0.584	1.1	1.354	0.816	0.258	0.428	0.608	0.88	0.392	0.214	0.158	0.39	0.17	0.31	0.754	9.236
170	0.82	0.584	1.1	1.354	0.816	0.258	0.428	0.608	0.88	0.392	0.214	0.158	0.39	0.17	0.31	0.754	9.236
180	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
190	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
200	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
210	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
220	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
230	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
240	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
250	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
260	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
270	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
280	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
290	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
300	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
310	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
320	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
330	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
340	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
350	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
360	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
370	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
380	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
390	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
400	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
410	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
420	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
430	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
440	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
450	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
460	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
470	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
480	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
490	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
500	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
510	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
520	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
530	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
540	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
550	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
560	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
570	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
580	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
590	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
600	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
610	0.82	0.584	1.1	1.298	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.08

Table A-2. Plume Height Frequency (%) (Average of 5 years: July 1, 2002 - June 30, 2007)

Height Above the Tower (m)	WIND FROM: N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
	PLUME HEADED: S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
620	0.82	0.584	1.1	1.248	0.772	0.258	0.428	0.608	0.88	0.392	0.214	0.146	0.324	0.17	0.31	0.754	9.008
630	0.82	0.584	1.1	1.248	0.772	0.258	0.428	0.608	0.88	0.392	0.214	0.146	0.324	0.17	0.31	0.754	9.008
640	0.82	0.584	1.1	1.248	0.772	0.258	0.428	0.608	0.88	0.392	0.214	0.146	0.324	0.17	0.31	0.754	9.008
650	0.82	0.584	1.1	1.248	0.772	0.258	0.428	0.608	0.88	0.392	0.214	0.146	0.324	0.17	0.31	0.754	9.008
660	0.82	0.558	1.042	1.248	0.772	0.256	0.414	0.608	0.88	0.386	0.212	0.146	0.324	0.17	0.306	0.754	8.896
670	0.784	0.542	0.966	1.248	0.772	0.256	0.414	0.598	0.842	0.382	0.212	0.146	0.324	0.16	0.27	0.704	8.622
680	0.784	0.542	0.966	1.212	0.768	0.256	0.414	0.598	0.842	0.382	0.212	0.146	0.324	0.16	0.27	0.704	8.58
690	0.784	0.542	0.966	1.212	0.768	0.256	0.414	0.598	0.842	0.382	0.212	0.146	0.324	0.16	0.27	0.704	8.58
700	0.784	0.542	0.966	1.212	0.768	0.256	0.414	0.598	0.842	0.382	0.212	0.146	0.324	0.16	0.27	0.704	8.58
710	0.784	0.542	0.966	1.212	0.768	0.256	0.414	0.598	0.842	0.382	0.212	0.146	0.324	0.16	0.27	0.704	8.58
720	0.784	0.542	0.966	1.212	0.768	0.256	0.414	0.598	0.842	0.382	0.212	0.146	0.324	0.16	0.27	0.704	8.58
730	0.784	0.542	0.966	1.212	0.768	0.256	0.414	0.598	0.842	0.382	0.212	0.146	0.324	0.16	0.27	0.704	8.58
740	0.784	0.542	0.966	1.212	0.768	0.256	0.414	0.598	0.842	0.382	0.212	0.146	0.324	0.16	0.27	0.704	8.58
750	0.7	0.52	0.92	1.212	0.768	0.252	0.404	0.564	0.816	0.38	0.212	0.146	0.324	0.154	0.258	0.648	8.282
760	0.7	0.52	0.92	1.212	0.768	0.252	0.404	0.564	0.816	0.38	0.212	0.146	0.324	0.154	0.258	0.648	8.282
770	0.7	0.52	0.92	1.212	0.768	0.252	0.404	0.564	0.816	0.38	0.212	0.146	0.324	0.154	0.258	0.648	8.282
780	0.7	0.52	0.92	1.212	0.768	0.252	0.404	0.564	0.816	0.38	0.212	0.146	0.324	0.154	0.258	0.648	8.282
790	0.7	0.52	0.92	1.212	0.768	0.252	0.404	0.564	0.816	0.38	0.212	0.146	0.324	0.154	0.258	0.648	8.282
800	0.7	0.52	0.92	1.212	0.768	0.252	0.404	0.564	0.816	0.38	0.212	0.146	0.324	0.154	0.258	0.648	8.282
810	0.52	0.386	0.77	1.024	0.592	0.21	0.288	0.42	0.722	0.322	0.188	0.114	0.296	0.114	0.202	0.504	6.678
820	0.52	0.386	0.77	1.024	0.592	0.21	0.288	0.42	0.722	0.322	0.188	0.114	0.296	0.114	0.202	0.504	6.678
830	0.444	0.314	0.586	0.864	0.49	0.162	0.24	0.362	0.608	0.264	0.144	0.088	0.252	0.098	0.182	0.438	5.538
840	0.308	0.21	0.364	0.864	0.49	0.088	0.134	0.19	0.372	0.148	0.082	0.088	0.252	0.054	0.094	0.296	4.04
850	0.19	0.108	0.17	0.56	0.318	0.03	0.026	0.054	0.136	0.072	0.042	0.046	0.172	0.026	0.062	0.194	2.208
860	0.19	0.108	0.17	0.236	0.118	0.03	0.026	0.054	0.136	0.072	0.042	0.028	0.11	0.026	0.062	0.194	1.606
870	0.076	0.01	0.03	0.068	0.03	0.004	0	0.03	0.052	0	0	0.008	0.02	0	0.026	0.136	0.492
880	0.03	0.01	0.03	0.016	0.002	0.004	0	0.016	0.016	0	0	0	0	0	0.026	0.076	0.228
890	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A-3. Plume Radius Frequency (%) (Average of 5 years: July 1, 2002 - June 30, 2007)

Height Above the Tower (m)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
	WIND FROM																
	PLUME HEADED																
	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
5	10.998	5.362	5.92	4.424	3.252	1.698	2.48	4.4	9.53	6.802	5.174	4.652	9.218	6.086	8.276	11.732	100
10	9.38	4.916	5.404	4.304	3.126	1.51	2.228	3.756	7.628	5.618	4.242	4.404	8.706	4.952	6.806	9.83	86.808
15	4.298	2.554	3.152	3.654	2.556	0.944	1.286	1.692	2.612	1.668	1.314	2.626	5.702	1.832	2.632	3.778	42.308
20	2.386	1.598	2.326	2.864	1.95	0.658	0.918	1.134	1.634	0.902	0.652	1.366	3.308	0.802	1.168	2.056	25.73
25	1.418	0.982	1.582	2.1	1.302	0.408	0.624	0.822	1.136	0.57	0.362	0.458	1.082	0.368	0.578	1.168	14.964
30	0.894	0.65	1.194	1.55	0.964	0.28	0.458	0.65	0.94	0.462	0.258	0.236	0.528	0.212	0.374	0.814	10.464
35	0.894	0.612	1.13	1.34	0.826	0.27	0.434	0.65	0.94	0.45	0.248	0.168	0.39	0.206	0.35	0.814	9.722
40	0.876	0.612	1.13	1.34	0.826	0.27	0.434	0.642	0.926	0.45	0.248	0.168	0.39	0.206	0.35	0.81	9.676
45	0.876	0.608	1.124	1.326	0.818	0.26	0.43	0.642	0.926	0.434	0.234	0.158	0.372	0.196	0.342	0.81	9.556
50	0.876	0.608	1.124	1.326	0.818	0.26	0.43	0.642	0.926	0.434	0.234	0.158	0.372	0.196	0.342	0.81	9.556
55	0.876	0.608	1.124	1.326	0.818	0.26	0.43	0.642	0.926	0.434	0.234	0.158	0.372	0.196	0.342	0.81	9.556
60	0.876	0.584	1.1	1.326	0.818	0.258	0.428	0.642	0.926	0.392	0.214	0.158	0.372	0.17	0.31	0.81	9.384
65	0.82	0.584	1.1	1.326	0.818	0.258	0.428	0.608	0.88	0.392	0.214	0.158	0.372	0.17	0.31	0.754	9.192
70	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
75	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
80	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
85	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
90	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
95	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
100	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
105	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
110	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
115	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
120	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
125	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
130	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
135	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
140	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
145	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
150	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
155	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
160	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
165	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
170	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
175	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
180	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
185	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
190	0.82	0.584	1.1	1.302	0.784	0.258	0.428	0.608	0.88	0.392	0.214	0.148	0.332	0.17	0.31	0.754	9.086
195	0.788	0.584	1.1	1.302	0.784	0.258	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.31	0.678	8.948
200	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
205	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
210	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
215	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
220	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
225	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
230	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
235	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
240	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
245	0.788	0.574	1.07	1.286	0.782	0.254	0.428	0.592	0.864	0.392	0.214	0.148	0.332	0.17	0.284	0.678	8.858
250	0.788	0.574	1.07	1.236	0.77	0.254	0.428	0.592	0.864	0.392	0.214	0.146	0.324	0.17	0.284	0.678	8.786
255	0.788	0.574	1.07	1.236	0.77	0.254	0.428	0.592	0.864	0.392	0.214	0.146	0.324	0.17	0.284	0.678	8.786
260	0.788	0.574	1.07	1.236	0.77	0.254	0.428	0.592	0.864	0.392	0.214	0.146	0.324	0.17	0.284	0.678	8.786
265	0.77	0.574	1.07	1.236	0.77	0.254	0.428	0.592	0.858	0.392	0.214	0.146	0.324	0.17	0.284	0.642	8.726
270	0.77	0.574	1.07	1.236	0.77	0.254	0.428	0.592	0.858	0.392	0.214	0.146	0.324	0.17	0.284	0.642	8.726
275	0.556	0.558	0.994	1.236	0.77	0.254	0.428	0.436	0.74	0.388	0.214	0.146	0.324	0.16	0.248	0.456	7.912
280	0.556	0.534	0.946	1.208	0.764	0.254	0.42	0.436	0.74	0.384	0.212	0.146	0.324	0.158	0.242	0.456	7.78
285	0.556	0.398	0.796	1.02	0.59	0.212	0.306	0.436	0.74	0.326	0.188	0.114	0.296	0.118	0.186	0.456	6.74
290	0.556	0.398	0.796	0.98	0.586	0.212	0.306	0.436	0.74	0.326	0.188	0.114	0.296	0.118	0.186	0.456	6.692
295	0.556	0.398	0.796	0.98	0.586	0.212	0.306	0.436	0.74	0.326	0.188	0.114	0.296	0.118	0.186	0.456	6.692
300	0.556	0.398	0.796	0.848	0.488	0.212	0.306	0.436	0.74	0.326	0.188	0.088	0.252	0.118	0.186	0.456	6.394
305	0.538	0.398	0.796	0.572	0.36	0.212	0.306	0.426	0.708	0.326	0.188	0.05	0.198	0.118	0.186	0.442	5.824

Table A-3. Plume Radius Frequency (%) (Average of 5 years: July 1, 2002 - June 30, 2007)

Height Above the Tower (m)	N (WIND FROM) / S (PLUME HEADED)	NNE / SSW	NE / SW	ENE / WSW	E / W	ESE / WNW	SE / NW	SSE / NNW	S / N	SSW / NNE	SW / NE	WSW / ENE	W / E	WNW / ESE	NW / SE	NNW / SSE	ALL / SUM
310	0.41	0.268	0.516	0.518	0.33	0.136	0.186	0.378	0.646	0.204	0.124	0.044	0.178	0.074	0.094	0.326	4.434
315	0.276	0.246	0.47	0.518	0.33	0.132	0.176	0.206	0.41	0.202	0.124	0.044	0.178	0.068	0.082	0.184	3.65
320	0.234	0.246	0.47	0.49	0.286	0.132	0.176	0.16	0.32	0.202	0.124	0.04	0.152	0.068	0.082	0.16	3.346
325	0.12	0.2	0.334	0.168	0.088	0.084	0.134	0.136	0.236	0.148	0.082	0.02	0.09	0.054	0.068	0.102	2.066
330	0.12	0.102	0.194	0.168	0.088	0.058	0.108	0.136	0.236	0.076	0.04	0.02	0.09	0.028	0.032	0.102	1.598
335	0.12	0.102	0.194	0	0	0.058	0.108	0.136	0.236	0.076	0.04	0	0	0.028	0.032	0.102	1.234
340	0.12	0.102	0.194	0	0	0.058	0.108	0.136	0.236	0.076	0.04	0	0	0.028	0.032	0.102	1.234
345	0.12	0.102	0.194	0	0	0.058	0.108	0.136	0.236	0.076	0.04	0	0	0.028	0.032	0.102	1.234
350	0	0.102	0.194	0	0	0.058	0.108	0	0	0.076	0.04	0	0	0.028	0.032	0	0.638
355	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
360	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
365	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
370	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
385	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
395	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
405	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
415	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
425	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
435	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
445	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
455	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
460	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
465	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
470	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
480	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
485	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
490	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
495	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A-4. Total Hours of Plume Fog (Sum of 5 years: July 1, 2002 - June 30, 2007)

Distance from the Tower (m)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
	WIND FROM																
	PLUME HEADED																
	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
100	0	2.5	2.2	0.9	0.9	0.1	0	0.2	1.8	0	0	0	0	0	0.8	0	9.4
200	0.5	10.6	12.4	1	1	0	0	0.5	4	0	0	0	0	0	1	0	31
300	0.4	9.6	12.6	0.7	0.7	0	0	0.5	4	0	0	0	0	0	0.5	0	29.1
400	0	9.1	11.4	0.5	0.5	0	0	0.5	4	0	0	0	0	0	0.5	0	26.5
500	0	7	8.5	0.4	0.5	0	0	0.5	4	0	0	0	0	0	0.5	0	21.4
600	0	6.6	8.1	0	0.5	0	0	0.5	4	0	0	0	0	0	0.5	0	20.2
700	0	6.5	8	0	0.5	0	0	0.1	1	0	0	0	0	0	0.5	0	16.6
800	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0.5
900	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0.5
1000	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0.2
1100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A-5. Total Hours of Rime Ice (Sum of 5 years: July 1, 2002 - June 30, 2007)

Distance from the Tower (m)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
	WIND FROM																
	PLUME HEADED																
	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
100	0	1.9	1.5	0	0	0	0	0	0	0	0	0	0	0	0.8	0	4.2
200	0	3.6	4.4	0	0	0	0	0	0	0	0	0	0	0	1	0	9
300	0	3	5	0	0	0	0	0	0	0	0	0	0	0	0.5	0	8.5
400	0	2.6	3.9	0	0	0	0	0	0	0	0	0	0	0	0.5	0	7
500	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0.5	0	2
600	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0.5	0	2
700	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0.5	0	2
800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A-6. Annual Average Salt Deposition (kg/km2/month) (Average of 5 years: July 1, 2002 - June 30, 2007)

Distance from the Tower (m)	WIND FROM: N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
	PLUME HEADED: S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
100	0.092	0.03	0.032	0.07	0.044	0.004	0.004	0.022	0.07	0.054	0.048	0.25	0.312	0.02	0.038	0.094	0.074
200	1.354	0.646	0.686	0.92	0.692	0.184	0.272	0.532	1.226	0.922	0.73	1.074	2.104	0.73	1.034	1.484	0.912
300	0.896	0.466	0.504	0.404	0.294	0.164	0.228	0.368	0.726	0.52	0.372	0.338	0.692	0.514	0.68	0.922	0.504
400	0.21	0.11	0.116	0.296	0.226	0.042	0.054	0.076	0.122	0.102	0.078	0.268	0.584	0.108	0.152	0.2	0.172
500	0.186	0.1	0.104	0.278	0.214	0.04	0.052	0.07	0.11	0.092	0.074	0.256	0.558	0.102	0.136	0.174	0.16
600	0.174	0.094	0.098	0.272	0.21	0.036	0.046	0.066	0.102	0.08	0.066	0.25	0.544	0.092	0.126	0.164	0.152
700	0.162	0.092	0.096	0.25	0.188	0.032	0.044	0.058	0.092	0.078	0.062	0.214	0.474	0.088	0.118	0.15	0.138
800	0.162	0.092	0.096	0.116	0.082	0.032	0.044	0.058	0.092	0.078	0.062	0.056	0.108	0.088	0.118	0.15	0.088
900	0.162	0.092	0.096	0.072	0.05	0.032	0.044	0.058	0.092	0.078	0.062	0.032	0.052	0.088	0.116	0.15	0.078
1000	0.158	0.088	0.092	0.054	0.036	0.03	0.042	0.056	0.092	0.074	0.058	0.03	0.048	0.084	0.108	0.144	0.074
1100	0.142	0.084	0.09	0.022	0.016	0.028	0.042	0.052	0.082	0.064	0.052	0.024	0.034	0.08	0.102	0.134	0.066
1200	0.138	0.082	0.09	0.018	0.014	0.028	0.042	0.05	0.08	0.064	0.052	0.016	0.028	0.08	0.102	0.13	0.066
1300	0.122	0.054	0.058	0.016	0.012	0.02	0.028	0.046	0.072	0.044	0.038	0.016	0.024	0.054	0.068	0.12	0.05
1400	0.048	0.018	0.022	0.014	0.01	0.01	0.012	0.018	0.032	0.014	0.01	0.014	0.022	0.012	0.018	0.044	0.022
1500	0.026	0.014	0.02	0.014	0.01	0.008	0.01	0.014	0.022	0.014	0.01	0.014	0.022	0.012	0.016	0.024	0.016
1600	0.02	0.008	0.01	0.014	0.01	0.002	0.004	0.006	0.016	0.01	0.008	0.014	0.022	0.008	0.012	0.02	0.01
1700	0.012	0.008	0.008	0.014	0.01	0	0	0.004	0.01	0.01	0.008	0.012	0.02	0.008	0.012	0.016	0.01
1800	0.012	0.006	0.006	0.012	0.01	0	0	0.002	0.008	0.008	0.006	0.01	0.02	0.008	0.012	0.014	0.01
1900	0.012	0.006	0.006	0.012	0.01	0	0	0.002	0.008	0.008	0.006	0.01	0.016	0.006	0.01	0.014	0.01
2000	0.012	0.006	0.006	0.012	0.01	0	0	0.002	0.008	0.008	0.004	0.008	0.016	0.006	0.01	0.014	0.008
2100	0.012	0.004	0.006	0.012	0.01	0	0	0.002	0.008	0.006	0.002	0.006	0.016	0.004	0.008	0.012	0.008
2200	0.01	0.002	0.006	0.008	0.006	0	0	0.002	0.006	0.004	0.002	0.002	0.012	0.002	0.008	0.01	0.004
2300	0.01	0.002	0.006	0.004	0.002	0	0	0.002	0.006	0.004	0.002	0.002	0.01	0.002	0.008	0.01	0.004
2400	0.01	0.002	0.006	0.002	0	0	0	0.002	0.006	0.004	0.002	0.002	0.01	0.002	0.008	0.01	0.002
2500	0.01	0.002	0.004	0	0	0	0	0.002	0.006	0.004	0.002	0	0.01	0	0.008	0.01	0.002
2600	0.01	0.002	0.004	0	0	0	0	0.002	0.004	0.004	0.002	0	0.006	0	0.008	0.01	0.002
2700	0.01	0.002	0.004	0	0	0	0	0	0.004	0.004	0.002	0	0.006	0	0.008	0.01	0
2800	0.01	0	0.004	0	0	0	0	0	0.004	0.002	0.002	0	0.006	0	0.006	0.01	0
2900	0.01	0	0.004	0	0	0	0	0	0.004	0.002	0	0	0.004	0	0.004	0.01	0
3000	0.01	0	0.004	0	0	0	0	0	0.002	0	0	0	0.004	0	0.002	0.01	0
3100	0.008	0	0	0	0	0	0	0	0.002	0	0	0	0.004	0	0.002	0.01	0
3200	0.006	0	0	0	0	0	0	0	0.002	0	0	0	0.004	0	0.002	0.008	0
3300	0.006	0	0	0	0	0	0	0	0	0	0	0	0.004	0	0.002	0.008	0
3400	0.006	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0.002	0.008	0
3500	0.006	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0.002	0.008	0
3600	0.006	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.006	0
3700	0.004	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.006	0
3800	0.004	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.006	0
3900	0.004	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.006	0
4000	0.004	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.006	0
4100	0.004	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.006	0
4200	0.002	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.004	0
4300	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.004	0
4400	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.002	0
4500	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.002	0
4600	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0.002	0
4700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0
4800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0
4900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0
5000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0
5100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A-6. Annual Average Salt Deposition (kg/km2/month) (Average of 5 years: July 1, 2002 - June 30, 2007)

Distance from the Tower (m)	N (WIND FROM) / S (PLUME HEADED)	NNE / SSW	NE / SW	ENE / WSW	E / W	ESE / WNW	SE / NW	SSE / NNW	S / N	SSW / NNE	SW / NE	WSW / ENE	W / E	WNW / ESE	NW / SE	NNW / SSE	ALL / AVG
6200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A-7. Total Hours of Plume Shadowing (Sum of 5 years: July 1, 2002 - June 30, 2007)

Distance from the Tower (m)	N (WIND FROM) / S (PLUME HEADED)	NNE / SSW	NE / SW	ENE / WSW	E / W	ESE / WNW	SE / NW	SSE / NNW	S / N	SSW / NNE	SW / NE	WSW / ENE	W / E	WNW / ESE	NW / SE	NNW / SSE	ALL / AVG
200	91.4	115.6	198.5	476.8	548.8	456	304.1	257.5	294.7	324.7	481.2	441.2	202.8	157.9	91.3	73.2	282.3
400	54	74.5	105.9	225.4	195.9	108.3	91.9	91.2	93.7	76.5	62	104.9	53.3	43.3	48	41.8	91.8
600	52.2	63.8	73.4	154.9	109.2	71.3	37.8	69.1	69.2	55.6	35.2	61.8	27.3	36.9	30.8	43.6	62.1
800	52.1	59.1	65	124.4	81.1	48.3	24.9	56.1	60	44	26.3	42.6	22.3	31.6	25	37.5	50
1000	51.9	63.4	58.2	107.7	63	42.3	22.4	47.6	57.2	43.9	20.5	33.1	17.8	27	22.4	37.6	44.8
1200	51.7	60.2	55	101.3	56	34.3	20.9	45.2	55.2	42.4	18.3	30.2	14.9	24.6	19.6	36.8	41.8
1400	49.3	59.2	51.5	93.1	51.9	32.3	19.9	45.9	54.2	40.1	17.5	25.4	11.2	21.3	19	37.4	39.4
1600	50.4	55.9	50.6	88.9	48.8	30.1	20.9	47.4	55.3	40.2	16.5	21	11.6	20.3	19.6	36.4	38.4
1800	50.4	56	48.7	85.5	47.3	29.6	23.2	46.9	56.1	40.2	16.5	19.4	10.9	18.6	17.6	39.6	37.9
2000	52.4	56	47.7	80.6	45.1	29.6	23.2	48.4	56.1	39.2	16.5	19.4	10.9	17.6	15.9	39.6	37.4
2200	51.2	56	47.1	80.4	44.2	28.8	23.2	49.4	56.1	39.2	15.7	19.8	9.3	17	15.5	38.7	37
2400	50	56	47.1	78.7	42.9	28.8	24.2	49.4	56.1	38.2	15.7	18.8	9.3	17	15.5	38.7	36.6
2600	50	58	46.2	76.5	42	28.2	24.2	49.4	56.1	38.2	15.7	18.8	9.3	15.8	15.5	38.7	36.4
2800	49.1	59.6	46.2	76.5	42	28.2	25.3	48.4	56.1	38.2	14.6	18.2	9.3	15	16.3	37.7	36.3
3000	49.1	60.7	46.2	75.8	42	28.2	24.3	47.4	56.9	38.2	14.6	18.2	8.6	14.8	16.3	36.9	36.2
3200	47.9	61.5	46.2	74.6	42	27.9	24.3	47.4	56.9	38.2	14.6	18.2	8.6	14.8	16.3	36.9	36
3400	46.9	61.5	46.2	74.8	42	27.2	24.3	46	55.6	38.2	14.4	18.2	9.9	14.8	16.3	36.9	35.8
3600	45.7	61.5	46.2	74.8	40.2	27.8	24.3	46	55.6	38.2	14.4	17.6	11.2	14.8	16.3	35.9	35.6
3800	45.7	61.5	46.2	74.1	40.8	26.7	24.3	45	54.7	38.2	14.4	17	11.2	14.8	16.3	35.9	35.4
4000	44.5	59.3	46.2	74.1	39.8	25.8	24.3	45	54.7	37.2	14.4	15.9	10.7	14.8	16.3	35.9	35
4200	44.5	57.9	44	72	37.3	25.8	24.3	45	53.8	37.2	14.4	15.9	10.7	14.8	16.3	35.9	34.3
4400	43.7	57.9	44	72	37.3	25.8	24.3	45	53.8	36.1	14.4	16.4	10.7	14.2	16.3	33.9	34
4600	43.7	57.9	44	72	37.3	25.8	24.3	45	53.8	36.1	14.4	16.4	10.7	14.2	16.3	33.9	34
4800	43.7	57.9	44	72	37.3	26.8	24.3	45	53.8	36.1	14.4	16.4	10.7	14.2	16.3	32.6	34
5000	43.7	57.9	44.7	71	38.1	26.8	23.4	45	53.8	36.1	14.4	16.4	10.7	14.2	16.3	32.6	34
5200	42.8	56.9	44.7	71	37.5	26.8	23.4	45.1	53.8	36.1	14.4	16.4	10.7	14.2	16.3	31.7	33.9
5400	41.8	55.7	44.7	71	36.5	26.2	23.4	45.1	53.8	36.1	14.4	16.4	10.7	14.2	16.3	31.7	33.6
5600	41.8	55.7	43.6	71	36.5	26.2	23.4	45.1	53.8	36.1	14.4	16.4	10.7	14.2	16.3	31.7	33.6
5800	41.8	54.6	43.6	70.4	35.5	25.3	23.4	45.1	53.8	36.1	14.4	16.4	10.7	14.2	16.3	32.7	33.4
6000	41.8	55.1	42.2	70.4	35.5	25.3	23.4	45.1	53.8	36.1	14.4	16.4	10.7	14.2	16.3	32.7	33.4
6200	41.8	55.1	42.2	69.4	35.5	25.3	24.5	45.1	53.8	36.1	15.4	16.4	10.7	14.2	17.2	32.7	33.5
6400	41.8	54	42.2	69.4	35.5	24.1	24.5	45.1	53.8	36.1	13.8	16.4	10.7	14.2	17.2	32.7	33.2
6600	41.8	54	41.1	69.4	35.5	23.6	24.5	45.1	53.8	36.1	13.8	16.4	10.7	14.2	17.2	31.7	33
6800	41.8	54	41.1	68.4	35.5	23.6	24.5	44	53.8	36.1	13.8	16.4	10.7	14.2	17.2	31.7	32.8
7000	42	50.7	41.1	68.4	35.5	23.6	24.5	44	53.8	36.1	13.2	15	10.7	14.2	17.2	30.7	32.6
7200	42	50.7	41.1	68.4	35.5	23.6	24.5	44	54.9	35.1	13.2	15	10.7	13.2	17.2	30.7	32.5
7400	39.3	49.9	41.1	68.4	35.5	23.6	24.5	44	54.9	35.1	11	15	10.7	13.2	17.2	29.7	32.1
7600	39.3	48.9	41.1	68.4	35.5	23.6	22.4	44	54	35.1	11	15	10.7	13.2	17.2	29.7	31.8
7800	39.3	48.9	40.4	68.4	35.5	23.6	22.4	44	54	35.1	11	15.8	10.7	13.2	17.2	25.6	31.5
8000	37.3	48.9	40.4	66.5	35.5	23.6	22.4	42.9	53.2	35.1	11	14.5	10.7	13.2	17.2	25.6	31.2

548.8

Table A-8. Annual Average Solar Energy Loss (MJ/m2) (Average of 5 years: July 1, 2002 - June 30, 2007)

Distance from the Tower (m)	WIND FROM: N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	ALL
	PLUME HEADED: S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	AVG
200	4.64	7	12.24	23.42	23.36	15.88	9.92	10.96	11.8	13.46	16.06	13	5.54	4.3	5.08	3.94	11.28
400	2.24	4.24	6.56	12.78	7.08	3.54	2.94	5.24	5.46	3.78	2.86	3.84	1.66	2.22	2.1	2.42	4.32
600	1.98	3.5	4.66	9.64	4.58	2.58	1.72	4.1	4.2	2.8	1.64	2.84	1.08	1.72	1.82	2.26	3.18
800	1.9	3.12	4.02	8.02	3.92	2.06	1.4	3.4	3.72	2.34	1.14	2.16	0.82	1.36	1.48	2.02	2.68
1000	1.94	3.28	3.76	6.62	3.26	1.94	1.36	2.96	3.68	2.38	1	1.74	0.78	1.12	1.54	1.96	2.46
1200	1.92	3.12	3.52	6.42	3.06	1.68	1.28	2.94	3.58	2.34	0.8	1.72	0.78	1.12	1.28	2	2.34
1400	1.82	3.08	3.5	6.28	3.04	1.66	1.24	3.14	3.52	2.22	0.86	1.46	0.58	1.02	1	2.04	2.3
1600	1.84	2.98	3.34	5.9	3.04	1.52	1.3	3.16	3.6	2.28	0.84	1.38	0.58	0.96	1	1.92	2.22
1800	1.84	2.82	3.32	5.82	3.02	1.42	1.32	3.24	3.62	2.28	0.84	1.32	0.58	0.88	0.98	1.98	2.22
2000	1.9	2.7	3.2	5.32	3.02	1.42	1.32	3.3	3.62	2.24	0.84	1.32	0.58	0.74	0.96	1.98	2.16
2200	1.88	2.68	3.2	5.3	3	1.42	1.32	3.36	3.62	2.24	0.84	1.34	0.46	0.74	0.86	1.98	2.14
2400	1.84	2.68	3.2	5.24	2.94	1.42	1.4	3.36	3.62	2.22	0.84	1.26	0.46	0.74	0.86	1.98	2.14
2600	1.84	2.8	3.2	5.12	2.94	1.42	1.4	3.36	3.62	2.22	0.84	1.26	0.46	0.72	0.86	1.98	2.14
2800	1.84	2.8	3.2	5.12	2.94	1.42	1.42	3.36	3.62	2.22	0.82	1.26	0.46	0.7	0.86	1.94	2.14
3000	1.84	2.82	3.2	5.12	2.94	1.42	1.4	3.28	3.62	2.22	0.82	1.26	0.46	0.7	0.86	1.94	2.12
3200	1.82	2.84	3.2	5.12	2.94	1.3	1.4	3.28	3.62	2.22	0.82	1.26	0.46	0.7	0.86	1.94	2.12
3400	1.78	2.84	3.2	5.14	2.94	1.3	1.4	3.24	3.56	2.22	0.8	1.26	0.5	0.7	0.86	1.94	2.12
3600	1.76	2.84	3.2	5.14	2.92	1.3	1.4	3.24	3.56	2.22	0.8	1.26	0.5	0.7	0.86	1.8	2.1
3800	1.76	2.84	3.2	5.14	2.92	1.3	1.4	3.04	3.54	2.22	0.8	1.26	0.5	0.7	0.86	1.8	2.1
4000	1.72	2.8	3.2	5.14	2.84	1.28	1.4	3.04	3.54	2.18	0.8	1.24	0.5	0.7	0.86	1.8	2.06
4200	1.72	2.76	3.14	5.02	2.76	1.28	1.4	3.04	3.54	2.18	0.8	1.24	0.5	0.7	0.86	1.8	2.06
4400	1.72	2.76	3.14	5.02	2.76	1.28	1.4	3.04	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.66	2.06
4600	1.88	2.76	3.14	5.02	2.76	1.28	1.4	3.04	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.66	2.06
4800	1.88	2.76	3.14	5.02	2.76	1.3	1.4	3.04	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.62	2.06
5000	1.88	2.76	3.14	4.98	2.76	1.3	1.4	3.04	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.62	2.06
5200	1.88	2.58	3.14	4.98	2.76	1.3	1.4	3.06	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.62	2.04
5400	1.86	2.52	3.14	4.98	2.7	1.3	1.4	3.06	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.62	2.04
5600	1.86	2.52	3.12	4.98	2.7	1.3	1.4	3.06	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.62	2.04
5800	1.86	2.5	3.12	4.98	2.66	1.3	1.4	3.06	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.74	2
6000	1.86	2.5	3.06	4.98	2.66	1.3	1.4	3.06	3.54	2.16	0.8	1.24	0.5	0.7	0.86	1.74	2
6200	1.86	2.5	3.06	4.84	2.66	1.3	1.42	3.06	3.54	2.16	0.94	1.24	0.5	0.7	0.88	1.74	2.02
6400	1.86	2.48	3.06	4.84	2.66	1.26	1.42	3.06	3.54	2.16	0.9	1.24	0.5	0.7	0.88	1.74	2.02
6600	1.86	2.48	3.04	4.84	2.66	1.26	1.42	3.06	3.54	2.16	0.9	1.24	0.5	0.7	0.88	1.6	2
6800	1.86	2.48	3.04	4.76	2.66	1.26	1.42	3.06	3.54	2.16	0.9	1.24	0.5	0.7	0.88	1.6	2
7000	1.86	2.4	3.04	4.76	2.66	1.26	1.42	3.06	3.54	2.16	0.86	1.16	0.5	0.7	0.88	1.6	1.98
7200	1.86	2.4	3.04	4.76	2.66	1.26	1.42	3.06	3.56	2.14	0.86	1.16	0.5	0.64	0.88	1.6	1.96
7400	1.74	2.4	3.04	4.76	2.66	1.26	1.42	3.06	3.56	2.14	0.82	1.16	0.5	0.64	0.88	1.56	1.96
7600	1.74	2.38	3.04	4.76	2.66	1.26	1.4	3.06	3.54	2.14	0.82	1.16	0.5	0.64	0.88	1.56	1.96
7800	1.74	2.38	3.04	4.76	2.66	1.26	1.4	3.06	3.54	2.14	0.82	1.18	0.5	0.64	0.88	1.36	1.96
8000	1.6	2.38	3.04	4.7	2.66	1.26	1.4	3.04	3.54	2.14	0.82	1.14	0.5	0.64	0.88	1.36	1.94