Public Service
of New Hampshire

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The Northeast Utilities System

September 30, 1994

OCT - 3 1994

D07999

Mr. Brian Hennessey, Mechanical Engineer
Air Management Division
U.S. Environmental Protection Agency
Region I - New England
JFK Federal Building (Mail Code: AAA)
Boston, MA 02203

Dear Mr. Hennessey,

Merrimack Station
Meteorological Data Gap

With reference to your telephone conversation of August 31 with Mr.John Leavitt, Public Service Company of New Hampshire (PSNH) is submitting a proposal to address the meteorological data gap at its Merrimack Station caused by a lightning strike on Saturday, July 9, 1994.

Background & Chronology of Events

July 9	(Saturday) a lightning strike hit the 100-meter meteorological tower (at approx. 2045 EST).
July 11	(Monday) damage was discovered to all four wind direction sensors, the modem and the data collection computer. Although not damaged, the datalogger was off-line. Damage to the SODAR interface card was not discovered until July 15.
July 12	Tower instrumentation returned to service by 0900.
July 16	Modem and replacement computer configured and placed in service. Problems continue with remote access of data and computer crashes.
July 26	Replacement custom card obtained from SODAR vendor and installed. Continuing problems with remote access of data; decision made not to attempt remote access of data until problem identified.

August 5 Improved surge protection installed on tower.

August 29 Replacement computer and custom hardware obtained from vendor and installed; problems resolved.

The resulting data gaps for the period were:

Tower: 61 hours, followed later by a 4-hour gap.
SODAR: 163 hours initially, followed by 176 total additional hours during the following 10-day period.

Proposal for Filling the Gaps in the Dataset

Although the loss of SODAR data during this event has been a serious setback to the program, data recovery for the other eight months of the program to date has been excellent (96-97 percent in the lower layers) and has been over 90 percent with July included. We are confident that 90 percent recovery for the year can be achieved, despite this misfortune, provided another major outage can be avoided. Recovery of tower data is in excess of 98 percent for the year to date.

As we discussed by telephone, PSNH proposes to close the gaps in the dataset as follows:

Tower Data: Where two gaps of 61 and 4 hours exist, PSNH proposes to substitute hourly observed data from the Concord NWS office at the Concord Municipal Airport into the tower dataset. Specifically:

- Wind Direction - to be substituted directly for the 10-, 70- and 100-meter data levels.
- Wind Speed - to be substituted, subject to power law adjustment from the Concord NWS anemometer height of 20 feet to each of the 10, 70- and 100- meter data levels.
- Ambient Temperature - to be substituted directly for each of the 2-, 10-, 40-, 70- and 100- meter data levels.
- Pasquill Stability - to be determined from sky cover and wind speed data.
- Vertical Wind Speed (and sigma w) and sigma-theta - to be left as missing data.

SODAR Data: Where data are missing for 339 total hours over a 17-day span, it is proposed that the dataset be created by extrapolation from the tower data. For 274 of these 339 hours, observed tower data are available to the 100 meter, or stack top, level. The remainder will be filled using Concord NWS data. The SODAR dataset consists of wind direction and wind speed data only. We propose filling these data gaps from the 120 to the 600 meter levels as follows:

- Wind Direction - replicate the-100 meter tower wind direction upward for each SODAR level.

- Wind Speed - using the power law relationship, extrapolate wind speeds from the 100-meter tower wind speed upward to each of the SODAR levels.

PSNH recognizes that these data will not be equivalent in quality to the data collected directly by the on-site instrumentation system. However, this proposal is in keeping with the methods cited in On-Site Meteorological Program Guidance for Regulatory Modeling Applications (EPA-450/4-87-013), revised February 1993, page 6-44. This guidance states that "If data are missing from the primary source, they should be handled as follows, in order of preference: (1) substitution of other representative on-site data; (2) linear interpolation of one or two missing hours; (3) substitution of representative off-site data; or (4) coding as a field of nines, according to the discussions in Section 6.5.3 and 6.6."

It is believed that the Concord NWS site is reasonably representative of the PSNH site, being located some 4 miles distant, at about the same elevation, in the same river valley and having approximately the same valley orientation. Please refer to Attachment 1, excerpted from the Concord (NH) and Suncook (NH) topographic quadrangles, USGS 7.5 minute series.

This method of substitution, assuming wind direction not to vary systematically with height in the lower layer of the atmosphere, while applying the power law relationship to wind speed, is an acceptable objective technique. We have elected to assume temperature is constant with height in the lower 100 meters rather than to use a standard atmospheric lapse rate. This is reasonable because of the susceptibility of the valley to frequent inversion formation. Atmospheric stability is typically not an extremely localized phenomenon. In similar meteorological and terrain regimes and at the same time, stability will tend to be conserved, hence its direct substitution. The extrapolation of wind speed and direction data upward through the SODAR levels is likewise a purely objective technique, free from bias or interpretation.

As PSNH is now in the final third of the twelve months of data collection, it is requested that a decision on this matter be expedited, so that resolution may be achieved on this issue prior to our scheduled end of the data collection period on December 31, 1994.

If you have any questions, please call Mr. Leavitt at (203) 665-4634.

Very truly yours,

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

R. G. Chevalier
Vice President

Enclosure

cc: Mr. James Black
Air Resources Division
Department of Environmental Services
64 North Main Street, Caller Box 2033
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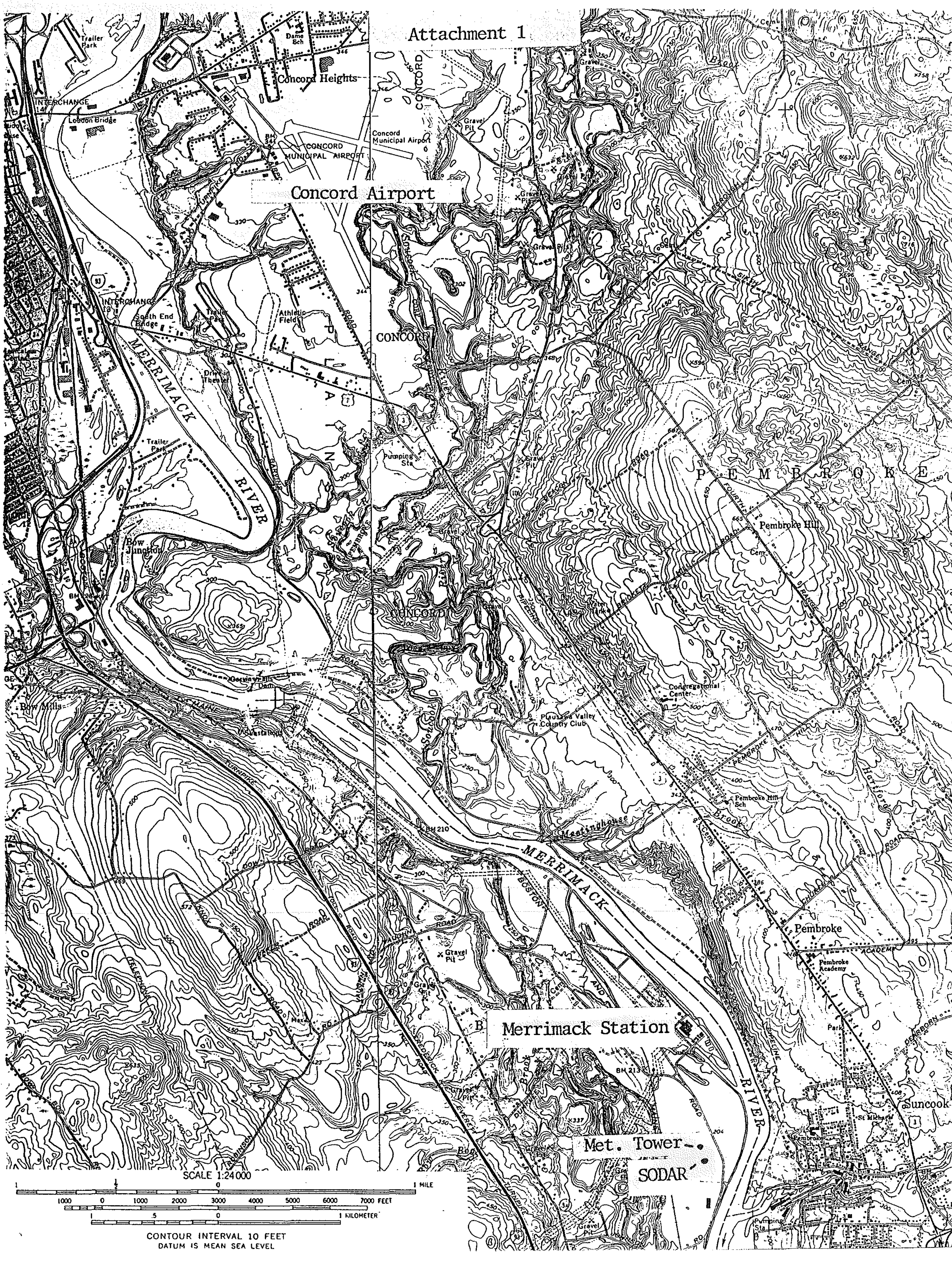
Attachment 1
Concord Airport
Merrimack Station
Met. Tower
SODAR
CONCORD MUNICIPAL AIRPORT
Concord Heights
MERRIMACK RIVER
P E M B R O K E
Pembroke Hill
Pembroke
Pembroke Academy
Suncook
Bow Junction
Bow Mills
SCALE 1:24000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL