



July 30, 2009
NND-09-0185

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

ATTN: Document Control Desk

Subject: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Combined License Application (COLA) - Docket Numbers 52-027 and 52-028 Response to NRC Request for Additional Information (RAI) Letter No. 049

Reference: Letter from Chandu P. Patel (NRC) to Alfred M. Paglia (SCE&G), Request for Additional Information Letter No. 049 Related to SRP Section 02.03.03 for the Virgil C. Summer Nuclear Station Units 2 and 3 Combined License Application, dated June 19, 2009.

The enclosure to this letter provides the South Carolina Electric & Gas Company (SCE&G) response to the RAI items included in the above referenced letter. The enclosure also identifies any associated changes that will be incorporated in a future revision of the VCSNS Units 2 and 3 COLA.

The supplemental information contained in the files on the enclosed CD is provided to support the NRC's review of the VCSNS Units 2 and 3 COLA, but does not comply with the requirements for electronic submissions as stated in NRC Guidance Document, "Guidance for Electronic Submissions to the NRC," dated October 29, 2008. The NRC staff requested that these files be provided in their native format as required for utilization in the software employed to support the COLA review. Formatting the data to comply with the guidance on electronic submissions would not serve the request to provide these files in their native formats.

Should you have any questions, please contact Mr. Al Paglia by telephone at (803) 345-4191, or by email at apaglia@scana.com.

DO83
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I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 30th day of July, 2009.

Sincerely,



Ronald B. Clary
General Manager
New Nuclear Deployment

AMM/RBC/am

Enclosures

c (w/o attachment):

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Chandu P. Patel
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NRC RAI Letter No. 049 Dated June 19, 2009

SRP Section: 02.03.03 – Onsite Meteorological Measurements Programs

Question from Siting and Accident Conseq Branch (RSAC)

NRC RAI Number: 02.03.03.-1

Revise the FSAR to contain the following based on the new, two year (Unit 2 and 3) meteorological data set:

- (1) Joint frequency distributions of wind speed, wind direction, and atmospheric stability for both measurement levels (10 and 60 meters), and annual and seasonal wind roses for both levels
- (2) Atmospheric dispersion and deposition factors presented in FSAR Sections 2.3.4 and 2.3.5.
Provide detailed user-provided information, including an electronic copy of the input and output files for the analyses using ARCON, PAVAN, and XOQDOQ, to allow the staff to perform its own confirmatory calculations.

SRP 2.3.3 states COL applicants should provide at least two consecutive annual cycles (and preferably 3 or more whole years) of onsite meteorological data with the COL application, including the most recent 1-year period. If two years of onsite meteorological data are not available at the time the application is filed, the staff expects that the COL applicant will provide at least one annual cycle of meteorological data collected onsite with the application. These data should be used by the applicant to calculate (1) the short-term atmospheric dispersion estimates for accident releases discussed in SRP Section 2.3.4 and (2) the long-term atmospheric dispersion estimates for routine releases discussed in SRP Section 2.3.5. The applicant should continue to monitor the data and submit the complete 2-year data set when it has collected all the data. This supplemental submittal should also include a reanalysis of the Section 2.3.4 and 2.3.5 atmospheric dispersion estimates based on the complete 2-year data set.

VCSNS RESPONSE:

The meteorological data for the year 2008 has now been collected and validated. Evaluations have been performed to assess the impact of the second year of data on the X/Q and D/Q values previously evaluated with one year of meteorological data. The reported values for the routine, accident and control room X/Q's are all less than the DCD values based on the two-year meteorological data. The X/Q and D/Q values for routine releases are within 10% of the single-year values, except for those calculated for the milk animal (a new and closer receptor from the most recent land use census). Control room X/Q's are almost the same (within 5% for the 0-2 hour period) and remain below the DCD values. Two-year accident release X/Q's are bounded by those

generated by the single year of data at the dose evaluation periphery. Accident release X/Q's are greater at the LPZ for the two-year data when compared to a single year of data, but remain below the DCD values.

The results of the ARCON96, PAVAN and XOQDOQ analyses based on the two years of data are now reflected in the FSAR revisions shown below.

In specific response to the RAI Items 1 and 2, above:

(1) Section 2.3 of the SCE&G FSAR will be revised to reflect a combined 2-year onsite dataset (January 1st 2007 – December 31st 2008) for joint frequency distributions of wind speed, wind direction, atmospheric stability and wind roses (annual and seasonal) for both 10-meter and 60-meter levels. Additionally, the FSAR text, tables and figures are being updated to reflect 2-years of onsite data wherever it is impacted.

(2) An electronic copy of the input and output files for ARCON96, PAVAN and XOQDOQ is provided as an attachment to this response.

This response is PLANT SPECIFIC.

ASSOCIATED VCSNS COLA REVISIONS:

The following FSAR changes will be made in a future revision of the COLA.

The statement of the revision to be made is done in bold and italics and the change itself is in regular font with red strikeouts being used to denote text that is being removed from the VCSNS FSAR (Revision 1). New text being added to the VCSNS FSAR is denoted by green, underlined text.

The last sentence of the 3rd paragraph in Subsection 2.3.2.1 will be updated to reflect the 2-year period of record for onsite data.

The data from this monitoring program, used to support Units 2 and 3, include measurements taken over the 2007 and 2008 annual cycles.

The sentence of the 4th paragraph in Subsection 2.3.2.2.1 will be updated to reflect the 2-year period of record.

Figures 2.3-202 through 2.3-206 present annual and seasonal wind rose plots (*i.e.*, graphical distributions of the direction from which the wind is blowing and wind speeds for each of sixteen, 22.5° compass sectors centered on north, north-northeast, northeast, etc.) for the 10-meter level based on measurements over the 2007 and 2008 annual cycles.

The last sentence of the 6th paragraph in Subsection 2.3.2.2.1 will be deleted to remove reference to monthly wind roses, which are being excluded following guidance by NRC reviewers.

Seasonally, winds from the southwest quadrant predominate during the spring and summer months (see Figures 2.3-204 and 2.3-205). This is also the case during the winter, although westerly winds prevail and the relative frequency of west-northwest winds during this season is greater (see Figure 2.3-203) because of increased cold frontal passages. Winds from the northeast quadrant predominate during the autumn months (see Figure 2.3-206). ~~Plots of individual monthly wind roses at the 10-meter measurement level are presented in Figure 2.3-207.~~

The first sentence of the 7th paragraph in Subsection 2.3.2.2.1 will be updated refer to seasonal and annual wind roses, rather than monthly. The last sentence of this paragraph will be deleted.

Annual and seasonal ~~W~~wind rose plots based on measurements at the 60-meter level are shown in Figures 2.3-208 through 2.3-212~~3~~. By comparison, wind direction distributions for the 60-meter level are fairly similar to the 10-meter level wind roses on composite annual and seasonal bases in terms of the predominant directional quadrants and variation over the course of the year. Prevailing winds differ between the two levels by one adjacent direction sector, generally veering (*i.e.*, turning clockwise) with height as might be expected. ~~Plots of individual monthly wind roses at the 60-meter level are presented in Figure 2.3-213.~~

The first sentence of the 9th paragraph in Subsection 2.3.2.2.1 will be updated to reflect the period of record from 1-year to 2-years.

Table 2.3-206 summarizes seasonal and annual mean wind speeds based on measurements from the upper and lower levels of the meteorological tower operated in support of Units 2 and 3 from January 1, 2007 through December 31, 2007~~8~~, and from wind instrumentation at the Columbia, South Carolina, NWS station based on a 49-year period of record (Reference 213). The elevation of the wind instruments at the Columbia NWS station is nominally 20 feet (approximately 6.1 meters) (Reference 213), comparable to the lower (10-meter) level measurements at the VCSNS site.

The first two sentences of the 10th paragraph in Subsection 2.3.2.2.1 will be updated to incorporate the second year of data to the period of record at the 10-meter and 60-meter levels.

Annually, mean wind speeds at the 10- and 60-meter levels are 2.43 and 4.42 meters per second, respectively, at the VCSNS site. The annual mean wind speed at Columbia (*i.e.*, 3.0 meters/second) is slightly higher than the 10-meter level at the VCSNS site, differing by only 0.67 meters/second.

The first sentence of the 2nd paragraph in Subsection 2.3.2.2.2 will be updated reflect the change in the period of record from 1-year to 2-years for the Units 2 and 3 tower.

Tables 2.3-207 and 2.3-208 present wind direction persistence/wind speed distributions based on measurements from the Units 2 and 3 monitoring program over a period of January 1, 2007 through December 31, 2008~~7~~.

The 3rd paragraph in Subsection 2.3.2.2.2 will be updated to reflect 2-year period of record at the 10-meter level from the Units 2 and 3 tower.

At the 10-meter level, the longest persistence period is greater than or equal to 18 hours for winds from the north-northeast and northeast sectors. This duration appears only in the lowest wind speed group (*i.e.*, for wind speeds greater than or equal to 5 mph). Persistence periods lasting for at least 12 hours are indicated for several directional sectors for wind speeds greater than or equal to 5 mph, including winds from the north, north-northeast, northeast, south, and southwest, west-southwest, west, and northwest sectors. Wind speeds greater than or equal to 20 mph persisted for three periods of only one greater than or equal to two hours, once in the south-southwest sector and twice in the west-southwest sector. There were no periods greater than or equal to 24 hours or persistent period of wind speeds greater than or equal to 25 mph.

The 4th paragraph in Subsection 2.3.2.2.2 will be updated to reflect 2-year period of record at the 60-meter level from the Units 2 and 3 tower.

At the 60-meter level, the longest persistence period is 24~~18~~ hours and occurs for winds from the west-southwest directional sector (see Table 2.3-208) for wind speeds greater than or equal to 5 mph and 10 mph. ~~For wind speeds greater than or equal to 10 mph maximum persistence periods are limited to 12 hours in six different sectors. For wind speeds greater than or equal to 15 mph, maximum persistence periods are limited to periods of 128 hours or less (in north-northeast, south, west-southwest and west sectors five different sectors) with the exception of 12-hour duration periods for winds from the north-northeast and west sectors.~~ Wind speeds greater than or equal to 30 mph persisted for only two ~~one~~ hours in the southeast, west-southwest and west sectors.

The first sentence of the 3rd paragraph in Subsection 2.3.2.2.3 will be updated to reflect the period of record for stability data from 1-year to 2-years for the Units 2 and 3 tower.

Over the period of record from January 1, 2007 through December 31, 2008~~7~~ for the monitoring program as operated in support of Units 2 and 3, ΔT was determined from the difference between temperature measurements made at the 60- and 10-meter tower levels.

The first sentence of the 4th paragraph in Subsection 2.3.2.2.3 will be updated to reflect the change in the period of record in the stability data from 1-year to 2-years for the Units 2 and 3 tower.

The data indicate a predominance of neutral stability (Class D) and slightly stable (Class E) conditions throughout the year, ranging from about ~~63~~⁵⁸ to ~~73~~³²% of the time for these stability classes combined.

The sentence of the 8th paragraph in Subsection 2.3.3.3.2 will be updated to reflect the 2-year period of record for onsite data.

For the Years 2007 and 2008, no data substitution has been required and the annualized data recovery rates for all parameters measured at the Units 2 and 3 meteorological tower well exceed 90%.

The 3^d paragraph in Subsection 2.3.3.3 will be corrected to change the period of record to 2-years of onsite data.

Two years of meteorological data collected from the VCSNS Units 2 and 3 meteorological tower ~~have~~^{will} been provided. The first year of meteorological data for the period, January 2007 through December 2007, was used to establish a baseline for preparing the VCSNS Units 2 and 3 COL Application. On-site meteorological data collected from January 2008 through December 2008 provide the second year of data. ~~A supplemental, reanalysis of the atmospheric dispersion estimates based on the complete two-year data set will be made in accordance with Regulatory Guide 1.206 and provided to the NRC in a subsequent revision of the COL application.~~

The last sentence of the 1st paragraph in Subsection 2.3.3.5.2 will be updated to reflect the 2-year period of record for onsite data.

Overall, the data recovery rate meets the requirements of Regulatory Guide 1.23. Specifically, the annual data recovery rates for data period from January 2007 through December 200~~8~~⁷ are greater than 90% for the three primary variables (*i.e.*, wind speed, wind direction, and temperature difference).

The 2nd sentence of the paragraph in Subsection 2.3.3.5.1 will be updated to reflect the 2-year period of record for onsite data.

The data collection system of the new meteorological tower, dedicated to serve Units 2 and 3 conforms to Regulatory Guide 1.23. In support of the VCSNS Units 2 and 3 COL application, ~~two one~~^{two} years of available onsite data (*i.e.*, 1/1/2007 - 12/31/200~~8~~⁷) from the Units 2 and 3 tower was used to make the atmospheric dispersion estimates. The results of these dispersion estimates are reported in Subsections 2.3.4 and 2.3.5.

The 1st sentence of the 1st paragraph in Subsection 2.3.3.5.3 will be updated to reflect the 2-year period of record for onsite data.

Data are provided for the collection period from January 1, 2007, through December 31, 2008. Specifically, an electronic sequential, hour-by-hour listing of the data set, in the format specified in Appendix A of Regulatory Guide 1.23, is provided.

The 1st and 2nd sentences of the 2nd paragraph in Subsection 2.3.3.5.3 will be updated to reflect the 2-year period of record for onsite data.

Two-years of available onsite data were used to calculate both the short-term and long-term atmospheric dispersion estimates presented in Subsections 2.3.4 and 2.3.5. A subsequent submittal, including a reanalysis of the atmospheric dispersion estimates, based on the complete two-year data set, will be made in accordance with Regulatory Guide 1.206.

The 1st paragraph in Subsection 2.3.4.1 will be updated to reflect the 2-year period of record for onsite data.

To evaluate potential health effects for the AP1000 reactor design basis accidents, a hypothetical accident is postulated to predict upper-limit concentrations and doses that might occur in the event of a containment release to the atmosphere. Site-specific meteorological data, covering a period from January 1, 2007 through December 31, 2008, was used to quantitatively evaluate such a hypothetical accident at the site. Onsite data provide representative measurements of local dispersion conditions appropriate to Units 2 and 3, and the two-year period is considered to be reasonably representative of long-term conditions as discussed in Subsection 2.3.3. An additional analysis will be performed using a second year of data.

The 2nd and 6th sentences (1st and 5th bullets) of the 10th paragraph in Subsection 2.3.4.2 will be updated to reflect the 2-year period of record for onsite data.

The PAVAN model input data is presented below:

- Meteorological data: 2-years (January 1, 2007 to December 31, 2008) composite onsite joint frequency distributions of wind speed, wind direction, and atmospheric stability
- Type of release: ground-level (a default height of 10 meters as suggested by Reference 230 was used)
- Wind sensor height: 10 meters
- Vertical temperature difference: (60 meters – 10 meters)
- Number of wind speed categories: 12 (including calm)

- Distances from release points along the PBAC to Dose Evaluation Periphery: 805 meters, for all downwind sectors
- Distances from release point to LPZ boundary for all downwind sectors (see Table 2.3-219)

The table after the 2nd paragraph in Subsection 2.3.4.2.1.1 will be updated to reflect the PAVAN model run with 2-years of onsite data.

Receptor Location	0–2 hours	0–8 hours	8–24 hours	1–4 days	4–30 days	Annual Average
Dose Evaluation Periphery	3.72E-04 3.57E-04	+	+	+	+	+
DCD*	5.1E-04	-	-	-	-	-
LPZ Boundary	+	5.87E-05 1.16E-04	4.22E-05 7.45E-05	2.07E-05 2.84E-05	7.44E-06 7.13E-06	+
DCD*	-	2.2E-04	1.60E-04	1.0E-04	8.0E-05	-

Table Notes:

- * From DCD Tier 1, Table 5.0-1 and DCD Tier 2, Table 2-1 (Site Parameters)
- The DCD does not list this value
- + The value is not provided because there is no equivalent DCD value.

The 1st sentence of the 3rd paragraph in Subsection 2.3.4.2.1.1 will be updated to reflect the PAVAN model run with 2-years of onsite data.

The results provided in Table 2.3-220 show that the maximum 0–2-hour X/Q value (3.573.72E-04) determined by the PAVAN modeling analyses at the Dose Evaluation Periphery is bounded by the 0–2-hour DCD X/Q value of 5.1E-04 as described in DCD Tier 1, Table 5.0-1 and DCD Tier 2, Table 2-1.

The 2nd and 3rd sentences of the 2nd paragraph in Subsection 2.3.4.2.1.2 will be updated to reflect the ARCON96 model run with 2-years of onsite data.

Control room X/Qs were estimated using the ARCON96 dispersion model as described in NUREG/CR-6331 (Reference 232) and considered receptor height, release height, release type, and building area. ~~Two One~~ annual cycles (January 1, 2007–December 31, 2008) of hourly meteorological data collected onsite were used as part of the input for the ARCON96 program. The two years of meteorological data ~~has~~ a data recovery

rate of more than 90% and are representative of the site dispersion characteristics as described in Subsection 2.3.3.

The last sentence of the 2nd paragraph in Subsection 2.3.5.1 will be updated to correct the XOQDOQ model run with receptors of interest.

The NRC-sponsored XOQDOQ computer program (Reference 231) was used to estimate X/Q values due to routine releases of gaseous effluents to the atmosphere. The XOQDOQ computer code has the primary function of calculating annual average X/Q values and annual average relative deposition (D/Q) values at receptors of interest (e.g., the Dose Evaluation Periphery and the LPZ boundary; the nearest: milk animal, residence, garden, and meat animal).

The 2nd sentence of the 4th paragraph in Subsection 2.3.5.1 will be updated to reflect the XOQDOQ model run with 2-years of onsite data.

The following input data and assumptions have been used in the XOQDOQ modeling analysis:

- Meteorological Data: 24-year (January 1, 2007 to December 31, 20087) composite onsite joint frequency distribution of wind speed, wind direction, and atmospheric stability
- Type of release: Ground-level (a default height of 10 meters as suggested by Reference 231 was used)
- Wind sensor height: 10 meters
- Vertical temperature difference: (60 meters – 10 meters)
- Number of wind speed categories: 12 (including calm)

The 2nd paragraph in Subsection 2.3.5.2 will be updated to reflect the XOQDOQ model run with 2-years of onsite data.

The overall maximum annual average X/Q value is 1.74.6E-05 sec/m³ (no decay, undepleted) and occurs at Unit 3 due to the release from Unit 2. The maximum annual average X/Q values (along with the direction and distance of the receptor locations relative to the Units 2 and 3 site) for the other sensitive receptor types are:

- 5.86.0E-06 sec/m³ for the Dose Evaluation Periphery occurring in the southeast sector at a distance of 0.5 mile
- 8.79.0E-07 sec/m³ for the nearest residence occurring in the southeast sector at a distance of 1.68 miles

- 4.6E-07 sec/m³ for the nearest meat animal occurring in the west-northwest sector at a distance of 1.74 miles
- ~~1.74~~2E-07 sec/m³ for the nearest milk animal in the northwest west sector at a receptor distance of ~~4.1~~74 miles
- ~~8.79~~0E-07 sec/m³ for the nearest vegetable garden occurring in the southeast sector at a distance of 1.68 miles

Reference 221 will be updated to reflect data available in the 2008 VCSNS RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

221. ~~SCE&G, Annual Effluent and Waste Disposal Report, Virgil G. Summer Nuclear Station, for the Operating Period January 1, 2004 – December 31, 2004, SCE&G, April 2005. SCE&G, Radiological Environmental Operating Report, Virgil C. Summer Nuclear Station, for the Operating Period January 1, 2008 – December 31, 2008, SCE&G, April 2009.~~

Table 2.3-206 will be updated to reflect the 2-year period of record for onsite data.

**Table 2.3-206
Seasonal and Annual Mean Wind Speeds for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008~~7~~) and the Columbia, South Carolina NWS Station**

Primary Tower Elevation	Location	Winter	Spring	Summer	Autumn	Annual
Upper Level (60 meters) (m/sec)	Units 2 and 3 Site	4.6	4.5 4.7	3.6 3.8	4.2 4.3	4.2 4.4
Lower Level (10 meters) (m/sec)	Units 2 and 3 Site	2.5	2.5 2.7	2.1 2.2	2.1 2.2	2.3 2.4
Single Level (6.1 meters) (m/sec)	Columbia Metro Airport WSFO ^(a)	3.2	3.5	2.7	2.7	3.0

(a) Reference 213

Winter = December, January, February
Spring = March, April, May
Summer = June, July, August
Autumn = September, October, November

Tables 2.3-207, 208, 210, 211 and 220-226 will be completely replaced as a result of the incorporation of 2-years of onsite data. Tables 2.3-209 and 217 have been completely replaced but show the old values as strikethrough in red and new values in green.

Table 2.3-209
Seasonal and Annual Vertical Stability Class and Mean 10-Meter Level
Wind Speed Distributions for the Units 2 and 3 Monitoring Program
(January 1, 2007–December 31, 2008)

Period	Vertical Stability Categories ^(a)							
	A	B	C	D	E	F	G	All
Winter								
Frequency (%)	0.09	1.09	3.99	38.06	34.27	12.48	10.01	
	0.26	1.21	3.82	39.34	33.16	13.24	8.97	
Wind Speed (m/sec)	5.23	4.52	4.02	2.91	2.44	1.56	1.21	2.46
	4.92	4.96	4.16	2.95	2.41	1.61	1.21	2.50
Spring								
Frequency (%)	4.97	6.06	8.80	28.44	29.85	12.63	9.25	
	4.01	5.56	8.07	30.71	31.87	11.92	7.84	
Wind Speed (m/sec)	4.29	3.89	3.13	2.73	2.44	1.61	1.30	2.55
	4.43	3.98	3.53	2.95	2.50	1.65		2.68
Summer								
Frequency (%)	4.45	6.49	10.31	28.43	33.97	13.81	2.54	
	3.34	5.09	8.16	31.34	34.73	14.69	2.64	
Wind Speed (m/sec)	3.40	2.95	2.68	2.28	1.74	1.52	1.25	2.10
	3.53	3.13	2.86	2.46	1.88	1.56	1.30	2.19
Autumn								
Frequency (%)	4.13	4.04	7.57	28.82	29.88	15.28	10.28	
	2.43	2.98	5.60	30.77	31.76	14.55	11.91	
Wind Speed (m/sec)	3.80	3.26	2.86	2.37	2.06	1.56	1.21	2.15
	3.98	3.49	3.13	2.46	2.15	1.56	1.16	2.19
Annual								
Frequency (%)	3.44	4.46	7.71	30.87	31.97	13.56	7.99	
	2.52	3.73	6.43	33.01	32.88	13.60	7.82	
Wind Speed (m/sec)	3.84	3.44	3.04	2.59	2.15	1.56	1.21	2.32
	4.02	3.67	3.31	2.73	2.24	1.61		2.41

(a) Vertical stability based on temperature difference (ΔT) between 60-meter and 10-meter measurement levels.

Table 2.3-210 (Sheet 1 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD10NEW Direction: DIR10NEW Lapse: DT60NEW
Stability Class A Delta Temperature Extremely Unstable

Wind Direction (from)	Wind Speed (m/s)												Total	
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0		
N	0	0	0	0	0	15	31	4	0	0	0	0	50	
NNE	0	0	0	0	0	17	39	7	0	0	0	0	63	
NE	0	0	0	0	0	6	64	0	0	0	0	0	70	
ENE	0	0	0	0	0	12	30	1	0	0	0	0	43	
E	0	0	0	0	0	2	12	0	0	0	0	0	14	
ESE	0	0	0	0	1	0	4	0	0	0	0	0	5	
SE	0	0	0	0	0	0	4	0	0	0	0	0	4	
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	
S	0	0	0	0	0	1	2	1	0	0	0	0	4	
SSW	0	0	0	0	1	3	2	0	0	0	0	0	6	
SW	0	0	0	0	0	0	13	5	0	0	0	0	18	
WSW	0	0	0	0	0	2	23	10	3	0	0	0	38	
W	0	0	0	0	1	2	22	15	0	0	0	0	40	
WNW	0	0	0	1	0	2	12	4	0	0	0	0	19	
NW	0	0	0	0	2	4	13	9	1	0	0	0	29	
NNW	0	0	0	0	1	4	18	13	1	0	0	0	37	
Totals	0	0	0	1	6	70	289	69	5	0	0	0	440	
Number of Calm Hours not included above for:													Total Period	0
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	111
Number of Valid Hours for:													Total Period	440
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-210 (Sheet 2 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD10NEW Direction: DIR10NEW Lapse: DT60NEW
Stability Class B Delta Temperature Moderately Unstable

Wind Direction (from)	Wind Speed (m/s)												Total	
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0		
N	0	0	0	0	1	36	30	0	0	0	0	0	67	
NNE	0	0	0	0	2	28	27	2	0	0	0	0	59	
NE	0	0	0	0	1	29	39	1	0	0	0	0	70	
ENE	0	0	0	0	0	18	25	0	0	0	0	0	43	
E	0	0	0	0	1	12	18	0	0	0	0	0	31	
ESE	0	0	0	0	0	4	4	0	0	0	0	0	8	
SE	0	0	0	0	0	0	2	0	0	0	0	0	2	
SSE	0	0	0	0	0	2	3	1	0	0	0	0	6	
S	0	0	0	0	0	6	18	1	0	0	0	0	25	
SSW	0	0	0	0	1	7	22	10	0	0	0	0	40	
SW	0	0	0	0	0	8	21	16	1	0	0	0	46	
WSW	0	0	0	0	0	5	44	18	6	0	0	0	73	
W	0	0	0	0	2	7	35	15	3	0	0	0	62	
WNW	0	0	0	1	6	12	20	3	0	0	0	0	42	
NW	0	0	0	0	2	15	13	9	2	0	0	0	41	
NNW	0	0	0	0	3	9	15	6	2	0	0	0	35	
Totals	0	0	0	1	19	198	336	82	14	0	0	0	650	
Number of Calm Hours not included above for:													Total Period	0
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	111
Number of Valid Hours for:													Total Period	650
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-210 (Sheet 3 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD10NEW Direction: DIR10NEW Lapse: DT60NEW
Stability Class C Delta Temperature Slightly Unstable

Wind Direction (from)	Wind Speed (m/s)												Total	
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0		
N	0	0	0	1	9	52	20	2	0	0	0	0	84	
NNE	0	0	0	1	3	33	35	0	0	0	0	0	72	
NE	0	0	1	0	2	35	24	0	0	0	0	0	62	
ENE	0	0	0	0	4	53	25	0	0	0	0	0	82	
E	0	0	0	2	5	28	15	0	0	0	0	0	50	
ESE	0	0	0	0	0	8	3	0	0	0	0	0	11	
SE	0	0	0	1	1	7	9	0	0	0	0	0	18	
SSE	0	0	0	0	3	9	10	0	0	0	0	0	22	
S	0	0	0	0	4	17	33	4	1	0	0	0	59	
SSW	0	0	0	0	1	23	53	16	0	0	0	0	93	
SW	0	0	0	0	7	26	49	19	0	0	0	0	101	
WSW	0	0	0	0	10	40	60	28	6	0	0	0	144	
W	0	0	0	3	11	24	47	15	4	0	0	0	104	
WNW	0	0	0	2	11	37	32	5	0	0	0	0	87	
NW	0	0	1	2	10	24	25	11	1	0	0	0	74	
NNW	0	0	0	2	9	24	16	7	0	0	0	0	58	
Totals	0	0	2	14	90	440	456	107	12	0	0	0	1121	
Number of Calm Hours not included above for:													Total Period	0
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	111
Number of Valid Hours for:													Total Period	1121
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-210 (Sheet 4 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD10NEW Direction: DIR10NEW Lapse: DT60NEW
Stability Class D Delta Temperature Neutral

Wind Direction (from)	Wind Speed (m/s)												Total	
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0		
N	1	4	8	25	50	70	75	19	1	0	0	0	253	
NNE	1	3	5	32	48	114	140	3	0	0	0	0	346	
NE	0	3	7	37	75	226	110	0	0	0	0	0	458	
ENE	0	3	17	55	73	146	55	0	0	0	0	0	349	
E	0	4	14	33	65	106	39	0	0	0	0	0	261	
ESE	0	2	7	30	49	110	24	1	0	0	0	0	223	
SE	1	2	5	23	41	103	20	0	0	0	0	0	195	
SSE	0	3	4	24	38	117	69	7	0	0	0	0	262	
S	0	2	8	24	41	127	117	21	2	0	0	0	342	
SSW	0	2	8	27	65	142	169	35	7	0	0	0	455	
SW	0	0	6	26	63	149	249	72	6	0	0	0	571	
WSW	0	1	7	56	100	137	175	64	18	0	0	0	558	
W	1	1	13	60	96	120	115	37	9	0	0	0	452	
WNW	0	2	14	75	73	146	77	29	2	0	0	0	418	
NW	0	3	14	72	87	93	55	16	1	0	0	0	341	
NNW	0	2	9	44	58	79	60	18	0	0	0	0	270	
Totals	4	37	146	643	1022	1985	1549	322	46	0	0	0	5754	
Number of Calm Hours not included above for:													Total Period	0
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	111
Number of Valid Hours for:													Total Period	5754
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-210 (Sheet 5 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period													
Period of Record = 1/1/2007 00:00 12/31/2008 23:00													
Elevation: Speed: SPD10NEW Direction: DIR10NEW Lapse: DT60NEW													
Stability Class E Delta Temperature Slightly Stable													
Wind Speed (m/s)													
Wind Direction	0.22 -	0.51 -	0.76 -	1.1 -	1.6 -	2.1 -	3.1 -	5.1 -	7.1 -	10.1 -	13.1 -		Total
(from)	0.50	0.75	1.0	1.5	2.0	3.0	5.0	7.0	10.0	13.0	18.0	> 18.0	
N	1	7	15	37	40	67	63	2	0	0	0	0	232
NNE	1	7	18	38	40	66	65	1	0	0	0	0	236
NE	0	5	15	60	83	135	50	0	0	0	0	0	348
ENE	2	4	13	88	84	69	8	0	0	0	0	0	268
E	1	6	21	73	68	66	2	0	0	0	0	0	237
ESE	3	8	17	57	80	84	19	2	0	0	0	0	270
SE	2	1	15	68	112	124	27	0	2	1	0	0	352
SSE	2	5	14	62	126	191	73	2	1	0	0	0	476
S	2	9	34	111	87	152	84	13	2	0	0	0	494
SSW	2	5	31	78	57	140	132	19	5	0	0	0	469
SW	1	11	20	62	77	176	146	28	3	0	0	0	524
WSW	0	13	18	66	130	124	97	24	0	0	0	0	472
W	0	9	21	82	88	101	102	18	1	0	0	0	422
WNW	1	17	21	82	74	74	35	3	0	0	0	0	307
NW	0	10	21	76	63	66	29	6	0	0	0	0	271
NNW	3	5	24	44	72	109	87	10	0	0	0	0	354
Totals	21	122	318	1084	1281	1744	1019	128	14	1	0	0	5732
Number of Calm Hours not included above for:												Total Period	0
Number of Variable Direction Hours for:												Total Period	0
Number of Invalid Hours for:												Total Period	111
Number of Valid Hours for:												Total Period	5732
Total Hours for:												Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-210 (Sheet 6 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period														
Period of Record =	1/1/2007 00:00 12/31/2008 23:00													
Elevation:	Speed:	SPD10NEW	Direction:	DIR10NEW	Lapse:	DT60NEW								
Stability Class F	Delta Temperature		Moderately Stable											
Wind Speed (m/s)														
Wind Direction (from)	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total	
N	1	3	16	22	16	12	1	0	0	0	0	0	71	
NNE	1	4	6	14	7	9	0	0	0	0	0	0	41	
NE	1	8	5	36	26	5	0	0	0	0	0	0	81	
ENE	0	8	6	34	76	35	1	0	0	0	0	0	160	
E	5	4	14	68	77	38	1	0	0	0	0	0	207	
ESE	3	3	17	48	53	53	1	0	0	0	0	0	178	
SE	4	5	14	50	68	93	3	0	0	0	0	0	237	
SSE	3	5	14	49	86	81	3	0	0	0	0	0	241	
S	3	5	20	53	70	53	5	1	0	0	0	0	210	
SSW	4	5	17	60	27	35	7	0	0	0	0	0	155	
SW	4	7	16	49	26	19	2	0	0	0	0	0	123	
WSW	1	13	9	41	35	23	3	0	0	0	0	0	125	
W	1	9	21	31	27	15	2	0	0	0	0	0	106	
WNW	2	10	18	42	33	6	1	0	0	0	0	0	112	
NW	0	9	35	74	30	11	0	0	0	0	0	0	159	
NNW	1	8	14	40	59	40	3	0	0	0	0	0	165	
Totals	34	106	242	711	716	528	33	1	0	0	0	0	2371	
Number of Calm Hours not included above for:													Total Period	0
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	111
Number of Valid Hours for:													Total Period	2371
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-210 (Sheet 7 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period													
Period of Record = 1/1/2007 00:00 12/31/2008 23:00													
Elevation: Speed: SPD10NEW Direction: DIR10NEW Lapse: DT60NEW													
Stability Class G Delta Temperature Extremely Stable													
Wind Speed (m/s)													
Wind Direction	0.22 - (from) 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	3	5	16	17	11	3	0	0	0	0	0	0	55
NNE	2	4	5	6	2	1	0	0	0	0	0	0	20
NE	6	10	0	7	0	0	1	0	0	0	0	0	24
ENE	4	4	11	6	6	0	0	0	0	0	0	0	31
E	4	9	6	13	18	12	0	0	0	0	0	0	62
ESE	4	8	16	20	23	16	2	0	0	0	0	0	89
SE	5	10	15	37	26	24	1	0	0	0	0	0	118
SSE	6	4	12	21	19	7	0	0	0	0	0	0	69
S	3	6	11	20	17	10	1	0	0	0	0	0	68
SSW	7	8	12	19	14	2	0	0	0	0	0	0	62
SW	9	9	5	18	8	1	0	0	0	0	0	0	50
WSW	12	7	11	15	2	3	0	0	0	0	0	0	50
W	8	8	16	11	2	0	0	0	0	0	0	0	45
WNW	1	18	26	23	7	0	0	0	0	0	0	0	75
NW	12	13	71	164	52	2	0	0	0	0	0	0	314
NNW	7	14	30	95	66	21	0	0	0	0	0	0	233
Totals	93	137	263	492	273	102	5	0	0	0	0	0	1365
Number of Calm Hours not included above for:												Total Period	0
Number of Variable Direction Hours for:												Total Period	0
Number of Invalid Hours for:												Total Period	111
Number of Valid Hours for:												Total Period	1365
Total Hours for:												Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-210 (Sheet 8 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD10NEW Direction: DIR10NEW Lapse: DT60NEW

Delta Temperature

Wind Direction (from)	Wind Speed (m/s)												Total	
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0		
N	6	19	55	102	127	255	220	27	1	0	0	0	812	
NNE	5	18	34	91	102	268	306	13	0	0	0	0	837	
NE	7	26	28	140	187	436	288	1	0	0	0	0	1113	
ENE	6	19	47	183	243	333	144	1	0	0	0	0	976	
E	10	23	55	189	234	264	87	0	0	0	0	0	862	
ESE	10	21	57	155	206	275	57	3	0	0	0	0	784	
SE	12	18	49	179	248	351	66	0	2	1	0	0	926	
SSE	11	17	44	156	272	407	158	10	1	0	0	0	1076	
S	8	22	73	208	219	366	260	41	5	0	0	0	1202	
SSW	13	20	68	184	166	352	385	80	12	0	0	0	1280	
SW	14	27	47	155	181	379	480	140	10	0	0	0	1433	
WSW	13	34	45	178	277	334	402	144	33	0	0	0	1460	
W	10	27	71	187	227	269	323	100	17	0	0	0	1231	
WNW	4	47	79	226	204	277	177	44	2	0	0	0	1060	
NW	12	35	142	388	246	215	135	51	5	0	0	0	1229	
NNW	11	29	77	225	268	286	199	54	3	0	0	0	1152	
Totals	152	402	971	2946	3407	5067	3687	709	91	1	0	0	17433	
Number of Calm Hours not included above for:													Total Period	0
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	111
Number of Valid Hours for:													Total Period	17433
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-211 (Sheet 1 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD60NEW Direction: DIR60NEW Lapse: DT60NEW
Stability Class A Delta Temperature Extremely Unstable

Wind Direction (from)	Wind Speed (m/s)												Total
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	
N	0	0	0	0	0	1	21	15	5	0	0	0	42
NNE	0	0	0	0	0	4	27	17	19	0	0	0	67
NE	0	0	0	0	0	1	26	42	7	0	0	0	76
ENE	0	0	0	0	0	0	21	23	4	0	0	0	48
E	0	0	0	0	0	1	6	8	1	0	0	0	16
ESE	0	0	0	0	0	0	0	1	1	0	0	0	2
SE	0	0	0	0	0	1	1	3	0	0	0	0	5
SSE	0	0	0	0	0	0	1	0	0	0	0	0	1
S	0	0	0	0	0	0	3	1	0	0	0	0	4
SSW	0	0	0	0	0	2	1	2	0	0	0	0	5
SW	0	0	0	0	0	0	6	7	3	0	0	0	16
WSW	0	0	0	0	1	2	9	7	8	4	0	0	31
W	0	0	0	0	1	1	6	20	29	0	0	0	57
WNW	0	0	0	0	0	2	3	5	2	0	0	0	12
NW	0	0	0	1	0	1	7	5	7	2	0	0	23
NNW	0	0	0	0	1	4	9	8	12	1	0	0	35
Totals	0	0	0	1	3	20	147	164	98	7	0	0	440
Number of Calm Hours not included above for:												Total Period	1
Number of Variable Direction Hours for:												Total Period	0
Number of Invalid Hours for:												Total Period	137
Number of Valid Hours for:												Total Period	440
Total Hours for:												Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-211 (Sheet 2 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD60NEW Direction: DIR60NEW Lapse: DT60NEW
Stability Class B Delta Temperature Moderately Unstable

<u>Wind Direction</u> <u>(from)</u>	<u>Wind Speed (m/s)</u>												<u>Total</u>	
	<u>0.22 - 0.50</u>	<u>0.51 - 0.75</u>	<u>0.76 - 1.0</u>	<u>1.1 - 1.5</u>	<u>1.6 - 2.0</u>	<u>2.1 - 3.0</u>	<u>3.1 - 5.0</u>	<u>5.1 - 7.0</u>	<u>7.1 - 10.0</u>	<u>10.1 - 13.0</u>	<u>13.1 - 18.0</u>	<u>> 18.0</u>		
N	0	0	0	0	0	8	23	9	0	0	0	0	40	
NNE	0	0	0	0	1	13	44	10	6	0	0	0	74	
NE	0	0	0	0	1	9	29	20	6	0	0	0	65	
ENE	0	0	0	0	1	1	38	19	3	0	0	0	62	
E	0	0	0	0	0	4	18	10	2	0	0	0	34	
ESE	0	0	0	0	0	1	1	0	0	0	0	0	2	
SE	0	0	0	0	0	1	3	0	0	0	0	0	4	
SSE	0	0	0	0	0	2	6	1	1	0	0	0	10	
S	0	0	0	0	0	3	16	6	0	0	0	0	25	
SSW	0	0	0	0	0	4	14	10	4	0	0	0	32	
SW	0	0	0	0	1	4	12	13	8	0	0	0	38	
WSW	0	0	0	0	0	4	23	32	17	5	0	0	81	
W	0	0	0	1	2	5	17	26	18	7	0	0	76	
WNW	0	0	0	0	5	8	13	6	2	0	0	0	34	
NW	0	0	0	0	2	8	8	7	6	3	0	0	34	
NNW	0	0	0	0	2	3	14	12	5	3	0	0	39	
Totals	0	0	0	1	15	78	279	181	78	18	0	0	650	
Number of Calm Hours not included above for:													Total Period	1
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	137
Number of Valid Hours for:													Total Period	650
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-211 (Sheet 3 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD60NEW Direction: DIR60NEW Lapse: DT60NEW
Stability Class C Delta Temperature Slightly Unstable

<u>Wind Direction</u> <u>(from)</u>	<u>Wind Speed (m/s)</u>												<u>Total</u>	
	<u>0.22 - 0.50</u>	<u>0.51 - 0.75</u>	<u>0.76 - 1.0</u>	<u>1.1 - 1.5</u>	<u>1.6 - 2.0</u>	<u>2.1 - 3.0</u>	<u>3.1 - 5.0</u>	<u>5.1 - 7.0</u>	<u>7.1 - 10.0</u>	<u>10.1 - 13.0</u>	<u>13.1 - 18.0</u>	<u>> 18.0</u>		
N	0	0	0	0	6	19	27	2	0	0	0	0	54	
NNE	0	0	0	1	2	18	53	14	8	0	0	0	96	
NE	0	0	1	0	2	9	41	16	3	0	0	0	72	
ENE	0	0	0	0	3	23	46	13	3	0	0	0	88	
E	0	0	0	0	2	7	30	10	1	0	0	0	50	
ESE	0	0	0	0	0	4	9	0	0	0	0	0	13	
SE	0	0	0	1	2	5	16	1	0	0	0	0	25	
SSE	0	0	0	0	2	8	10	3	1	0	0	0	24	
S	0	0	0	0	0	11	32	15	1	1	0	0	60	
SSW	0	0	0	0	3	14	44	24	4	0	0	0	89	
SW	0	0	0	0	2	15	29	21	6	0	0	0	73	
WSW	0	0	0	1	11	25	51	34	28	8	0	0	158	
W	0	0	0	3	10	16	36	33	18	10	3	0	129	
WNW	0	0	0	4	5	22	24	10	6	0	0	0	71	
NW	0	0	0	2	5	15	18	8	9	1	0	0	58	
NNW	0	0	1	2	1	19	19	7	10	1	0	0	60	
Totals	0	0	2	14	56	230	485	211	98	21	3	0	1120	
Number of Calm Hours not included above for:													Total Period	1
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	137
Number of Valid Hours for:													Total Period	1120
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-211 (Sheet 4 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

		Total Period												
Period of Record =		1/1/2007 00:00 12/31/2008 23:00												
Elevation:		Speed: SPD60NEW				Direction: DIR60NEW				Lapse: DT60NEW				
Stability Class D		Delta Temperature				Neutral								
		Wind Speed (m/s)												
Wind Direction (from)	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total	
N	0	3	7	19	23	41	38	26	22	1	0	0	180	
NNE	0	2	5	11	16	56	79	136	55	4	1	0	365	
NE	0	2	3	19	24	59	192	154	21	0	0	0	474	
ENE	0	3	6	15	28	74	221	98	12	0	0	0	457	
E	0	2	3	17	30	66	122	37	3	0	0	0	280	
ESE	0	2	5	13	14	69	105	21	5	0	0	0	234	
SE	0	1	4	12	15	52	89	20	3	0	0	0	196	
SSE	0	3	2	11	20	58	92	40	9	0	0	0	235	
S	0	1	1	19	22	70	130	69	30	3	0	0	345	
SSW	0	1	7	13	45	99	139	92	21	4	0	0	421	
SW	0	1	6	14	37	106	158	123	46	3	0	0	494	
WSW	0	0	4	32	85	109	171	128	84	16	4	0	633	
W	0	3	7	35	77	89	130	93	79	35	2	0	550	
WNW	0	0	9	40	49	95	94	38	20	2	0	0	347	
NW	1	7	11	47	56	62	51	21	17	1	0	0	274	
NNW	0	0	7	23	31	68	71	28	32	2	0	0	262	
Totals	1	31	87	340	572	1173	1882	1124	459	71	7	0	5747	
Number of Calm Hours not included above for:													Total Period	1
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	137
Number of Valid Hours for:													Total Period	5747
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-211 (Sheet 5 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD60NEW Direction: DIR60NEW Lapse: DT60NEW
Stability Class E Delta Temperature Slightly Stable

<u>Wind Direction</u> <u>(from)</u>	<u>Wind Speed (m/s)</u>												<u>Total</u>	
	<u>0.22 - 0.50</u>	<u>0.51 - 0.75</u>	<u>0.76 - 1.0</u>	<u>1.1 - 1.5</u>	<u>1.6 - 2.0</u>	<u>2.1 - 3.0</u>	<u>3.1 - 5.0</u>	<u>5.1 - 7.0</u>	<u>7.1 - 10.0</u>	<u>10.1 - 13.0</u>	<u>13.1 - 18.0</u>	<u>> 18.0</u>		
N	1	1	3	6	5	17	64	80	15	0	0	0	192	
NNE	0	1	0	12	10	20	56	100	36	1	0	0	236	
NE	1	1	2	10	7	30	134	125	65	0	0	0	375	
ENE	0	2	1	9	7	32	136	129	14	0	0	0	330	
E	0	0	5	5	6	29	118	64	2	0	0	0	229	
ESE	0	0	2	6	4	28	109	76	13	1	0	0	239	
SE	0	1	3	3	4	27	128	98	12	0	2	1	279	
SSE	0	2	2	7	12	29	82	114	23	0	0	0	271	
S	1	1	4	7	10	43	203	191	41	2	0	0	503	
SSW	0	3	3	9	7	60	234	172	41	2	0	0	531	
SW	0	1	1	8	14	74	262	158	47	2	0	0	567	
WSW	0	3	6	7	14	64	284	215	69	1	0	0	663	
W	1	3	3	12	12	58	216	161	109	4	0	0	579	
WNW	1	4	3	16	12	50	110	39	10	0	0	0	245	
NW	0	0	3	11	23	49	66	37	6	0	0	0	195	
NNW	0	1	2	11	15	36	97	84	34	0	0	0	280	
Totals	5	24	43	139	162	646	2299	1843	537	13	2	1	5714	
Number of Calm Hours not included above for:													Total Period	1
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	137
Number of Valid Hours for:													Total Period	5714
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-211 (Sheet 6 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD60NEW Direction: DIR60NEW Lapse: DT60NEW
Stability Class F Delta Temperature Moderately Stable

Wind Direction (from)	Wind Speed (m/s)												Total	
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0		
N	0	2	1	4	3	13	45	21	2	0	0	0	91	
NNE	1	1	2	4	3	14	38	8	1	0	0	0	72	
NE	1	2	2	1	6	28	20	12	1	0	0	0	73	
ENE	1	0	0	2	6	18	40	69	31	0	0	0	167	
E	1	0	2	5	6	14	50	72	13	0	0	0	163	
ESE	1	0	1	4	5	13	46	52	7	0	0	0	129	
SE	0	1	1	8	4	16	56	57	6	0	0	0	149	
SSE	0	1	1	5	9	17	62	77	11	0	0	0	183	
S	1	1	3	3	10	26	71	81	9	0	0	0	205	
SSW	0	1	1	6	5	30	97	95	8	0	0	0	243	
SW	0	0	2	5	12	13	94	101	7	0	0	0	234	
WSW	1	0	3	6	3	24	90	93	6	0	0	0	226	
W	0	0	3	6	9	22	63	66	6	0	0	0	175	
WNW	0	0	1	1	6	35	35	11	0	0	0	0	89	
NW	1	2	1	3	3	20	28	10	0	0	0	0	68	
NNW	0	0	2	7	5	11	49	28	1	0	0	0	103	
Totals	8	11	26	70	95	314	884	853	109	0	0	0	2370	
Number of Calm Hours not included above for:													Total Period	1
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	137
Number of Valid Hours for:													Total Period	2370
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-211 (Sheet 7 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD60NEW Direction: DIR60NEW Lapse: DT60NEW
Stability Class G Delta Temperature Extremely Stable

Wind Direction (from)	Wind Speed (m/s)												Total	
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0		
N	1	3	1	3	7	12	40	17	1	0	0	0	85	
NNE	0	1	0	3	7	28	54	11	0	0	0	0	104	
NE	1	1	1	2	5	34	41	12	0	0	0	0	97	
ENE	0	2	1	6	9	24	28	8	0	0	0	0	78	
E	0	1	1	3	4	13	19	22	7	0	0	0	70	
ESE	0	0	2	3	3	9	28	14	0	0	0	0	59	
SE	1	0	0	1	6	2	28	11	1	0	0	0	50	
SSE	0	0	0	2	6	12	35	25	2	0	0	0	82	
S	0	2	1	3	9	15	54	26	0	0	0	0	110	
SSW	0	0	3	4	5	23	48	27	0	0	0	0	110	
SW	1	1	1	5	6	18	44	32	3	0	0	0	111	
WSW	0	3	0	5	8	27	48	34	0	0	0	0	125	
W	0	1	1	3	9	22	35	17	1	0	0	0	89	
WNW	0	0	2	4	6	19	20	3	0	0	0	0	54	
NW	0	0	0	2	4	30	21	1	0	0	0	0	58	
NNW	0	1	1	4	7	23	37	10	0	0	0	0	83	
Totals	4	16	15	53	101	311	580	270	15	0	0	0	1365	
Number of Calm Hours not included above for:													Total Period	1
Number of Variable Direction Hours for:													Total Period	0
Number of Invalid Hours for:													Total Period	137
Number of Valid Hours for:													Total Period	1365
Total Hours for:													Total Period	17544

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-211 (Sheet 8 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability Class for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 20087)

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period
Period of Record = 1/1/2007 00:00 12/31/2008 23:00
Elevation: Speed: SPD60NEW Direction: DIR60NEW Lapse: DT60NEW

Delta Temperature

Wind Direction (from)	Wind Speed (m/s)												Total
	0.22 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	
N	2	9	12	32	44	111	258	170	45	1	0	0	684
NNE	1	5	7	31	39	153	351	296	125	5	1	0	1014
NE	3	6	9	32	45	170	483	381	103	0	0	0	1232
ENE	1	7	8	32	54	172	530	359	67	0	0	0	1230
E	1	3	11	30	48	134	363	223	29	0	0	0	842
ESE	1	2	10	26	26	124	298	164	26	1	0	0	678
SE	1	3	8	25	31	104	321	190	22	0	2	1	708
SSE	0	6	5	25	49	126	288	260	47	0	0	0	806
S	2	5	9	32	51	168	509	389	81	6	0	0	1252
SSW	0	5	14	32	65	232	577	422	78	6	0	0	1431
SW	1	3	10	32	72	230	605	455	120	5	0	0	1533
WSW	1	6	13	51	122	255	676	543	212	34	4	0	1917
W	1	7	14	60	120	213	503	416	260	56	5	0	1655
WNW	1	4	15	65	83	231	299	112	40	2	0	0	852
NW	2	9	15	66	93	185	199	89	45	7	0	0	710
NNW	0	2	13	47	62	164	296	177	94	7	0	0	862
Totals	18	82	173	618	1004	2772	6556	4646	1394	130	12	1	17406

Number of Calm Hours not included above for:	Total Period	<u>1</u>
Number of Variable Direction Hours for:	Total Period	<u>0</u>
Number of Invalid Hours for:	Total Period	<u>137</u>
Number of Valid Hours for:	Total Period	<u>17406</u>
Total Hours for:	Total Period	<u>17544</u>

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-m and 10-m measurement levels.

Table 2.3-217
Annual Data Recovery Rate for VCSNS Units 2 and 3
Meteorological Monitoring System (January 2007–December 2008⁷)

Parameter	Recovery Rate (in Percent)
Wind Speed (10 meters)	99.499.2
Wind Speed (60 meters)	99.398.9
Wind Direction (10 meters)	99.499.2
Wind Direction (60 meters)	99.398.9
Delta-T (60 meters – 10 meters) ^(a)	99.499.1
Ambient Temperature (10 meters)	99.299.2
Dew Point/Relative Humidity (30-meters)	98.599.2
Precipitation (ground) ^(b)	—
Composite Parameters	
WS/WD (10 meters), delta-T (60 meters–10 meters) ^(a)	99.499.1
WS/WD (60 meters), delta-T (60 meters–10 meters) ^(a)	99.298.8

(a) Temperature difference (delta-T) between 60-meters and 10-meters levels.

(b) Precipitation is measured at the base of the Unit 1 meteorological tower and events confirmed for consistency with Columbia NWS precipitation events.

**Table 2.3-220
Units 2 & 3 Ground-Level Release PAVAN Output — X/Q Values at the Dose Evaluation Periphery**

Dose Evaluation Periphery Exclusion Area Boundary Calculations - Building Wake Credit Is Not Included.									
Relative Concentration (X/Q) Values (Sec/cCubic Meter) Versus Averaging Time									
Downwind Sector	Distance (Meters)	0-2 Hours	0-8 Hours	8-24 Hours	1-4 Days	4-30 Days	Annual Average	Hrs Per Year Max 0-2 Hr X/Q Exceeded In Sector	
S	805	<u>1.75E-04</u>	<u>1.15E-04</u>	<u>9.38E-05</u>	<u>5.97E-05</u>	<u>3.13E-05</u>	<u>1.42E-05</u>	<u>10.5</u>	
SSW	805	<u>1.22E-04</u>	<u>8.22E-05</u>	<u>6.75E-05</u>	<u>4.41E-05</u>	<u>2.39E-05</u>	<u>1.13E-05</u>	<u>256.0</u>	
SW	805	<u>1.40E-04</u>	<u>9.87E-05</u>	<u>8.29E-05</u>	<u>5.68E-05</u>	<u>3.30E-05</u>	<u>1.70E-05</u>	<u>11.9</u>	
WSW	805	<u>1.47E-04</u>	<u>1.04E-04</u>	<u>8.75E-05</u>	<u>6.00E-05</u>	<u>3.49E-05</u>	<u>1.80E-05</u>	<u>9.0</u>	
W	805	<u>2.07E-04</u>	<u>1.41E-04</u>	<u>1.16E-04</u>	<u>7.64E-05</u>	<u>4.19E-05</u>	<u>2.01E-05</u>	<u>14.6</u>	
WNW	805	<u>2.22E-04</u>	<u>1.49E-04</u>	<u>1.22E-04</u>	<u>7.91E-05</u>	<u>4.25E-05</u>	<u>1.99E-05</u>	<u>13.6</u>	
NW	805	<u>2.45E-04</u>	<u>1.67E-04</u>	<u>1.38E-04</u>	<u>9.04E-05</u>	<u>4.95E-05</u>	<u>2.37E-05</u>	<u>17.2</u>	
NNW	805	<u>2.02E-04</u>	<u>1.41E-04</u>	<u>1.18E-04</u>	<u>8.00E-05</u>	<u>4.57E-05</u>	<u>2.30E-05</u>	<u>13.1</u>	
N	805	<u>2.09E-04</u>	<u>1.46E-04</u>	<u>1.22E-04</u>	<u>8.27E-05</u>	<u>4.73E-05</u>	<u>2.38E-05</u>	<u>11.2</u>	
NNE	805	<u>2.06E-04</u>	<u>1.43E-04</u>	<u>1.19E-04</u>	<u>8.03E-05</u>	<u>4.56E-05</u>	<u>2.28E-05</u>	<u>15.1</u>	
NE	805	<u>1.99E-04</u>	<u>1.39E-04</u>	<u>1.16E-04</u>	<u>7.85E-05</u>	<u>4.48E-05</u>	<u>2.25E-05</u>	<u>16.4</u>	
ENE	805	<u>1.92E-04</u>	<u>1.35E-04</u>	<u>1.14E-04</u>	<u>7.80E-05</u>	<u>4.54E-05</u>	<u>2.34E-05</u>	<u>16.8</u>	
E	805	<u>1.98E-04</u>	<u>1.37E-04</u>	<u>1.13E-04</u>	<u>7.60E-05</u>	<u>4.28E-05</u>	<u>2.12E-05</u>	<u>15.1</u>	
ESE	805	<u>2.39E-04</u>	<u>1.62E-04</u>	<u>1.33E-04</u>	<u>8.69E-05</u>	<u>4.72E-05</u>	<u>2.24E-05</u>	<u>19.9</u>	
SE	805	<u>3.57E-04</u>	<u>2.48E-04</u>	<u>2.06E-04</u>	<u>1.39E-04</u>	<u>7.85E-05</u>	<u>3.91E-05</u>	<u>43.7</u>	
SSE	805	<u>2.94E-04</u>	<u>2.01E-04</u>	<u>1.67E-04</u>	<u>1.11E-04</u>	<u>6.13E-05</u>	<u>2.98E-05</u>	<u>25.4</u>	
MAX X/Q		<u>3.57E-04</u>	Total Hours Entire Site Max 0-2 hr X/Q Exceeded						<u>509.7</u>

Site Limit	<u>2.82E-04</u>	<u>2.03E-04</u>	<u>1.73E-04</u>	<u>1.21E-04</u>	<u>7.28E-05</u>	<u>3.91E-05</u>
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**Table 2.3-221
Units 2 & 3 Ground-Level Release PAVAN Output — X/Q Values at the Low Population Zone Boundary**

Low Population Zone Calculations - Building Wake Credit Is Not Included. Relative Concentration (X/Q) Values (Sec/cCubic Meter) Versus Averaging Time									
Downwind Sector	Distance (Meters)	0-2 Hours	0-8 Hours	8-24 Hours	1-4 Days	4-30 Days	Annual Average	Hrs Per Year Max 0-2 Hr X/Q Exceeded In Sector	
S	3130	4.50E-05	2.26E-05	1.60E-05	7.56E-06	2.58E-06	6.91E-07	15.3	
SSW	3057	2.78 E-05	1.46E-05	1.06E-05	5.31E-06	1.96E-06	5.77E-07	7.5	
SW	3147	3.76 E-05	2.00E-05	1.45E-05	7.32E-06	2.73E-06	8.18E-07	14.1	
WSW	3403	4.09 E-05	2.10E-05	1.51E-05	7.33E-06	2.60E-06	7.33E-07	10.5	
W	3823	4.46 E-05	2.22E-05	1.56E-05	7.31E-06	2.46E-06	6.48E-07	10.9	
WNW	4378	4.27E-05	2.04E-05	1.41E-05	6.32E-06	2.00E-06	4.89E-07	10.0	
NW	5008	4.23E-05	1.99E-05	1.37E-05	6.06E-06	1.88E-06	4.48E-07	8.4	
NNW	5595	3.10E-05	1.47E-05	1.02E-05	4.55E-06	1.43E-06	3.48E-07	6.1	
N	6005	2.90E-05	1.37E-05	9.42E-06	4.18E-06	1.30E-06	3.12E-07	3.5	
NNE	6142	2.92E-05	1.36E-05	9.25E-06	4.03E-06	1.22E-06	2.84E-07	6.2	
NE	5972	2.73E-05	1.29E-05	8.88E-06	3.94E-06	1.23E-06	2.95E-07	7.3	
ENE	5536	3.03E-05	1.45E-05	1.00E-05	4.52E-06	1.43E-06	3.53E-07	10.1	
E	4940	3.23E-05	1.56E-05	1.09E-05	4.94E-06	1.59E-06	3.99E-07	10.0	
ESE	4315	4.82E-05	2.31E-05	1.59E-05	7.17E-06	2.27E-06	5.58E-07	15.0	
SE	3768	8.97E-05	4.46E-05	3.15E-05	1.48E-05	4.97E-06	1.31E-06	43.7	
SSE	3368	7.96E-05	4.01E-05	2.85E-05	1.36E-05	4.67E-06	1.27E-06	32.0	
MAX X/Q		8.97E-05	Total Hours Entire Site Max 0-2 hr X/Q Exceeded						210.4
Site Limit		2.82E-04	1.16E-04	7.45E-04	2.84E-04	7.13E-06	1.31E-06		

Table 2.3-222
ARCON96 X/Q Values at the Control Room HVAC Intake (sec/m³)

Release Point and DCD Values ^a	0-2 hours	2-8 hours	8-24 hours	1-4 days	4-30 days
Plant Vent	<u>1.90E-03</u>	<u>1.39E-03</u>	<u>4.82E-04</u>	<u>3.52E-04</u>	<u>2.59E-04</u>
DCD	<u>3.00E-03</u>	<u>2.50E-03</u>	<u>1.00E-03</u>	<u>8.00E-04</u>	<u>6.00E-04</u>
PCS Air Diffuser	<u>1.65E-03</u>	<u>1.24E-03</u>	<u>4.71E-04</u>	<u>3.46E-04</u>	<u>2.66E-04</u>
DCD	<u>3.00E-03</u>	<u>2.50E-03</u>	<u>1.00E-03</u>	<u>8.00E-04</u>	<u>6.00E-04</u>
Fuel Building Blowout Panel	<u>1.53E-03</u>	<u>1.13E-03</u>	<u>4.05E-04</u>	<u>3.03E-04</u>	<u>2.28E-04</u>
DCD	<u>6.00E-03</u>	<u>4.00E-03</u>	<u>2.00E-03</u>	<u>1.50E-03</u>	<u>1.00E-03</u>
Radwaste Building Truck Staging Area Door	<u>1.12E-03</u>	<u>8.20E-04</u>	<u>3.10E-04</u>	<u>2.18E-04</u>	<u>1.88E-04</u>
DCD	<u>6.00E-03</u>	<u>4.00E-03</u>	<u>2.00E-03</u>	<u>1.50E-03</u>	<u>1.00E-03</u>
Steam Vent	<u>1.54E-02</u>	<u>1.27E-02</u>	<u>5.54E-03</u>	<u>3.90E-03</u>	<u>3.11E-03</u>
DCD	<u>2.40E-02</u>	<u>2.00E-02</u>	<u>7.50E-03</u>	<u>5.50E-03</u>	<u>5.00E-03</u>
PORV & Safety Valves	<u>1.35E-02</u>	<u>1.10E-02</u>	<u>4.87E-03</u>	<u>3.45E-03</u>	<u>2.64E-03</u>
DCD	<u>2.00E-02</u>	<u>1.80E-02</u>	<u>7.00E-03</u>	<u>5.00E-03</u>	<u>4.50E-03</u>
Condenser Air Removal Stack	<u>1.58E-03</u>	<u>1.20E-03</u>	<u>4.90E-04</u>	<u>3.16E-04</u>	<u>2.65E-04</u>
DCD	<u>6.00E-03</u>	<u>4.00E-03</u>	<u>2.00E-03</u>	<u>1.50E-03</u>	<u>1.00E-03</u>
Containment Shell (As Diffuse Area Source)	<u>2.72E-03</u>	<u>1.66E-03</u>	<u>6.58E-04</u>	<u>5.36E-04</u>	<u>4.10E-04</u>
DCD	<u>6.00E-03</u>	<u>3.60E-03</u>	<u>1.40E-03</u>	<u>1.80E-03</u>	<u>1.50E-03</u>

(a) DCD site parameter values are from DCD Tier 2, Chapter 15, Appendix 15A, Table 15A-6.

Table 2.3-223
ARCON96 X/Q Values at the Annex Building Access Door (sec/m³)

Release Point and DCD Values ^a	0-2 hours	2-8 hours	8-24 hours	1-4 days	4-30 days
Plant Vent	<u>4.15E-04</u>	<u>3.12E-04</u>	<u>1.09E-04</u>	<u>7.97E-05</u>	<u>5.80E-05</u>
DCD	<u>1.00E-03</u>	<u>7.50E-04</u>	<u>3.50E-04</u>	<u>2.80E-04</u>	<u>2.50E-04</u>
PCS Air Diffuser	<u>4.25E-04</u>	<u>3.16E-04</u>	<u>1.11E-04</u>	<u>8.22E-05</u>	<u>6.24E-05</u>
DCD	<u>1.00E-03</u>	<u>7.50E-04</u>	<u>3.50E-04</u>	<u>2.80E-04</u>	<u>2.50E-04</u>
Fuel Building Blowout Panel	<u>3.81E-04</u>	<u>2.93E-04</u>	<u>1.01E-04</u>	<u>7.78E-05</u>	<u>6.20E-05</u>
DCD	<u>6.00E-03</u>	<u>4.00E-03</u>	<u>2.00E-03</u>	<u>1.50E-03</u>	<u>1.00E-03</u>
Radwaste Building Truck Staging Area Door	<u>3.46E-04</u>	<u>2.64E-04</u>	<u>9.18E-05</u>	<u>7.10E-05</u>	<u>5.52E-05</u>
DCD	<u>6.00E-03</u>	<u>4.00E-03</u>	<u>2.00E-03</u>	<u>1.50E-03</u>	<u>1.00E-03</u>
Steam Vent	<u>9.47E-04</u>	<u>7.44E-04</u>	<u>2.48E-04</u>	<u>2.01E-04</u>	<u>1.52E-04</u>
DCD	<u>4.00E-03</u>	<u>3.20E-03</u>	<u>1.20E-03</u>	<u>1.00E-03</u>	<u>8.00E-04</u>
PORV & Safety Valves	<u>9.97E-04</u>	<u>7.78E-04</u>	<u>2.62E-04</u>	<u>2.10E-04</u>	<u>1.56E-04</u>
DCD	<u>4.00E-03</u>	<u>3.20E-03</u>	<u>1.20E-03</u>	<u>1.00E-03</u>	<u>8.00E-04</u>
Condenser Air Removal Stack	<u>3.89E-03</u>	<u>3.09E-03</u>	<u>1.18E-03</u>	<u>9.11E-04</u>	<u>6.92E-04</u>
DCD	<u>2.00E-02</u>	<u>1.80E-02</u>	<u>7.00E-03</u>	<u>5.00E-03</u>	<u>4.50E-03</u>
Containment Shell (As Diffuse Area Source)	<u>3.94E-04</u>	<u>3.21E-04</u>	<u>1.10E-04</u>	<u>8.43E-05</u>	<u>6.78E-05</u>
DCD	<u>1.00E-03</u>	<u>7.50E-04</u>	<u>3.50E-04</u>	<u>2.80E-04</u>	<u>2.50E-04</u>

(a) DCD site parameter values are from DCD Tier 2, Chapter 15, Appendix 15A, Table 15A-6.

Table 2.3-224
Shortest Distances Between the Units 2 and 3 Power Block Area Circle and Receptors of Interest by Downwind Direction Sector^(a)

Downwind Direction Sector^(b)	Meat Animal	Milk Animal	Residence	Vegetable Garden	Dose Evaluation Periphery	Unit 3 Reactor
N	<u>6756</u>	----	<u>7260</u>	<u>7718</u>	<u>805</u>	----
NNE	<u>9313</u>	----	<u>5981</u>	<u>6480</u>	<u>805</u>	----
NE	<u>3429</u>	----	<u>3429</u>	<u>3703</u>	<u>805</u>	----
ENE	----	----	<u>2094</u>	<u>2647</u>	<u>805</u>	----
E	----	----	<u>1978</u>	<u>1978</u>	<u>805</u>	----
ESE	----	----	----	----	<u>805</u>	----
SE	----	----	<u>2704</u>	<u>2704</u>	<u>805</u>	----
SSE	----	----	----	----	<u>805</u>	----
S	<u>6403</u>	----	<u>4099</u>	<u>4099</u>	<u>805</u>	<u>274</u>
SSW	<u>5793</u>	----	<u>3234</u>	<u>4296</u>	<u>805</u>	<u>274</u>
SW	----	----	<u>3719</u>	<u>3719</u>	<u>805</u>	<u>274</u>
WSW	<u>6570</u>	----	----	<u>6570</u>	<u>805</u>	----
W	<u>7396</u>	<u>7396</u>	<u>3540</u>	----	<u>805</u>	----
WNW	<u>2795</u>	----	<u>3597</u>	<u>3973</u>	<u>805</u>	----
NW	<u>6659</u>	<u>6659</u>	<u>6801</u>	<u>7556</u>	<u>805</u>	----
NNW	<u>5664</u>	----	<u>5664</u>	<u>5664</u>	<u>805</u>	----

(a) Distances shown are in meters.
(b) Not all direction sectors included receptors of interest.

Table 2.3-225
XOQDOQ-Predicted Maximum X/Q and D/Q Values
at Sensitive Receptors of Interest

<u>Type of Sensitive Receptor Location</u>	<u>Direction from Site</u>	<u>Distance (miles)</u>	<u>X/Q (sec/m³) (No Decay)</u>
Residence	SE	1.68	8.70E-07
Meat Animal	WNW	1.74	4.60E-07
Milk Animal	NW	4.14	1.70E-07
Vegetable Garden	SE	1.68	8.70E-07
Dose Evaluation Periphery	SE	0.50	5.80E-06
Unit 3 Reactor	SW	0.17	1.70E-05

<u>Type of Sensitive Receptor Location</u>	<u>Direction from Site</u>	<u>Distance (miles)</u>	<u>X/Q (sec/m³) (2.26-Day Decay)</u>
Residence	SE	1.68	8.60E-07
Meat Animal	WNW	1.74	4.50E-07
Milk Animal	NW	4.14	1.70E-07
Vegetable Garden	SE	1.68	8.60E-07
Dose Evaluation Periphery	SE	0.50	5.80E-06
Unit 3 Reactor	SW	0.17	1.70E-05

<u>Type of Sensitive Receptor Location</u>	<u>Direction from Site</u>	<u>Distance (miles)</u>	<u>X/Q (sec/m³) (8-Day Decay)</u>
Residence	SE	1.68	7.30E-07
Meat Animal	WNW	1.74	3.80E-07
Milk Animal	NW	4.14	1.30E-07
Vegetable Garden	SE	1.68	7.30E-07
Dose Evaluation Periphery	SE	0.50	5.30E-06
Unit 3 Reactor	SW	0.17	1.60E-05

<u>Type of Sensitive Receptor Location</u>	<u>Direction from Site</u>	<u>Distance (miles)</u>	<u>D/Q (1/m³)</u>
Residence	ENE	1.30	3.30E-09
Meat Animal	NE	2.13	1.40E-09
Milk Animal	NW	4.14	2.70E-10
Vegetable Garden	E	1.23	3.10E-09
Dose Evaluation Periphery	ENE,NE	0.50	1.60E-08
Unit 3 Reactor	SW	0.17	6.50E-08

Table 2.3-226 (Sheet 1 of 2)
XOQDOQ-Predicted Maximum Annual Average X/Q and D/Q Values at the Standard Radial Distances
and Distance-Segment Boundaries

<u>No Decay</u>												
<u>Undepleted</u>		<u>DISTANCE IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>0.25</u>	<u>0.5</u>	<u>0.75</u>	<u>1</u>	<u>1.5</u>	<u>2</u>	<u>2.5</u>	<u>3</u>	<u>3.5</u>	<u>4</u>	<u>4.5</u>	
<u>X/Q (s/m³)</u>	<u>1.953E-05</u>	<u>5.790E-06</u>	<u>2.904E-06</u>	<u>1.841E-06</u>	<u>1.019E-06</u>	<u>6.767E-07</u>	<u>4.977E-07</u>	<u>3.956E-07</u>	<u>3.258E-07</u>	<u>2.754E-07</u>	<u>2.375E-07</u>	
		<u>DISTANCE IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>5</u>	<u>7.5</u>	<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>	
<u>X/Q (s/m³)</u>	<u>2.082E-07</u>	<u>1.254E-07</u>	<u>8.773E-08</u>	<u>5.318E-08</u>	<u>3.738E-08</u>	<u>2.847E-08</u>	<u>2.281E-08</u>	<u>1.892E-08</u>	<u>1.610E-08</u>	<u>1.397E-08</u>	<u>1.231E-08</u>	
		<u>SEGMENT BOUNDARIES IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>.5-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>		
<u>X/Q (s/m³)</u>	<u>3.073E-06</u>	<u>1.050E-06</u>	<u>5.046E-07</u>	<u>3.265E-07</u>	<u>2.379E-07</u>	<u>1.271E-07</u>	<u>5.383E-08</u>	<u>2.858E-08</u>	<u>1.896E-08</u>	<u>1.399E-08</u>		
<u>2.26 Day</u>												
<u>Decay</u>												
<u>Undepleted</u>		<u>DISTANCE IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>0.25</u>	<u>0.5</u>	<u>0.75</u>	<u>1</u>	<u>1.5</u>	<u>2</u>	<u>2.5</u>	<u>3</u>	<u>3.5</u>	<u>4</u>	<u>4.5</u>	
<u>X/Q (s/m³)</u>	<u>1.950E-05</u>	<u>5.773E-06</u>	<u>2.892E-06</u>	<u>1.831E-06</u>	<u>1.010E-06</u>	<u>6.692E-07</u>	<u>4.908E-07</u>	<u>3.890E-07</u>	<u>3.194E-07</u>	<u>2.693E-07</u>	<u>2.316E-07</u>	
		<u>DISTANCE IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>5</u>	<u>7.5</u>	<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>	
<u>X/Q (s/m³)</u>	<u>2.023E-07</u>	<u>1.202E-07</u>	<u>8.283E-08</u>	<u>4.877E-08</u>	<u>3.330E-08</u>	<u>2.465E-08</u>	<u>1.919E-08</u>	<u>1.547E-08</u>	<u>1.280E-08</u>	<u>1.080E-08</u>	<u>9.247E-09</u>	
		<u>SEGMENT BOUNDARIES IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>.5-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>		
<u>X/Q (s/m³)</u>	<u>3.061E-06</u>	<u>1.041E-06</u>	<u>4.977E-07</u>	<u>3.202E-07</u>	<u>2.319E-07</u>	<u>1.218E-07</u>	<u>4.947E-08</u>	<u>2.477E-08</u>	<u>1.552E-08</u>	<u>1.082E-08</u>		

Table 2.3-226 (Sheet 2 of 2)
XOQDOQ-Predicted Maximum Annual Average X/Q and D/Q Values at the Standard Radial Distances
and Distance-Segment Boundaries

<u>8 Day Decay Undepleted</u>											
	<u>DISTANCE IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>0.25</u>	<u>0.5</u>	<u>0.75</u>	<u>1</u>	<u>1.5</u>	<u>2</u>	<u>2.5</u>	<u>3</u>	<u>3.5</u>	<u>4</u>	<u>4.5</u>
<u>X/Q (s/m³)</u>	<u>1.847E-05</u>	<u>5.283E-06</u>	<u>2.585E-06</u>	<u>1.609E-06</u>	<u>8.633E-07</u>	<u>5.586E-07</u>	<u>4.016E-07</u>	<u>3.127E-07</u>	<u>2.528E-07</u>	<u>2.101E-07</u>	<u>1.783E-07</u>
	<u>DISTANCE IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>5</u>	<u>7.5</u>	<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>
<u>X/Q (s/m³)</u>	<u>1.539E-07</u>	<u>8.735E-08</u>	<u>5.798E-08</u>	<u>3.226E-08</u>	<u>2.112E-08</u>	<u>1.512E-08</u>	<u>1.145E-08</u>	<u>9.016E-09</u>	<u>7.307E-09</u>	<u>6.054E-09</u>	<u>5.104E-09</u>
	<u>SEGMENT BOUNDARIES IN MILES FROM SITE</u>										
<u>Southeast</u>	<u>.5-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	
<u>X/Q (s/m³)</u>	<u>2.751E-06</u>	<u>8.936E-07</u>	<u>4.079E-07</u>	<u>2.536E-07</u>	<u>1.787E-07</u>	<u>8.909E-08</u>	<u>3.303E-08</u>	<u>1.525E-08</u>	<u>9.060E-09</u>	<u>6.074E-09</u>	
<u>Relative Deposition</u>											
	<u>DISTANCE IN MILES FROM SITE</u>										
<u>East-Northeast</u>	<u>0.25</u>	<u>0.5</u>	<u>0.75</u>	<u>1</u>	<u>1.5</u>	<u>2</u>	<u>2.5</u>	<u>3</u>	<u>3.5</u>	<u>4</u>	<u>4.5</u>
<u>D/Q (1/m³)</u>	<u>4.849E-08</u>	<u>1.640E-08</u>	<u>8.419E-09</u>	<u>5.170E-09</u>	<u>2.577E-09</u>	<u>1.563E-09</u>	<u>1.057E-09</u>	<u>7.659E-10</u>	<u>5.823E-10</u>	<u>4.588E-10</u>	<u>3.714E-10</u>
	<u>DISTANCE IN MILES FROM SITE</u>										
<u>East-Northeast</u>	<u>5</u>	<u>7.5</u>	<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>
<u>D/Q (1/m³)</u>	<u>3.072E-10</u>	<u>1.506E-10</u>	<u>9.447E-11</u>	<u>4.775E-11</u>	<u>2.890E-11</u>	<u>1.938E-11</u>	<u>1.388E-11</u>	<u>1.043E-11</u>	<u>8.106E-12</u>	<u>6.475E-12</u>	<u>5.285E-12</u>
	<u>SEGMENT BOUNDARIES IN MILES FROM SITE</u>										
<u>East-Northeast</u>	<u>.5-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	
<u>D/Q (1/m³)</u>	<u>8.748E-09</u>	<u>2.703E-09</u>	<u>1.075E-09</u>	<u>5.877E-10</u>	<u>3.735E-10</u>	<u>1.604E-10</u>	<u>4.975E-11</u>	<u>1.972E-11</u>	<u>1.053E-11</u>	<u>6.518E-12</u>	

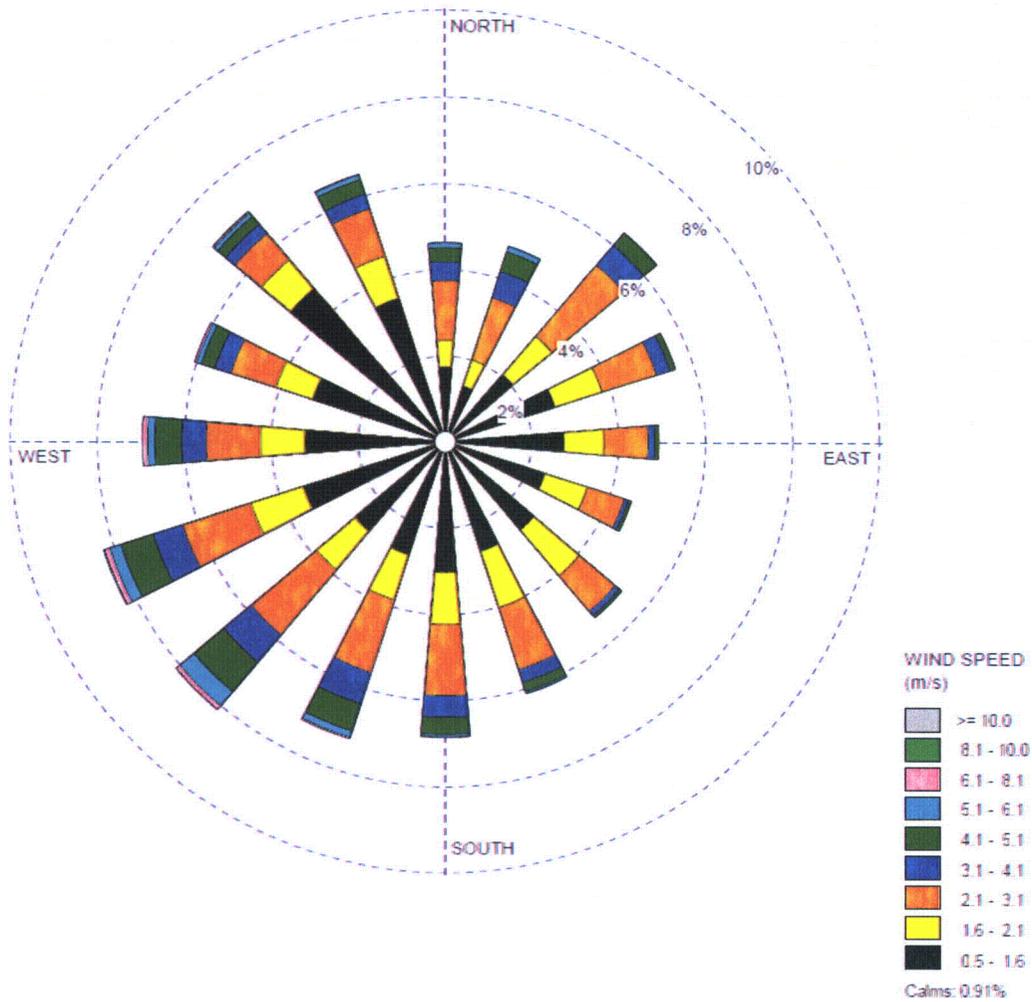


Figure 2.3-202. 10-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Annual

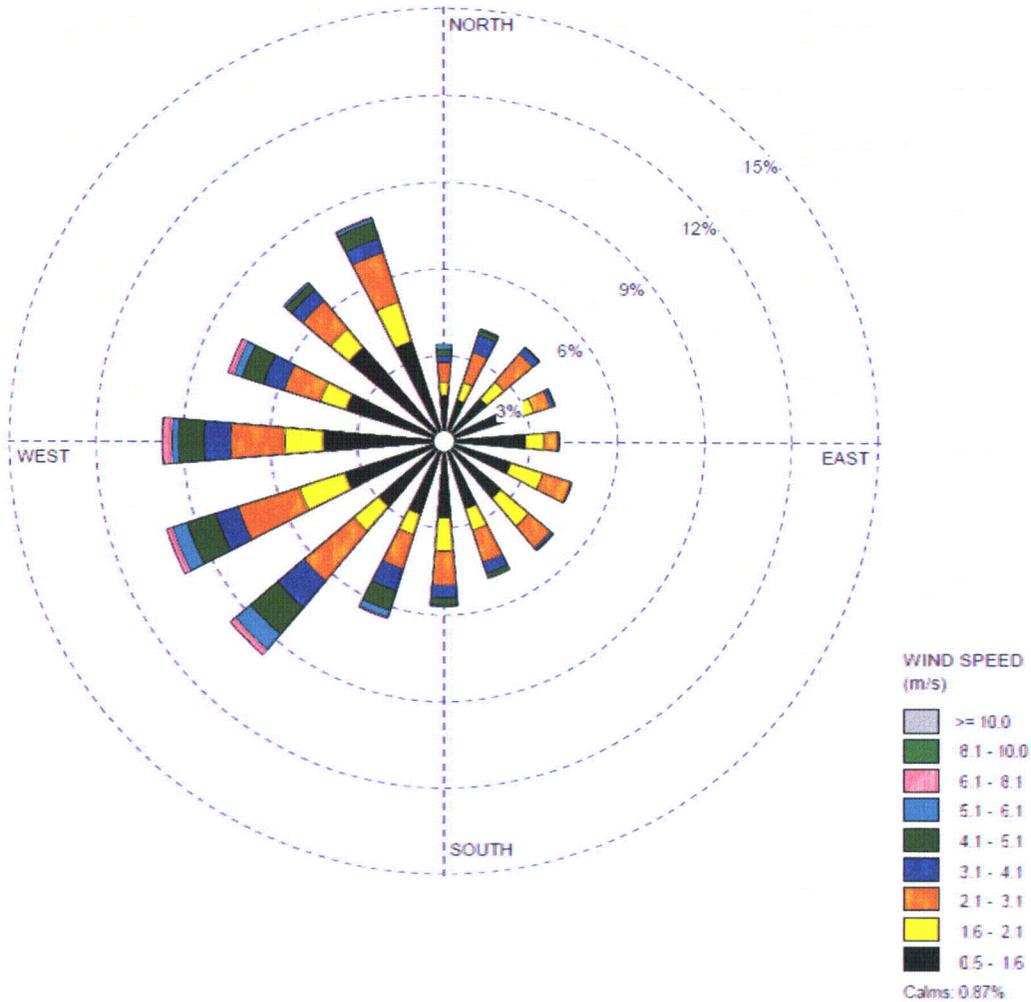


Figure 2.3-203. 10-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Winter

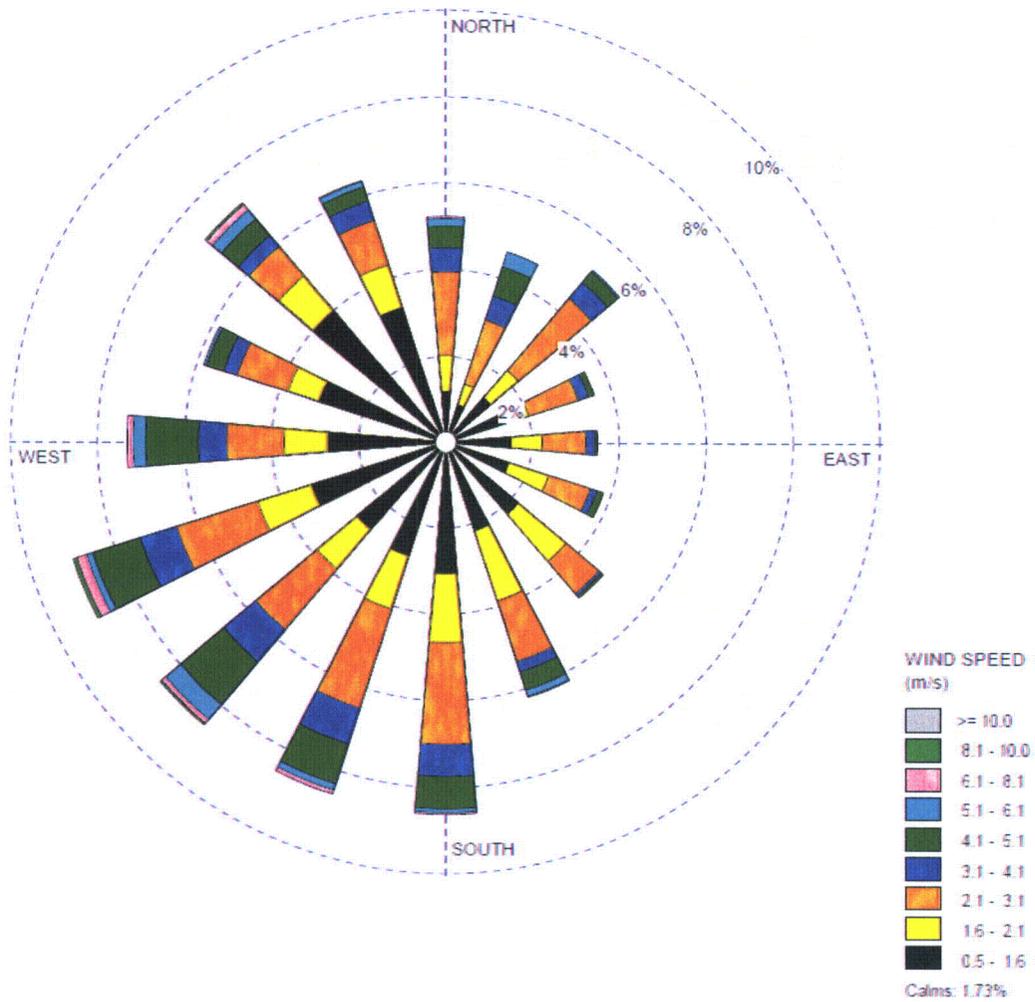


Figure 2.3-204. 10-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Spring

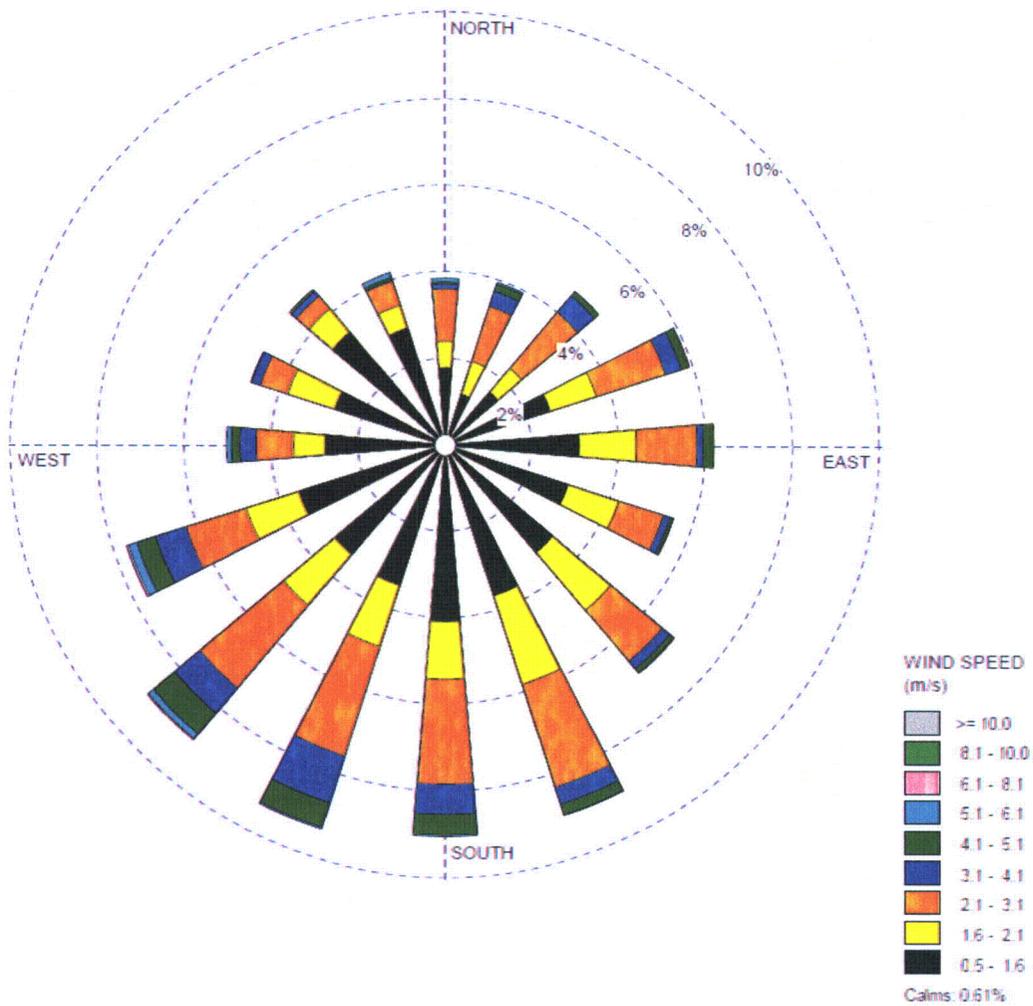


Figure 2.3-205. 10-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) —Summer

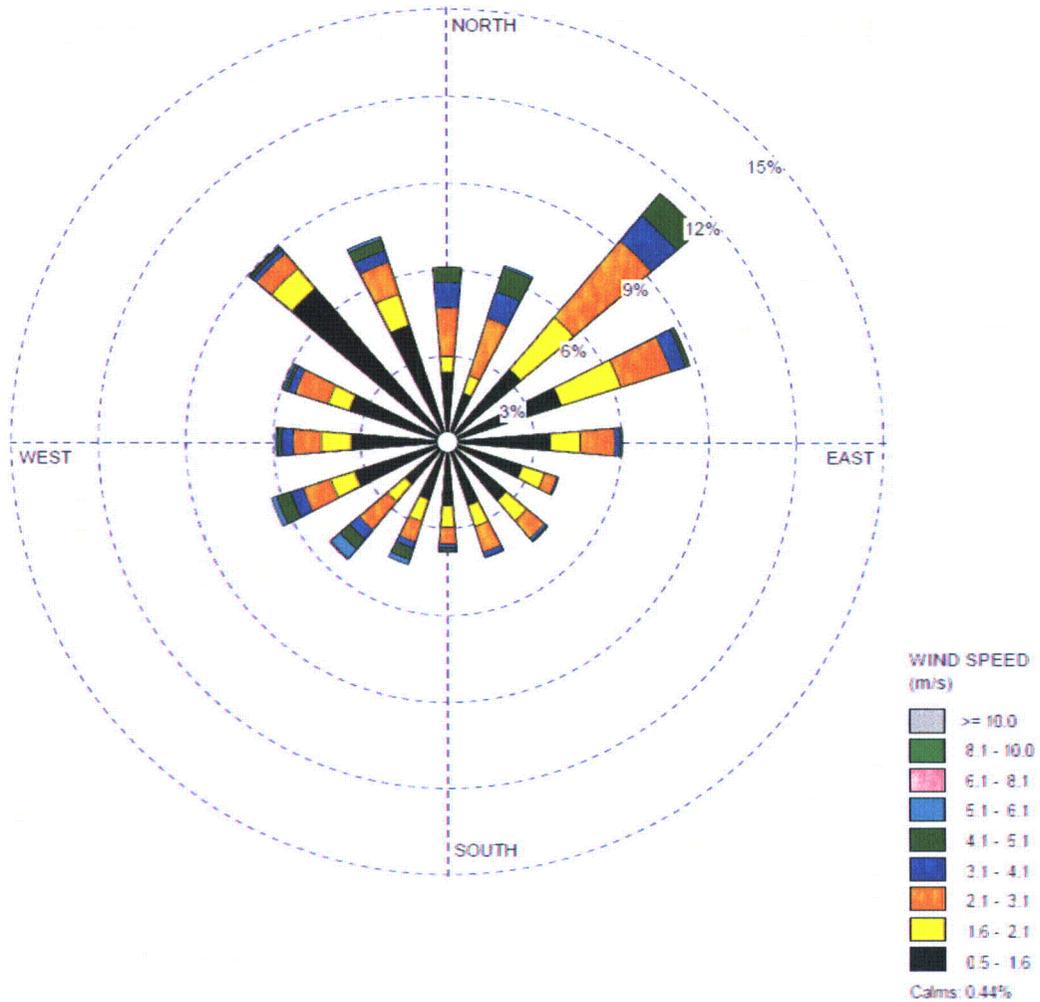


Figure 2.3-206. 10-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Autumn

Figure 2.3-207. DELETED (12 sheets)

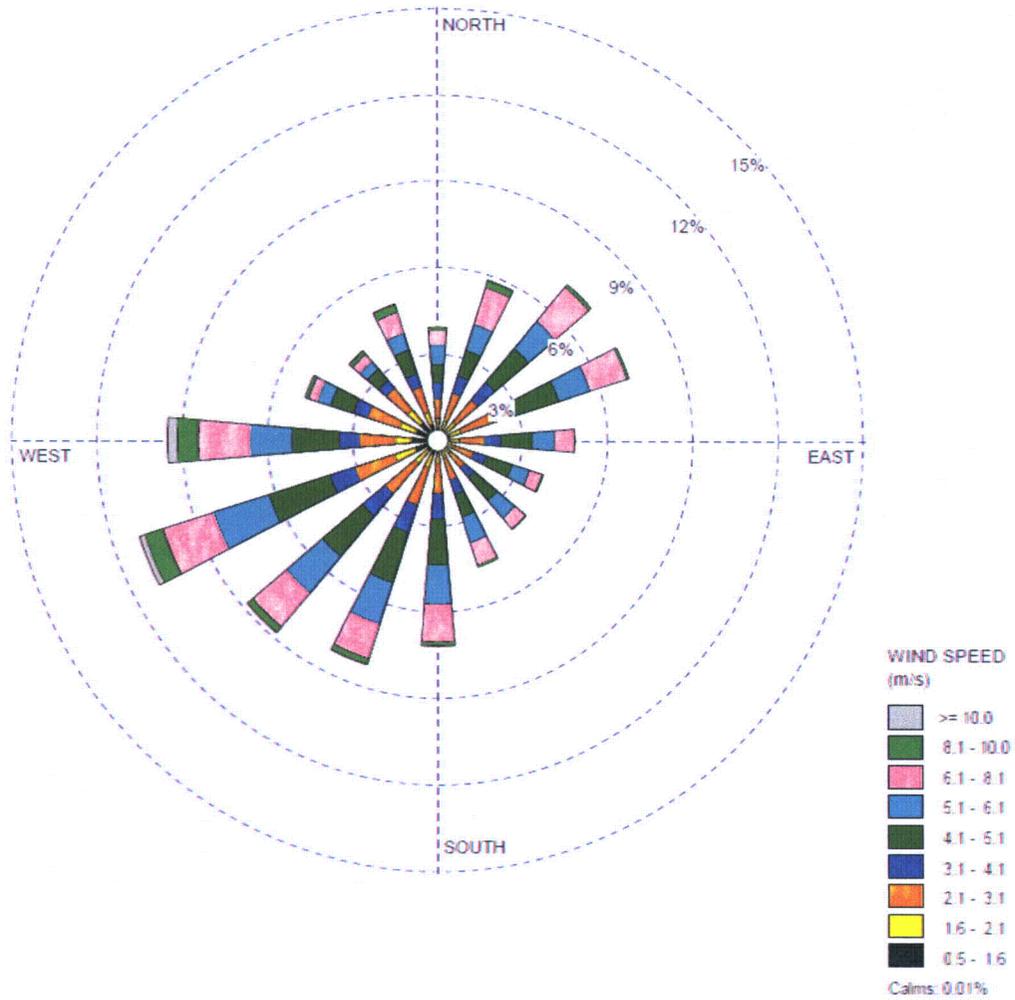


Figure 2.3-208. 60-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Annual

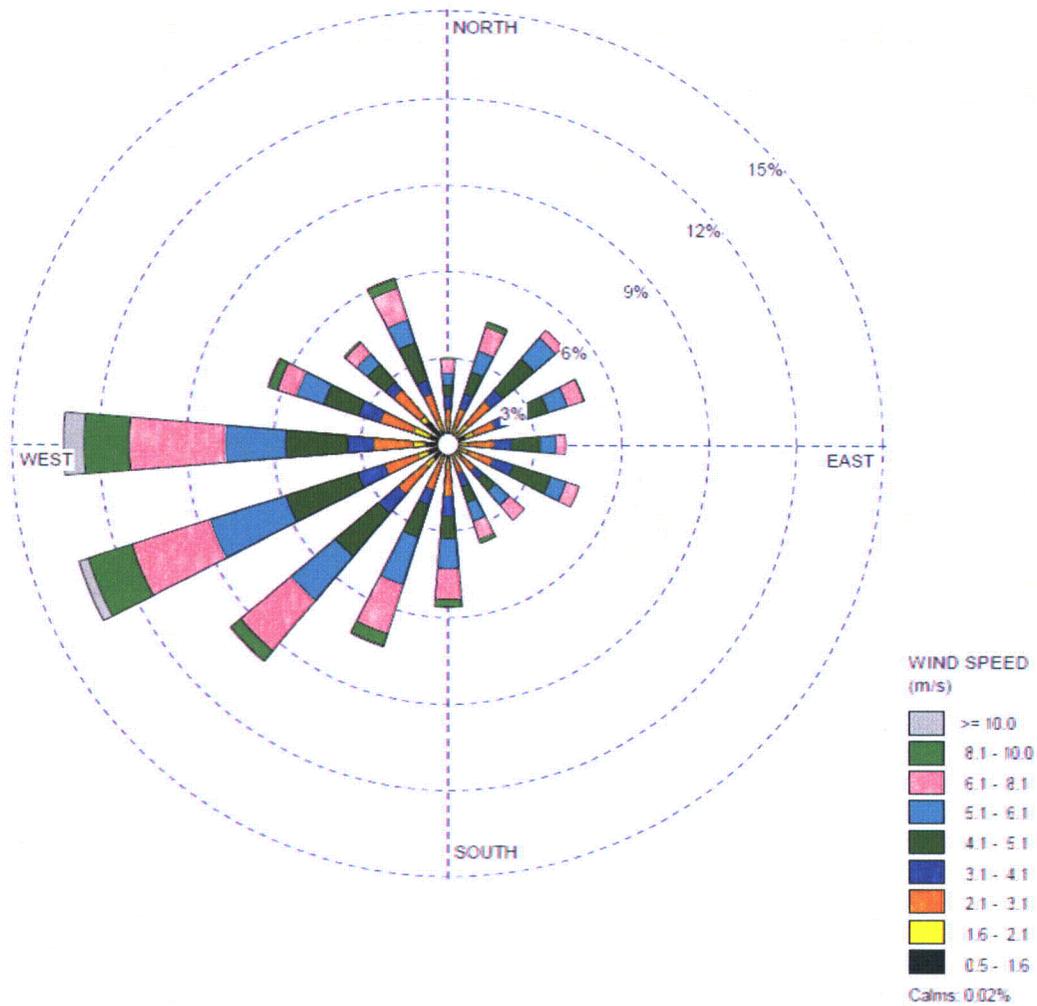


Figure 2.3-209. 60-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Winter

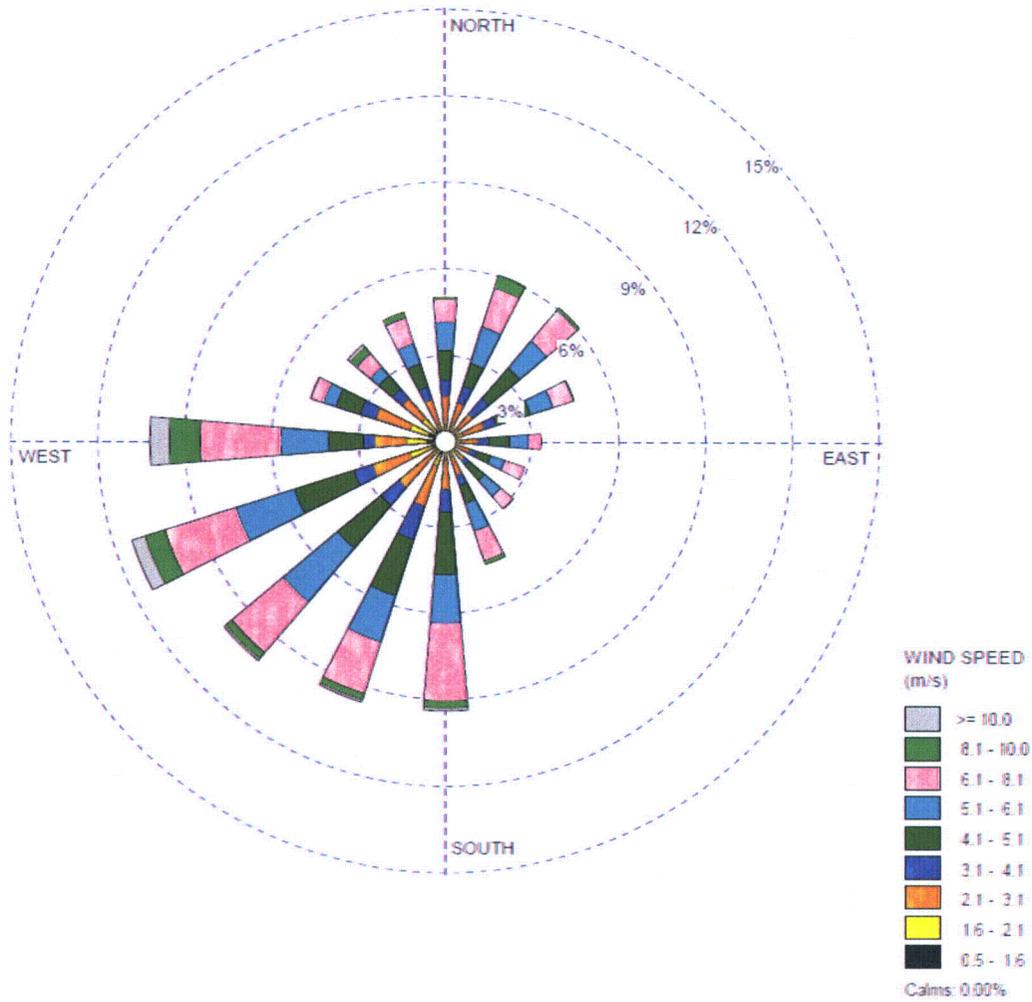


Figure 2.3-210. 60-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Spring

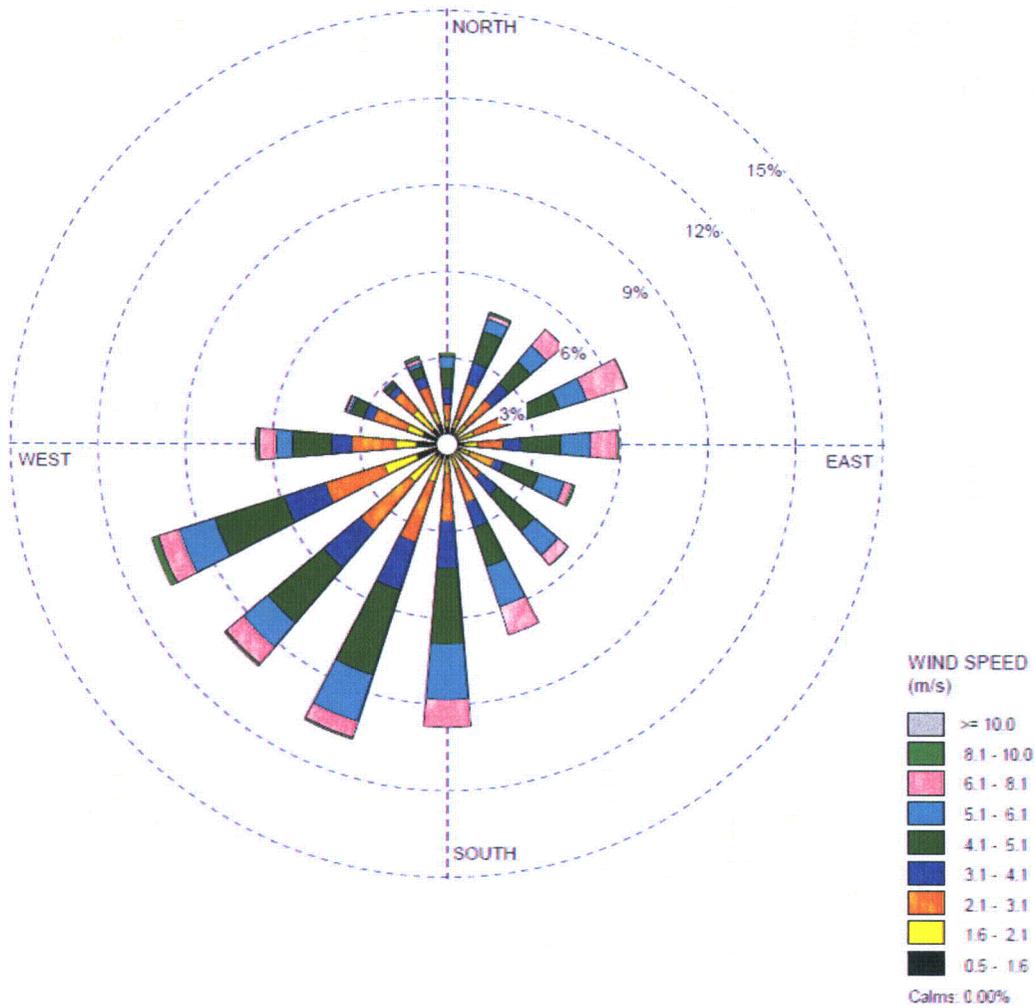


Figure 2.3-211. 60-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Summer

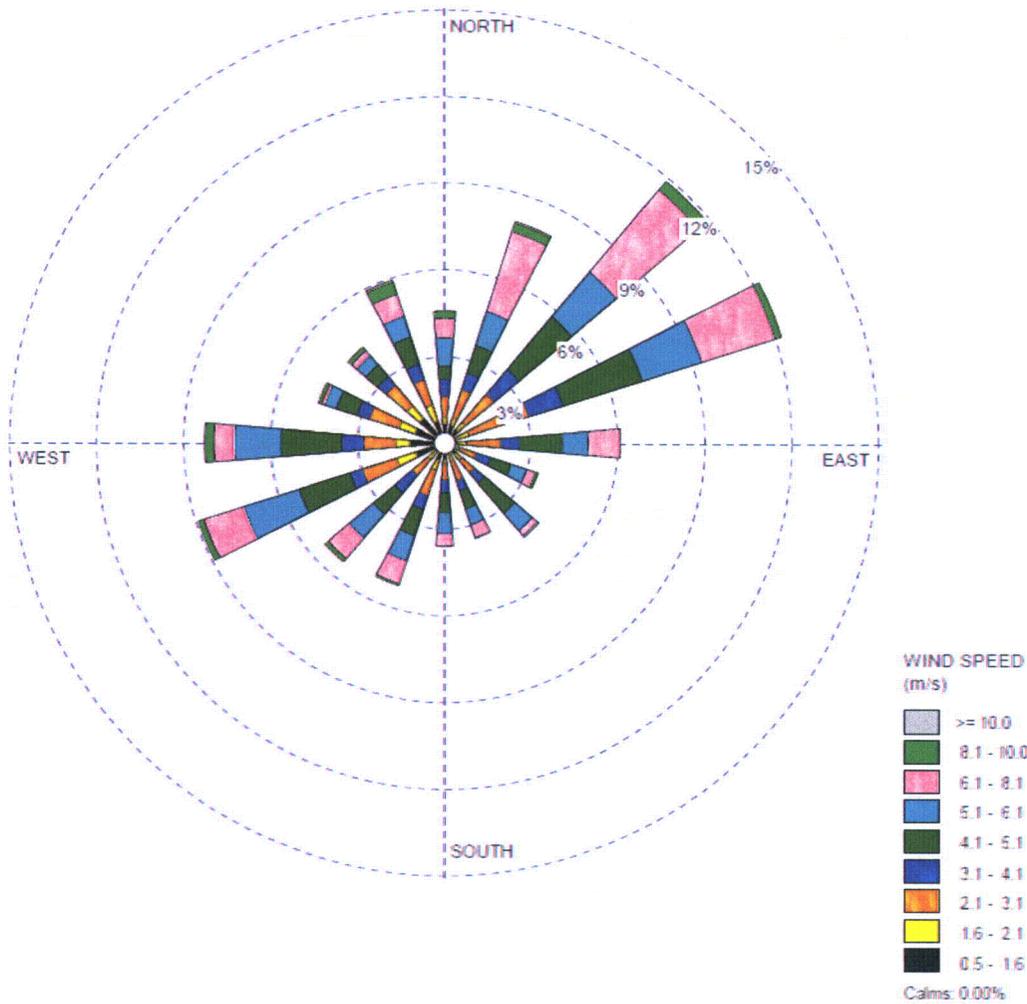


Figure 2.3-212. 60-Meter Level Composite Wind Rose for the Units 2 and 3 Monitoring Program (January 1, 2007–December 31, 2008) — Autumn

Figure 2.3-213. DELETED (12 Sheets).

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ASSOCIATED ATTACHMENTS:

See attached CD containing an electronic copy of the ARCON, PAVAN and XOQDOQ input/output files.

NRC RAI Letter No. 049 Dated June 19, 2009

SRP Section: 02.03.03 – Onsite Meteorological Measurements Programs

Question from Siting and Accident Conseq Branch (RSAC)

NRC RAI Number: 02.03.03.-2

Regulatory Guide 1.23, Revision 1, provides guidance for meteorological instrumentation accuracy and ranges. The guidance states that ambient temperature and atmospheric moisture instrumentation should be capable of operating over the range of expected climatic extremes based on regional climatology.

FSAR Table 2.3-216 identifies a System Accuracy range of -0.6°F to 107.7°F for Ambient Temperature, Differential Temperature, and Dew Point. FSAR Table 2.3-203 identifies Regional Climatological temperature extremes of -5°F (Chester 1NW) and +111°F (Camden 3NW). Provide a discussion of the performance of the meteorological monitoring equipment and the use of data collected under such circumstances given that the instrument accuracy range (-0.6°F to 107.7°F) provided in Table 2.3-216 was exceeded by the regional climatological extremes (-5°F and +111°F) provided in Table 2.3-203.

VCSNS RESPONSE:

Temperature data collected by the U.S. Weather Service are normally measured near the ground level (about 1.5 - 2 meters above ground level). The temperature measurement as specified in Regulatory Guide 1.23 is measured at 10-meters and higher levels. The "system accuracy" shown in Table 2.3-216 is based on an observed temperature range of -0.6°F to 107.7°F. This range is about 5°F more than the minimum recorded and 3°F less than the maximum historical extremes measured in the site region. Strong lapse rates are a necessary condition under which extreme temperatures occur. Values that are less extreme than the historical limits would be measured at the 10-m or higher levels on the VCSNS Units 2 and 3 tower than would be observed close to the surface by temperature probes at U.S. Weather Service observation sites. Instrumentation system accuracies do not substantially change for incremental changes in absolute temperature values. Therefore, the uncertainties presented in Table 2.3-216 are considered appropriate for the site.

This response is PLANT SPECIFIC.

ASSOCIATED VCSNS COLA REVISIONS:

The following FSAR changes will be made in a future revision of the COLA.

Add the following after the first paragraph of Subsection 2.3.3.3.5.1:

It should be noted that temperature data collected by the U.S. Weather Service are normally measured near the ground level (about 1.5 - 2 meters above ground level). The temperature measurement as specified in Regulatory Guide 1.23 is measured at 10-meters and higher levels. The "system accuracy" shown in Table 2.3-216 is based on an observed temperature range of -0.6°F to 107.7°F. This range is about 5°F more than the minimum recorded and 3°F less than the maximum historical extremes measured in the site region. Strong lapse rates are a necessary condition under which extreme temperatures occur. Values that are less extreme than the historical limits would be measured at the 10-m or higher levels on the VCSNS Units 2 and 3 tower than would be observed close to the surface by temperature probes at U.S. Weather Service observation sites.

ASSOCIATED ATTACHMENTS:

None