APPENDIX 2CC
EVALUATION OF METEOROLOGICAL DATA

2CC.1 Purpose

WLS COL 2.3-1 This Appendix demonstrates the consistency of the Lee meteorological data between years. In addition, comparisons are provided between the onsite data and the National Weather Service station (Greenville-Spartanburg (GSP)) for selected data.

2CC.2 Data Evaluation

The complete two-year site data set (12/1/2005 - 11/30/2007) was used in these evaluations. Additional long-term meteorological data was obtained from the GSP Local Climatic Data (LCD) Summary (Reference 2CC-201). The 30-year normals provided in the GSP LCD are based on data from 1971-2000. The meteorological parameters evaluated consist of temperature, relative humidity and precipitation. A comparison of the stability class, wind speed frequency and wind direction frequency is provided for the two years of site data.

Temperature and Moisture

The first parameter considered is the site temperature. Table 2CC-201 compares temperatures from the Greenville-Spartanburg (GSP) Local Climatic Data Summary with the first year of Lee Nuclear Station data and the complete two-year Lee Nuclear Station data set. A comparison of the monthly mean dry bulb temperatures is also given in Figure 2CC-201. As seen, the annual mean daily maximum temperature is slightly higher for the two-year Lee Nuclear Station data set than for either the GSP weather station data or the Lee Nuclear Station one-year data set. Likewise, the annual mean daily minimum temperature is slightly lower for the two-year data set. It appears that Lee Nuclear Station is potentially warmer than GSP in January, early spring (March/April), and August, but cooler than GSP in May-July. The mean monthly dry bulb temperature is in good agreement between the three data sets. The annual dry bulb mean temperature is within a one-half degree (° F) temperature range for the three data sets.

Moisture content of the air can be characterized with measurements of wet bulb temperature, dew point temperature, and relative humidity. The annual wet bulb temperatures are also in good agreement. The comparison of the average wet bulb temperature for the three data sets is given in Figure 2CC-202. Table 2CC-201 shows that the annual average wet bulb temperature for GSP is within one degree (° F) of the Lee Nuclear Station wet bulb temperatures. The dew point temperatures are also in good agreement with the annual average Lee Nuclear Station dew point temperatures, being within one degree (° F) of the GSP annual average dew point temperature. Dew point temperatures are compared graphically in Figure 2CC-203. The Lee Nuclear Station wet-bulb and dew point temperatures indicate higher air moisture content at Lee Nuclear Station than at GSP potentially during the months of January, March, April, and August. These are the same months as when Lee Nuclear Station temperatures appear to trend warmer than GSP, and thus can achieve a higher capacity to hold water vapor. The Lee Nuclear Station relative humidity was calculated from the measured 10 m dry bulb temperature and dew point temperature. The comparison of the relative humidity for the three data sets is given in Figure 2CC-204. Relative humidity is not the best indicator of moisture content in the air, as can be seen by the slightly larger spread between the data sets. However, the annual average relative humidity is consistent among the three data sets as shown in Table 2CC-201, and the data sets exhibit similar annual trends. Based on these results, it is concluded that the dry bulb temperatures, wet bulb temperatures, dew point temperatures, and relative humidity values from the Lee Nuclear Station first year data, presented in FSAR Section 2.3, are consistent with the two-year Lee Nuclear Station data set. In addition, the comparison with longer-term data from GSP demonstrates that either Lee

Nuclear Station data set is sufficiently representative of long term conditions that would be expected at the Lee Nuclear Station site, allowing for typical annual variability.

Stability Class

The frequency of occurrence for each stability class was determined for the first year of Lee Nuclear Station meteorological data (12/1/2005 - 11/30/2006) and the complete two-year data set (12/1/2005 - 11/30/2007). The comparison between these data sets is shown on Figure 2CC-205. This figure shows that the percentage frequency of unstable conditions (stability classes A, B, and C) for the first year data set was around 24% and the percentage frequency for the two year data set decreased to about 22%. The percentage frequency of neutral conditions (stability class D) increased from 24.6% for the first year of data to 26.1% for the two year data set. The percentage frequency of stable conditions (stability classes E, F, and G) increased only slightly from 51.3% for the first year of data to 51.6% for the two-year data set. In summary, the complete two-year data set had slightly fewer unstable conditions and more neutral conditions than are present in the first year data set. Stable conditions are similarly represented with either the one-year or two-year data sets. The effect of these variabilities relative to atmospheric dispersion and depositions would be relatively minor.

Precipitation Comparison

The comparison of the monthly and annual precipitation totals are as expected considering the drought conditions during the 2005-2007 time period (Reference 2CC-202). As seen in Table 2CC-202, the long term annual precipitation total is 50.2 inches for GSP and the recent precipitation totals at the Lee Nuclear Station site are much less (39.7 inches for the first year data and 32.7 inches for the two-year data set). To some extent, geographical influences on the spatial distribution of precipitation may also be a factor, as GSP is located in the western side of the Carolinas piedmont region and closer to the foothills than is the Lee Nuclear Station site.

Wind Speed Frequency

The comparison of the wind speed percentage frequency at the lower (10-m) measurement level for the first year and the two-year data set is given in Figure 2CC-206. This comparison shows that the data sets agreed very well and there is no significant difference in the wind speed percentage frequency for either period. The most common wind speed is in the 1.5 through 5.4 mph range.

The wind speed percentage frequency at the upper (60-m) measurement level is also consistent between the two Lee Nuclear Station data sets. Figure 2CC-207 provides the comparison between the data sets. Comparing the first year data set with the two-year data set shows that both data sets display very similar frequencies of wind speed classes. As expected, the 60-m wind speed frequency distribution is shifted toward the higher wind speeds than are the 10-m level winds.

Wind Direction Frequency

The wind direction frequency distribution at the lower (10-m) level is given in Figure 2CC-208. This figure shows that the wind direction frequency is consistent between the two data sets. This figure also shows that there is the same prevalent NW wind direction at 10-m, and a secondary max from the SSW - SW sectors.

The wind direction frequency distribution at the upper level (60-m) is given in Figure 2CC-209. This figure shows that the wind direction is consistent between the data sets and that the prevailing wind directions at this elevation are in the SSW – SW and the NE - NNE directions.

2CC.3 Conclusion

Based on the information presented in this Appendix, it is concluded that the two-year meteorological data set is consistent with the first year data set and the nearby historic data set. The atmospheric stability class percentage frequency, wind speed frequency, and the wind direction frequency are consistent for the two data sets.

These comparisons demonstrate that the first year of data is consistent with the complete two-year Lee Nuclear Station data set and is representative of longer-term conditions at the site. No anomalous behavior was observed between the first year and second year of data, or comparison to the normal conditions observed at the NWS office at Greer, SC (GSP). No changes are needed to FSAR Section 2.3 based on the collection of the second year of meteorological data.

References:

2CC-201 National Climatic Data Center (NCDC) Local Climatic Data Annual Summary with Comparative Data, Greenville–Spartanburg (Greer), South Carolina (Station ID GSP), 2007.

2CC-202 South Carolina State Climatology Office, Regional Drought Monitor, https://www.dnr.sc.gov/drought/, accessed 10/22/2008.

TABLE 2CC-201
TEMPERATURE AND HUMIDITY COMPARISON

Temperature (°F)	POR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Daily Maximum (GSP LCD)	45.0	51.1	54.7	63.6	72.3	79.3	85.5	88.6	87.3	81.3	71.9	62.5	53.5	71.0
Mean Daily Maximum (Lee 1-yr)		57.7	53.6	62.7	76.0	77.1	84.6	87.9	87.4	78.1	68.8	62.9	51.5	70.7
Mean Daily Maximum (Lee 2-yr)		55.6	52.7	65.7	73.2	77.7	83.9	86.6	91.0	81.4	72.2	62.8	55.1	71.5
Mean Daily Minimum (GSP LCD)	45.0	31.2	33.1	40.3	48.0	56.5	64.4	68.7	67.8	61.4	49.6	40.5	33.7	49.6
Mean Daily Minimum (Lee 1-yr)		37.3	33.5	41.1	51.9	54.9	63.7	68.7	69.8	61.6	47.9	39.9	30.7	50.1
Mean Daily Minimum (Lee 2-yr)		36.0	30.4	44.4	46.1	53.2	58.3	61.2	71.7	62.2	54.1	37.1	34.9	49.1
Mean Dry Bulb (GSP LCD)	45.0	41.1	43.9	52.0	60.1	67.9	75.1	78.7	77.6	71.4	60.7	51.5	43.6	60.3
Mean Dry Bulb (Lee 1-yr)		47.1	43.6	52.2	64.0	65.8	73.6	77.7	77.5	69.1	57.7	50.8	40.5	60.0
Mean Dry Bulb (Lee 2-yr)		45.7	42.3	54.5	61.4	66.2	72.7	75.9	79.8	71.2	61.1	50.1	43.4	60.4
Mean Wet Bulb (GSP LCD)	24.0	36.5	38.7	44.7	51.6	60.2	67.3	70.8	70.2	64.2	54.6	45.8	38.3	53.6
Mean Wet Bulb (Lee 1-yr)		43.6	38.8	45.7	56.2	59.5	67.0	71.5	72.2	64.4	53.1	46.1	37.0	54.6
Mean Wet Bulb (Lee 2-yr)		41.9	37.3	47.7	53.7	59.3	66.2	69.4	72.6	64.9	56.1	45.0	39.5	54.5
Mean Dew Point (GSP LCD)	24.0	30.3	32.4	38.1	45.8	56.3	64.2	68.2	67.8	61.3	50.7	41.1	32.7	49.1
Mean Dew Point (Lee 1-yr)		37.4	29.1	35.7	48.4	54.6	63.3	68.6	69.9	61.7	48.3	40.0	30.4	48.9
Mean Dew Point (Lee 2-yr)		34.9	25.9	37.8	44.7	53.8	62.6	66.2	69.2	61.0	51.6	37.7	32.5	48.1
Humidity (%)														
Normal Humidity (GSP LCD)	30.0	67.0	64.0	63.0	62.0	69.0	72.0	73.0	76.0	75.0	71.0	70.0	68.0	69.0
Average Humidity (Lee 1-yr)		71.9	61.8	58.4	62.6	71.2	74.0	76.7	79.9	79.6	74.9	70.6	71.5	71.1
Average Humidity (Lee 2-yr)		70.3	58.0	58.2	60.1	69.0	74.3	75.0	73.9	73.7	74.8	67.0	70.1	68.7

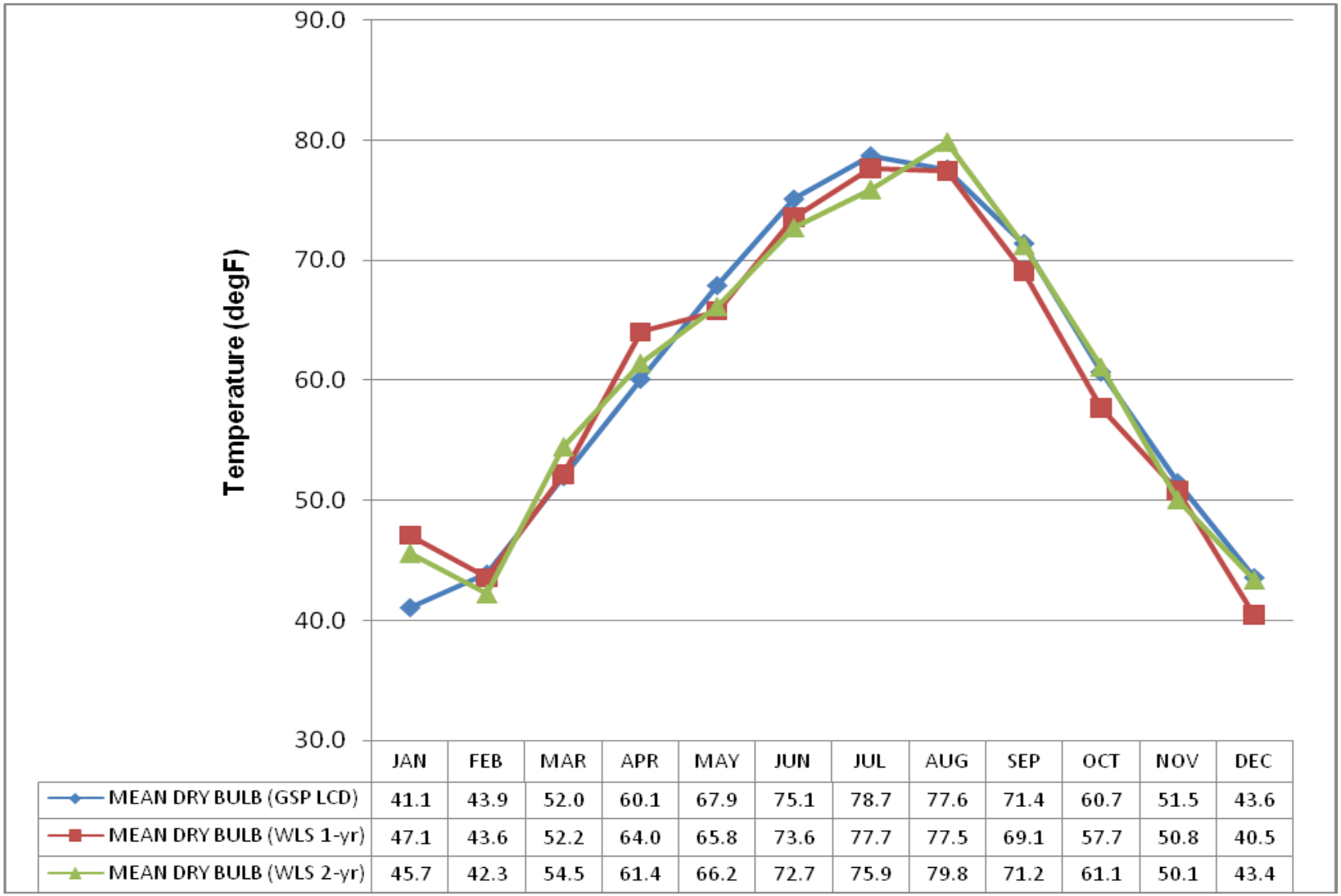
NOTE: POR is the period of record for the GSP data set.

TABLE 2CC-202
PRECIPITATION COMPARISON

		Precipitation (in)												
	POR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Normal (GSP LCD)	30	4.41	4.24	5.31	3.54	4.59	3.92	4.65	4.08	3.97	3.88	3.79	3.86	50.2
Lee (1-yr)		3.71	1.05	1.09	2.34	2.67	4.89	3.69	4.3	2.89	3.47	4.63	4.99	39.7
Lee (2-yr)		3.59	1.94	2.59	3.21	1.88	3.75	2.2	2.6	1.83	2.76	2.64	3.8	32.7

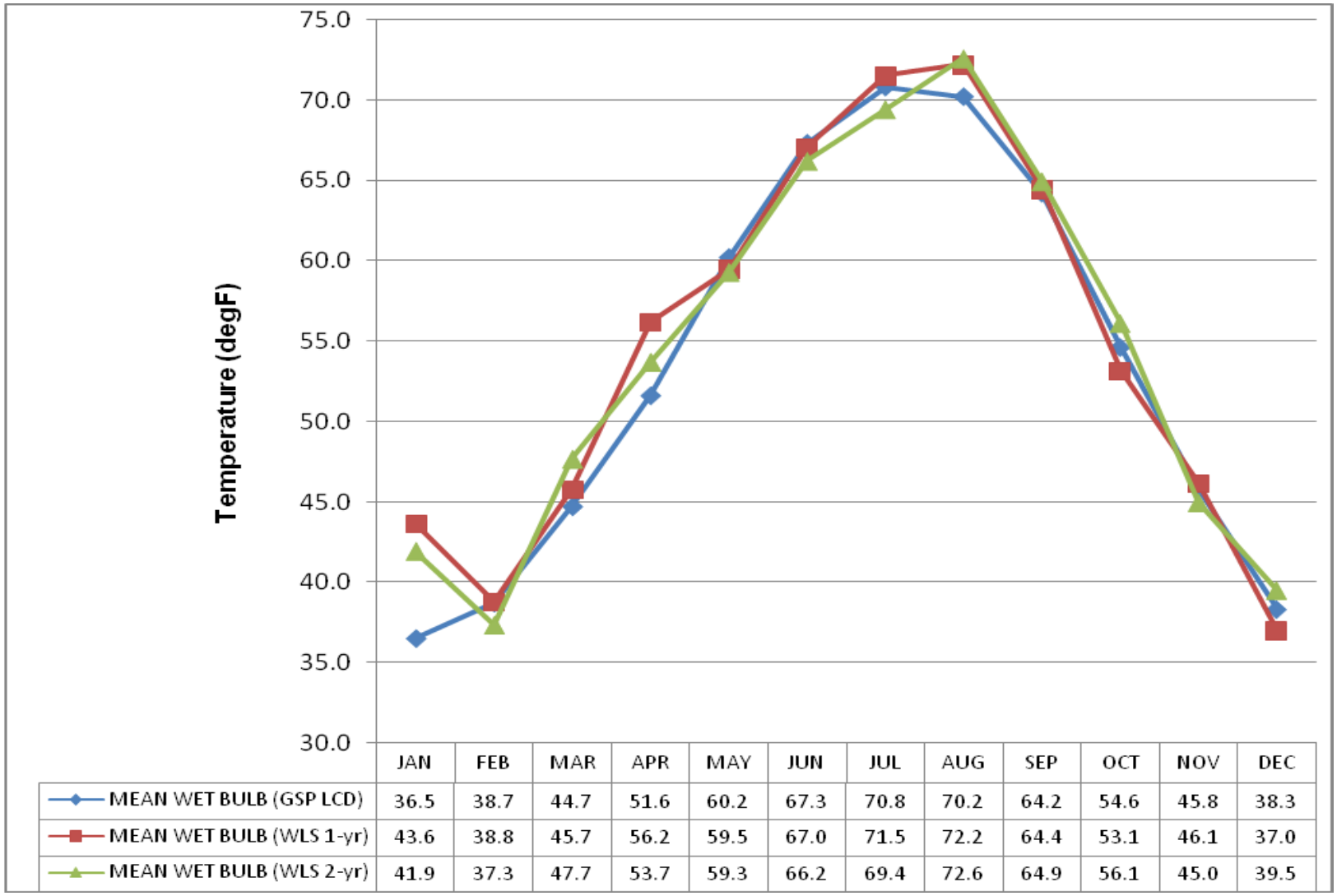
TABLE 2CC-203 through TABLE 2CC-221
DELETED

FIGURE 2CC-201
DRY BULB TEMPERATURE COMPARISON



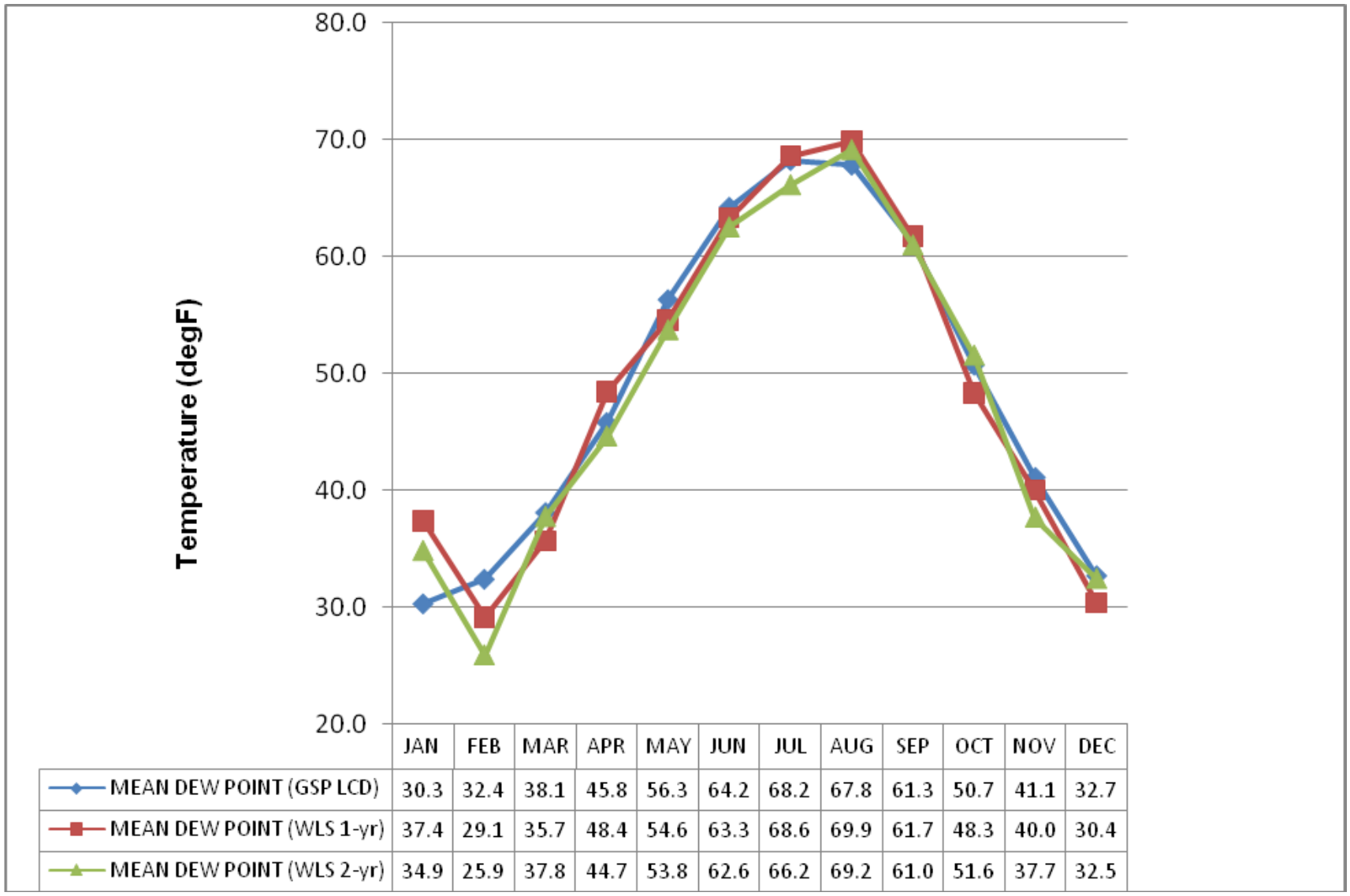
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MEAN DRY BULB (GSP LCD)	41.1	43.9	52.0	60.1	67.9	75.1	78.7	77.6	71.4	60.7	51.5	43.6
MEAN DRY BULB (WLS 1-yr)	47.1	43.6	52.2	64.0	65.8	73.6	77.7	77.5	69.1	57.7	50.8	40.5
MEAN DRY BULB (WLS 2-yr)	45.7	42.3	54.5	61.4	66.2	72.7	75.9	79.8	71.2	61.1	50.1	43.4

FIGURE 2CC-202
WET BULB TEMPERATURE COMPARISON



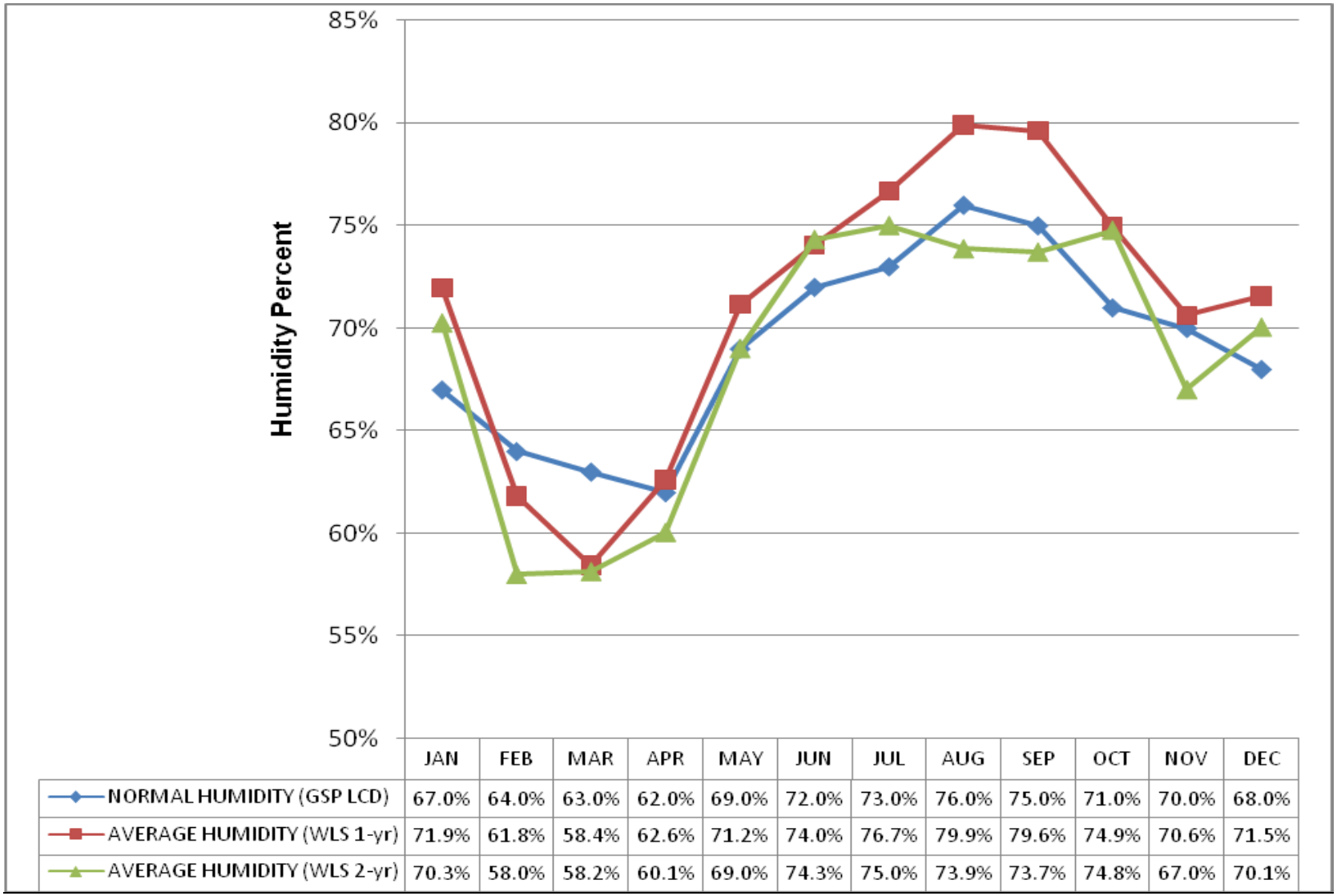
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MEAN WET BULB (GSP LCD)	36.5	38.7	44.7	51.6	60.2	67.3	70.8	70.2	64.2	54.6	45.8	38.3
MEAN WET BULB (WLS 1-yr)	43.6	38.8	45.7	56.2	59.5	67.0	71.5	72.2	64.4	53.1	46.1	37.0
MEAN WET BULB (WLS 2-yr)	41.9	37.3	47.7	53.7	59.3	66.2	69.4	72.6	64.9	56.1	45.0	39.5

FIGURE 2CC-203
DEW POINT TEMPERATURE COMPARISON



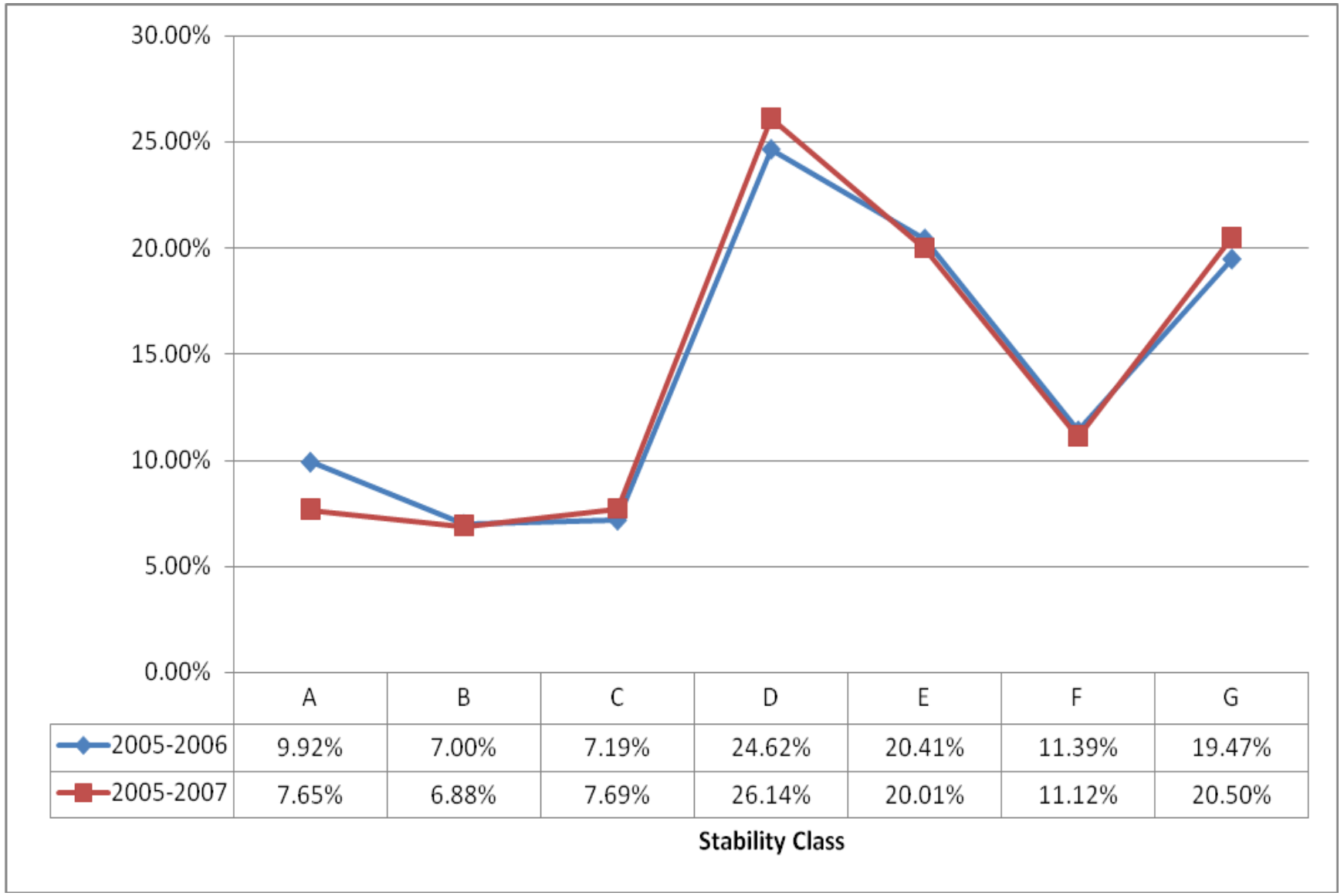
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MEAN DEW POINT (GSP LCD)	30.3	32.4	38.1	45.8	56.3	64.2	68.2	67.8	61.3	50.7	41.1	32.7
MEAN DEW POINT (WLS 1-yr)	37.4	29.1	35.7	48.4	54.6	63.3	68.6	69.9	61.7	48.3	40.0	30.4
MEAN DEW POINT (WLS 2-yr)	34.9	25.9	37.8	44.7	53.8	62.6	66.2	69.2	61.0	51.6	37.7	32.5

FIGURE 2CC-204
RELATIVE HUMIDITY COMPARISON



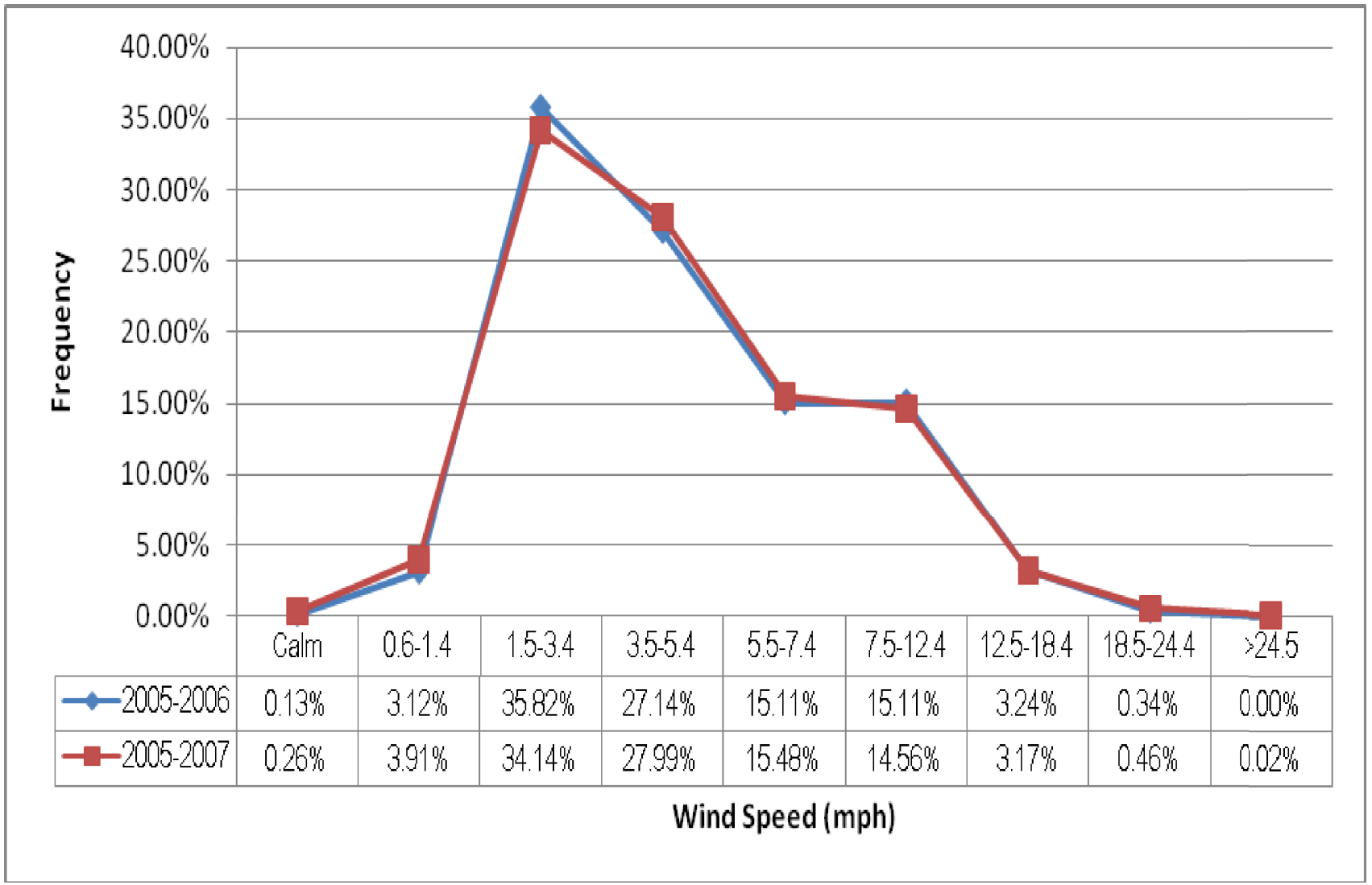
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NORMAL HUMIDITY (GSP LCD)	67.0%	64.0%	63.0%	62.0%	69.0%	72.0%	73.0%	76.0%	75.0%	71.0%	70.0%	68.0%
AVERAGE HUMIDITY (WLS 1-yr)	71.9%	61.8%	58.4%	62.6%	71.2%	74.0%	76.7%	79.9%	79.6%	74.9%	70.6%	71.5%
AVERAGE HUMIDITY (WLS 2-yr)	70.3%	58.0%	58.2%	60.1%	69.0%	74.3%	75.0%	73.9%	73.7%	74.8%	67.0%	70.1%

FIGURE 2CC-205
LEE NUCLEAR STATION STABILITY CLASS COMPARISON



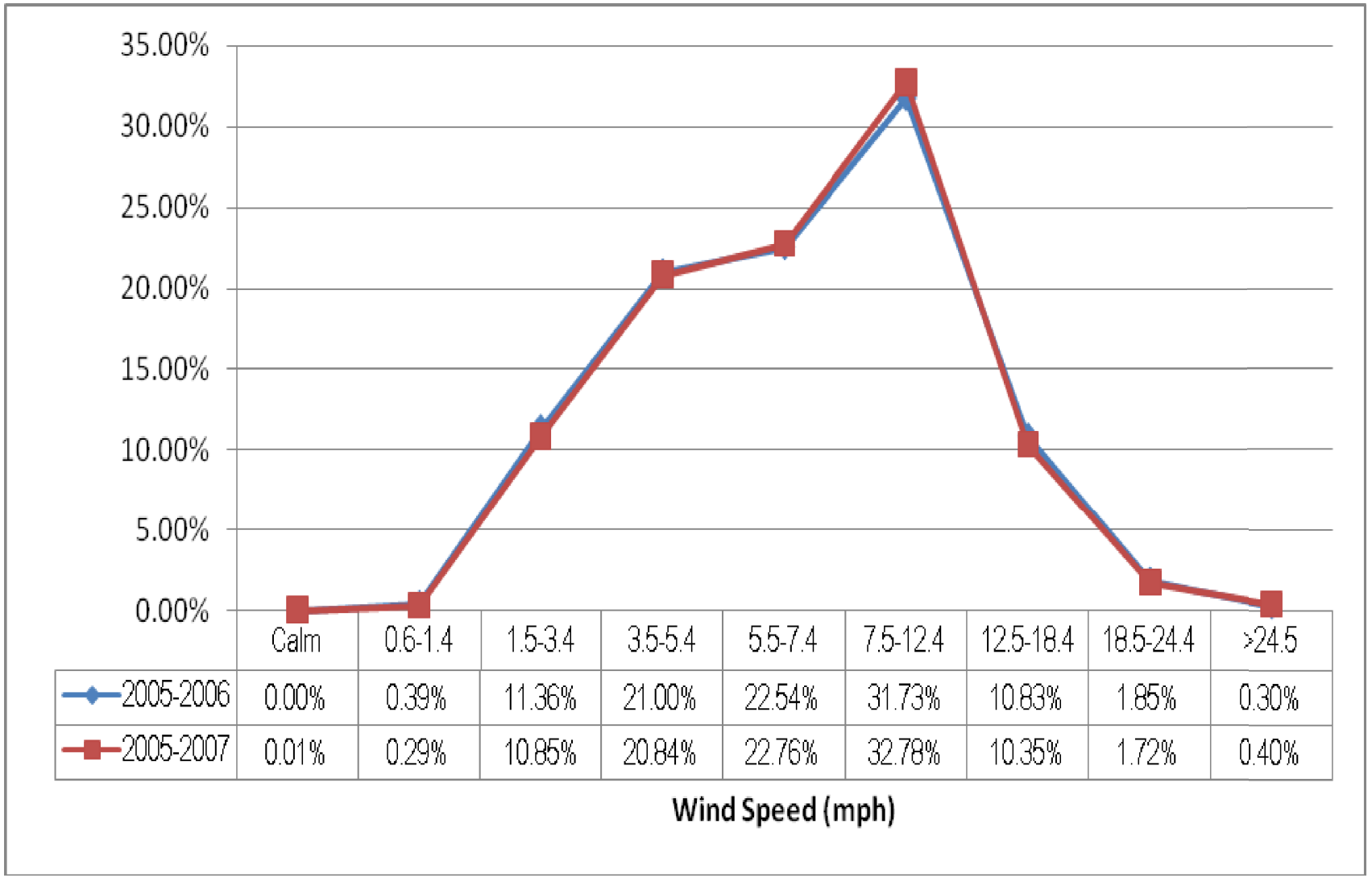
	A	B	C	D	E	F	G
2005-2006	9.92%	7.00%	7.19%	24.62%	20.41%	11.39%	19.47%
2005-2007	7.65%	6.88%	7.69%	26.14%	20.01%	11.12%	20.50%

FIGURE 2CC-206
WIND SPEED FREQUENCY
(10 M LEVEL)



	Calm	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>24.5
2005-2006	0.13%	3.12%	35.82%	27.14%	15.11%	15.11%	3.24%	0.34%	0.00%
2005-2007	0.26%	3.91%	34.14%	27.99%	15.48%	14.56%	3.17%	0.46%	0.02%

FIGURE 2CC-207
WIND SPEED FREQUENCY
(60 M LEVEL)



	Calm	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>24.5
2005-2006	0.00%	0.39%	11.36%	21.00%	22.54%	31.73%	10.83%	1.85%	0.30%
2005-2007	0.01%	0.29%	10.85%	20.84%	22.76%	32.78%	10.35%	1.72%	0.40%

FIGURE 2CC-208
WIND DIRECTION FREQUENCY
(10 M LEVEL)

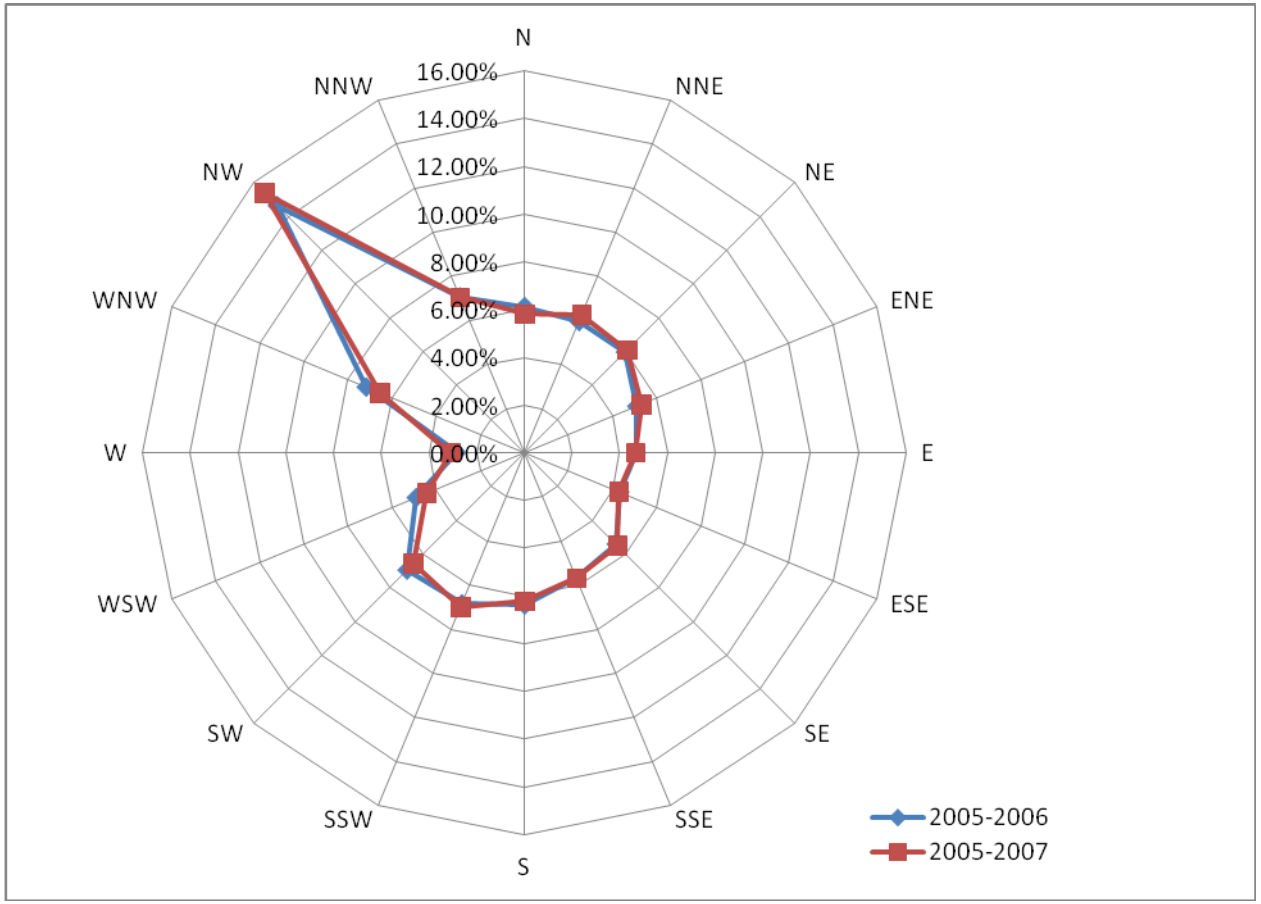


FIGURE 2CC-209
WIND DIRECTION FREQUENCY
(60 M LEVEL)