QUESTION 372.1

Provide any revisions to the extreme meteorological values presented in the Susquehanna Safety Analysis Report that may be necessary as a result of meteorological events occurring subsequent to 1974.

RESPONSE:

Tables 2.3-17 and 2.3-33 have been revised to include this information.

QUESTION 372.2

Tables 2.3-50 through 2.3-62 provide a precipitation wind rose for the Susquehanna site. During the winter months, the occurrence of invalid observations is quite frequent (e.g., January & February - 22%, December - 46%). To what may these invalidations be attributed? Provide a list of the periods of significant outage, including the cause, and discuss the effect of these outages on the monthly data summaries.

RESPONSE:

The frequency of invalid observations during the winter months is due to the freezing of the weighing rain gage, and/or the anemometer or wind vane. The following difficulties were noted:

November 1973 - Freezing of anemometer & wind vane
December 1973 - Freezing of anemometer & wind vane
January 1974 - Freezing of anemometer & wind vane
February 1974 - Freezing of anemometer & wind vane
December 1974 - Freezing of rain gage; freezing of anemometer & wind vane
December 1976 - Freezing of rain gage.

These outages result in a smaller data sample for the monthly summaries.

QUESTION 372.3

Information from Avoca, Penna. on the occurrence of fog was presented for a four year period concurrent with the onsite meteorological program. Provide long-term data (e.g., 30 years) for this meteorological phenomena.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.1.4.

QUESTION 372.4

Atmospheric stability data are provided for Avoca based on STAR data for the period 1971-1975. Explain the rationale for selection of this 5 year period and the representativeness of this period to long-term meteorological conditions (e.g., 30 years). Describe the seasonal occurrence of Pasquill E and F stability categories which were noted to occur 24% of the year.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.1.5.

QUESTION 372.5

Calendar year 1976 meteorological data were inputs to the natural draft cooling tower impact assessment model. Explain the rationale for selection of this year of data and its representativeness with respect to long-term atmospheric conditions.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.2.

QUESTION 372.6

Cite references for the cooling tower impact assessment model which was used.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.2.

QUESTION 372.7

For each parameter, provide the height of meteorological measurement inputs to the model used to assess the impact of the proposed Susquehanna natural draft cooling towers.

RESPONSE:

The response to this question is provided in Subsection 2.3.2.2.

QUESTION 372.8

What is the minimum distance from the onsite meteorological tower to the "deciduous trees in a gully to the south?" How tall are these trees?

RESPONSE:

The response to this question is provided in Subsection 2.3.3.1.

QUESTION 372.9

Regulatory Guide 1.23 identifies recommended accuracies of the entire meteorological data collection and reduction system; however, the specifications provided in Section 2.3.3.3 pertain only to the sensors. Provide the system accuracies for each parameter and compare these with the recommendations of Regulatory Guide 1.23.

RESPONSE:

PP&L believes that the accuracy for sensors was only identified in Regulatory Guide 1.23. Instrumentation accuracies have been presented in the FSAR.

QUESTION 372.10

Are the temperature accuracies presented in Section 2.3.3.3 of the FSAR instantaneous or time-averaged values?

RESPONSE:

The response to this question is provided in Subsection 2.3.3.3.

QUESTION 372.11

On FSAR page 2.3-18, full scale on the wind sensor is listed as 25 mph.

Describe the impact on plant operation and safety of your inability to record occurrences of wind speeds greater than 25 mph.

RESPONSE:

The inability to record occurrences of wind speeds greater than 25 mph has no impact on plant operation and safety.

QUESTION 372.12

Are the digital data recorded onto magnetic tape instantaneous or integrated one-minute time averages?

RESPONSE:

Instantaneous values are recorded on the magnetic tape.

QUESTION 372.13

Discuss the results of the calibration findings including adjustments and/or replacements of components in the data collection and recording system.

RESPONSE:

During the inspection and calibration of the equipment at the Susquehanna SES meteorological tower, all wind speed and wind direction sensors are replaced with pre-calibrated sensors. The dewcell is retreated at least semi-annually.

The translator cards and chart recorders are checked and calibrated as necessary.

As a result of the calibration, the only data which had to be corrected was the wind direction. This correction was due to the meteorological tower being straightened. All other data has not needed correction after the calibration and inspection.

QUESTION 372.14

Provide the dates and times of significant instrument outage, the causes of the outage, and the corrective action taken.

RESPONSE:

The following are the dates and times of significant instrument outage (more than 5 days), the causes of the outage, and the corrective action taken:

Instrument	Date and time of outage	Cause of outage	Corrective action taken
Wind speed 30' level	12/32/73-8 AM to 12/26/73 10 AM	System power failure	Power restored
	1/2/74-11 AM to 1/14/74-11 AM	Frozen bearings	None
	1/18/74-6 AM to 2/25/74-10 AM	Frozen and dirty bearings	Sensor replaced
	12/7/74-8 AM to 12/11/74-9 AM	Frozen and dirty bearings	Sensor replaced
	6/11/75-11 AM to 6/17/75-10 AM	Dirty bearings	Sensor replaced
	6/2/76-3 AM to 6/7/76-11 AM	Dirty bearings	Sensor replaced
	12/3/76-1 AM to 12/10/76-11 PM	Frozen sensor due to storm	None
Wind Speed 300' level	1/6/73-4 AM to 1/15/73-11 AM	Frozen bearings due to precipitation	None

	2/8/73-6 PM to 2/14/73-4 PM	Frozen bearings due to precipitation	None
	5/16/73-10 PM to 5/23/73-11 AM	Dirty bearings	Sensor replaced
	12/21/73-8 AM to 10/26/73-10 AM	System power failure	Power restored
	11/29/76-6 AM to 12/10/76-8 PM	Frozen and dirty bearings	Sensor replaced
Wind Direction 30' level	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
	1/2/74-11 AM to 1/14/74-11 AM	Frozen and dirty bearings	None
	1/18/74-6 AM to 2/25/74-10 PM	Frozen and dirty bearings	Sensor replaced
	12/7/74-8 AM to 12/11/74-9 AM	Frozen and dirty bearings	Sensor replaced
	6/11/75-11 AM to 6/21/75-10 AM	Dirty bearings	Sensor replaced
	6/2/76-3 AM to 6/7/76-11 AM	Dirty bearings	Sensor replaced
Wind Direction 300' level	1/6/73-4 AM to 1/15/73-11 AM	Frozen bearings	None
	2/8/73-6 PM to 2/14/73-4 PM	Frozen bearings	None

	5/16/73-10 PM to 5/23/73-11 AM	Dirty bearings	Sensor replaced
	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
	12/3/76-1 AM to 12/10/76-11 PM	Frozen and dirty bearings	Sensor replaced
Dry bulb Temperature 30' level	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
Wet bulb Temperature 30' level	10/13/73-9 PM to 10/25/73-7 AM	Sensor failure	Sensor replaced
	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
Delta Temperature 100'-30' levels	6/8/73-midnight to 6/14/73-11 PM	Sensor failure	Sensor replaced
	6/27/73-midnight to 7/3/73-10 AM	Sensor failure	Sensor replaced
	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
	1/2/74-11 AM to 1/14/74-11 AM	Sensor failure	Sensor replaced
	1/18/74-6 AM to 2/26/74-11 AM	Sensor failure	Sensor replaced
Delta Temperature 300'-30' levels	1/1/73-midnight to 2/23/73-11 AM	Sensor failure	Sensor replaced

	6/8/73-midnight to 7/20/73-11 PM	Sensor failure	Sensor replaced
	12/21/73-8 AM to 12/26/73	System power failure	Power restored
	1/2/74-11 AM to 1/14/74-10 AM	Sensor failure	Sensor replaced
	1/18/74-6 AM to 2/26/74-11 AM	Sensor failure	Sensor replaced
Precipitation	12/21/73-8 AM to 12/26/73-10 AM	System power failure	Power restored
	12/6/74-11 AM to 12/27/74-5 PM	Ice in weighing mechanism	Ice removed from mechanism
	12/1/76-midnight to 12/31/76-11 PM	Ice in weighing mechanism	Ice removed from mechanism

QUESTION 372.15

Identify the fraction of meteorological data recorded digitally that was lost and supplemented by strip chart records.

RESPONSE:

The response to this question is provided in Subsection 2.3.3.4.

QUESTION 372.16

Provide an estimate of the root mean square and largest differences found in the comparison of strip chart and digital data for each meteorological parameter measured.

RESPONSE:

The response to this question is provided in Subsection 2.3.3.4.

QUESTION 372.17

FSAR page 2.3-21 states that if the wind speed is non-calm and the wind direction is zero, implying a calm, then the wind direction for that observation is set to north. Does this statement mean that all non-calm winds for which no direction was recorded were grouped into the north direction category? What was the frequency of occurrence of this phenomena and what impact does this have on the data summaries which were used in making relative concentration estimates?

RESPONSE:

If the wind speed is calm there can be no direction associated with that observation because the wind direction for a calm must be distributed in proportion to the wind direction frequency of the lowest non-calm wind speed class by stability class. Therefore, it was decided to identify all calm wind directions with a zero. If, however, the wind direction for an observation with a non-calm wind speed was determined to be 0°, indicating calm, this would be an error. So, for all non-calm wind speeds with a wind direction of 0° the wind direction was changed to 360° in order to avoid counting the observation as a calm. For all observations which no wind direction was recorded or was determined to be invalid the direction was "---" indicating missing or invalid data. We do not know the frequency of occurrence of this phenomena but it has no impact whatsoever on the relative concentration estimates.

QUESTION 372.18

A description of the method used to calculate hourly wind directions is provided. What are the bases for selecting the modal direction for wind speeds between calm and 3 mph? How are multi-modal occurrences of the same magnitude within the same hour treated? For wind speeds of about 3 mph, what are the differences in the resultant wind direction selected using the modal technique versus the vector analysis technique?

RESPONSE:

The text of the FSAR has been corrected to reflect the fact that all non-calm wind directions are determined by vector analysis. For calm conditions wind directions are determined by the frequency distribution of the lowest non-calm wind speed class by stability class.

QUESTION 372.19

To calculate short-term diffusion estimates, you have used a directional dependent model. This is to inform you that there are two models which may be used to evaluate atmospheric transport conditions for analysis of accidents.

Attached are a copy of our Interim Branch Technical Position concerning a model which considers horizontal plume meander and the directional dependence of dispersion conditions, air flow, and exclusion area boundaries, and a copy of our DRAFT Regulatory Guide 1.XXX, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," 9/23/77. The model was approved for interim use by the Regulatory Requirements Review Committee on May 2, 1978. If you choose to revise your estimates based on this position, the Susquehanna Units 1 & 2 FSAR should be updated to reflect this change. To facilitate our review we request that you provide the 16 exclusion area boundary distances as described in Section C.2 of Regulatory Guide 1.XXX, if you wish to revise your exclusion area so that it is no longer circular.

RESPONSE:

PP&L does not plan on revising the Susquehanna SES exclusion area.

QUESTION 372.20

How were periods of missing data handled when making running average (e.g., 8 hour) estimates of relative concentration?

RESPONSE:

The response to this question is provided in Subsection 2.3.4.2.

QUESTION 372.21

Section 2.3.4.4 of the FSAR states that "the percentile calculations were performed using the total concentration distribution (independent of sector)," yet FSAR Tables 2.3-93 through 2.3-117 list cumulative percentile by direction. Explain further what the quoted statement means.

RESPONSE:

The response to this question is provided in Subsection 2.3.4.4.

QUESTION 372.22

FSAR Tables 2.3-115 lists a cumulative frequency totaling 138.21 percent in the SE sector. Correct this error.

RESPONSE:

For response see Revised Table 2.3-115.

QUESTION 372.23

The statement is made that "calculations were made after removing all zero values." What was the frequency of occurrence of such values and the impact of removing these values from the cumulative frequency?

RESPONSE:

The response to this question is provided in Subsection 2.3.4.4.

QUESTION 372.24

A puff advection model was used in your assessment of routine releases to derive a table (2.3-128) of terrain correction factor. Were the correction factors which were less than unity used to adjust the uncorrected straight line model?

RESPONSE:

The response to this question is provided in Subsection 2.3.5.1.4.

QUESTION 372.25

Provide a copy of the Dames and Moore Susquehanna tornado evaluation cited in Reference 2.3-18.

RESPONSE:

The above referenced document is provided to you under separate cover.

QUESTION 372.26

The hourly onsite meteorological data which you have submitted indicates that during part of the four year period, the 96m temperature reading exceeded the dew point reading by as much as 9°C during periods of precipitation. What fraction of the time did this occur? Under what conditions might this happen? During a 56 consecutive hour period in 1973 the temperature and dew point readings were identical. To what may this be attributed?

RESPONSE:

We have reviewed the data and determined that during periods of precipitation there were 240 occurrences when the dry bulb temperature was greater than the wet bulb temperature by more than 3°C. These occurrences were noted primarily between the months of April and September. A spot check of some occurrences showed that the precipitation amount was very light (.04) and isolated or it happened during the onset of a long period of precipitation. We feel that passing isolated light showers typical for the April - September period could explain the occurrences which fell into the first category. When the temperature-wet bulb differential is large and precipitation starts it will take some period of continuous precipitation until this differential becomes 3°C or less (Thus, the occurrences during the onset of a precipitation period).

We suspect that the 56-hour period when the temperature and wet bulb were identical was due to an equipment malfunction.

QUESTION 372.27

What are the delta-T intervals used in each of the joint frequency distributions presented (e.g. Tables 2.3-75 through 2.3-81)? Describe the effect on the estimation of atmospheric stability of using an interval from 30.5 to 9.6 meters versus a deeper layer as described in Regulatory Guide 1.23.

RESPONSE:

Refer to Question 372.28 for response.

QUESTION 372.28

FSAR Tables 2.3-75 through 2.3-81 are joint frequency distribution summaries for winds measured at the 9.6 meter level. We have compiled joint frequency distributions for a delta-T interval from 30.5 to 9.6 meters from the hourly data tape which you provided. For some stability classes there are significant differences. Therefore, provide a detailed description of the procedure used to derive the joint frequency distributions which appear in the Susquehanna FSAR. Were these distributions generated from a data tape identical to the tape which was supplied to us or were the data in some other form (e.g., more significant digits, different units)?

RESPONSE:

As discussed in Subsection 2.3.3.6 of the FSAR, the primary delta-T interval was from 31.5 ft. to 300 ft. If these data were missing or invalid, data from the 31.5 ft. to 100 ft interval were used. If both sets of data were missing or invalid, there was no stability classification for that observation. The stability classifications used are as follows:

Pasquill Category	NRC REG 1.23 (°C/100 m)	ΔT°C/270 ft.	ΔT°C/70 ft.
A	<-1.9	<-1.6	<-0.4
B	-1.9 to -1.7	-1.6 to -1.4	-0.4
C	-1.7 to -1.5	-1.3 to -1.2	-0.3
D	-1.5 to -0.5	-1.1 to -0.5	-0.2 to -0.1
E	-0.5 to 1.5	-0.4 to 1.2	0 to 0.3
F	1.5 to 4.0	1.3 to 3.3	0.4 to 0.9
G	>4.0	>3.3	>0.9

Since the interval between 30.5 and 9.6 meters is rather small the stability range is significantly compressed with 5 stability classes falling in a 1.3°C range. With so small a range one would expect to find more values at the ends of the stability classification scale if this were used as the primary delta-T interval.