

APPENDIX F

Background Sound Levels

**BACKGROUND SOUND LEVEL MONITORING
AT THE PROPOSED GLEN DHU WIND FARM SITE,
OCTOBER 22 to 24, 2007**

Prepared For:
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1.0 INTRODUCTION

On behalf of Shear Wind Inc., a background sound level monitoring program was conducted from October 22 to October 24, 2007 at locations within the boundaries of the proposed Glen Dhu Wind Farm. The purpose of this program was to measure typical sound levels within the proposed project boundary and to compare these levels to guidelines established by Nova Scotia Environment and Labour. This data will provide background sound levels at the project area prior to any activities related to the wind farm project. The findings of this monitoring program are attached.

2.0 METHODOLOGY

Sound levels are typically measured as sound pressure levels in decibels (dBA) which are within the typical audible range for humans. A change in the sound level of 1 dBA cannot be heard by a human. Sound levels were recorded over a 48 hour period from approximately noon on October 22, 2007 to noon October 24, 2007. Other than the installation and removal of the instruments, no other human activity was known to have occurred at these sites during the monitoring period. The instruments recorded sound levels which occurred naturally at the sites over the sampling period.

The monitoring program used four Extech Data Logging Sound Level Meters to sample and record sound pressure levels in db using the A weighting method (dBA). The instruments were set on a fast response time to record sound level peaks and noises which may occur quickly. The sound level detection range is from 30dBA to 130dBA. Prior to the study, all instruments were calibrated following the manufacturer's specifications and Stantec's ISO 9000 protocol for instrument maintenance. The instruments collect readings at 200 millisecond intervals and one minute average value recorded. On recovery from the field, these data are downloaded from the instrument and data tables and graphs presented on an hourly basis as per NSEL guidelines. Maximum, minimum and average values were calculated from the data set for each location.

The locations for the monitoring program were selected to be secure from potential vandalism and to be representative of the study area. The locations are near the boundaries of the proposed wind farm and are considered to reflect the conditions to which on-site or neighbouring receptors would be exposed. The monitoring locations represent various locals within the project boundary as listed in Table 1 and Figure 1.

Ambient sound levels may be influenced by local weather conditions particularly wind speed and direction. Hourly weather records from Environment Canada's weather station at Caribou Point, NS were retrieved to assess the influence of wind conditions during the sound level monitoring period. These data are presented in Appendix A.

The instruments were placed in metal boxes with the microphone element exposed to the outside ambient conditions and the box chained to a rigid object to prevent potential theft. Typically, the instruments were set at between 1 and 2 meters above ground level to emulate the level of a human receptor.

Table 1: Summary of Monitoring Locations

Location Number	Name	Meter Number	Co-ordinates	Elevation (MASL)	Description
1	Nick's Cabin	020110406	20 557831E 5052866N	254	In fork of tree behind cabin and woodshed
2	Glen Dhu Road	020110408	20560049E 5057502N	238	In tree in woods 40m from road
3	Weaver's Met Tower	020110409	20559454E 5046926N	231	Attached to tower cable anchor
4	Marshy Hope	020110410	20561537E 5050231N	245	In tree in woods 30m from road

Note: MASL = meters above sea level

3.0 RESULTS

The results are presented in tabular and graphical form. The average hourly sound level readings for each site are presented in Table 2. Graphical representations of these readings for each site are provided on separate figures. Maximum, minimum and average sound level values for the record period at each location are shown on the lower right-hand corner of the figure.

The red line on each figure represents NSEL sound level guidelines. These guidelines are established on a time-of-day basis as follows:

- 7:00 am until 7:00 pm – 65 dBA
- 7:00 pm until 11:00 pm – 60 dBA
- 11:00 pm until 7:00 am – 55 dBA

The lowest sound level (32.9 dBA) was detected at the Glen Dhu road site at 7:00 pm on October 22, 2007 and the highest sound level (61.8 dBA) at Weaver's Met Tower at 11:00 pm October 23, 2007. The overall average sound level at all sites during the study period was 45.2 dBA

As shown on Table 2 in the highlighted data, exceedences of the night time 55dBA guideline occurred during the monitoring period at each location. The time window for these exceedences was between approximately 8:00 pm on October 23 and 4:00 am on October 24. Differences between the sites are noted both in the sound levels and periods over which the exceedences occurred, however, exceedences were noted at each site in this interval.

Wind speed and direction records for Caribou Point were examined for the period in which maximum sound levels were recorded. It should be noted that Caribou Point is approximately 40 km west of the study area. Given the west to east movement of a local weather system, it is reasonable to assume a time lag between the weather conditions measured at Caribou Point and the conditions experienced in the study area. A 2 hour time lag was allowed in the data set to compensate for the time required for a weather system moving at approximately 20 kph from Caribou Point to the Study Area (40 km).

Background Sound Level Monitoring
Glen Dhu Wind Energy Project

Table 2: Hourly Sound Level Values For Selected Glen Dhu Sites (dBA)

Date/Time	NSEL Guideline	Site #1	Site #2	Site #3	Site #4
10/22/07 12:00	65	40.4	-	-	-
10/22/07 13:00	65	37.4	37.2	-	-
10/22/07 14:00	65	36.4	34.6	36.3	-
10/22/07 15:00	65	35.7	33.4	34.7	35.9
10/22/07 16:00	65	37.2	33.4	38.8	36.8
10/22/07 17:00	65	37.2	34.1	34.2	35.7
10/22/07 18:00	65	37.3	33.8	35.4	35.8
10/22/07 19:00	60	37.8	32.9	38.6	37.7
10/22/07 20:00	60	42.0	33.8	40.9	39.7
10/22/07 21:00	60	43.5	38.2	40.8	40.2
10/22/07 22:00	60	43.5	37.6	46.1	37.6
10/22/07 23:00	55	43.6	34.6	44.1	37.7
10/22/07 24:00	55	45.2	40.2	45.6	38.7
10/23/07 1:00	55	45.7	41.0	42.0	37.7
10/23/07 2:00	55	43.9	37.4	37.1	37.9
10/23/07 3:00	55	40.1	34.4	41.2	37.0
10/23/07 4:00	55	41.4	33.3	40.5	36.7
10/23/07 5:00	55	42.9	35.0	42.7	38.2
10/23/07 6:00	55	49.2	45.9	42.6	41.9
10/23/07 7:00	65	50.4	43.6	50.7	43.1
10/23/07 8:00	65	52.0	46.2	52.2	44.8
10/23/07 9:00	65	51.5	46.9	45.6	45.6
10/23/07 10:00	65	46.1	48.6	47.6	43.0
10/23/07 11:00	65	45.4	48.6	51.2	44.5
10/23/07 12:00	65	47.1	49.1	46.1	46.8
10/23/07 13:00	65	46.7	47.2	50.9	47.8
10/23/07 14:00	65	43.9	46.5	49.1	46.7
10/23/07 15:00	65	44.9	50.3	55.2	45.5
10/23/07 16:00	65	50.8	50.8	56.9	45.9
10/23/07 17:00	65	50.0	48.7	57.2	48.7
10/23/07 18:00	65	47.5	48.1	55.7	47.7
10/23/07 19:00	60	53.9	54.5	58.7	50.5
10/23/07 20:00	60	60.0	56.9	60.6	52.2
10/23/07 21:00	60	58.6	56.5	60.5	53.7
10/23/07 22:00	60	60.5	56.6	61.1	56.7
10/23/07 23:00	55	59.3	57.9	61.8	55.6
10/23/07 24:00	55	60.7	58.6	61.0	53.8
10/24/07 1:00	55	59.5	59.1	60.6	55.6
10/24/07 2:00	55	57.4	53.7	60.4	54.1
10/24/07 3:00	55	52.4	52.4	59.1	52.2
10/24/07 4:00	55	48.8	45.8	53.0	44.9
10/24/07 5:00	55	44.6	42.7	45.7	41.8
10/24/07 6:00	55	48.9	52.7	45.6	51.5
10/24/07 7:00	65	41.0	40.3	44.2	41.2
10/24/07 8:00	65	41.7	41.7	42.0	42.4
10/24/07 9:00	65	43.9	41.6	43.1	43.1
10/24/07 10:00	65	39.3	36.3	40.7	39.4
10/24/07 11:00	65	39.1	35.3	40.2	39.6
10/24/07 12:00	65	40.3	36.2	42.9	39.5
10/24/07 13:00	65	-	34.5	37.1	37.1
10/24/07 14:00	65	-	-	37.2	36.1
10/24/07 15:00	65	-	-	-	36.2

Note: Shading denotes exceedances for NSEL guideline

Table 3 shows maximum, minimum and average values for winds at Caribou Point over the 8 hour periods adjusted for the time lag due to distance. These data show a correlation between the occurrence of increased wind velocity and background sound levels.

Table 3: Wind conditions at Caribou Point during selected time periods

Time Period	Wind Direction (from)	Maximum Wind Speed (kph)	Minimum Wind Speed (kph)	Average Wind Speed (kph)
10:00 am to 6:00 pm, Oct.23	SW	22	11	15
6:00 pm, Oct.23 to 2:00 am, Oct.24 ¹	SW	32	26	29
2:00 am to 10:00 am, Oct.24	SW changing to NW	28	9	15

Note: 1 – Period of Maximum background sound levels minus two hours

4.0 DISCUSSION

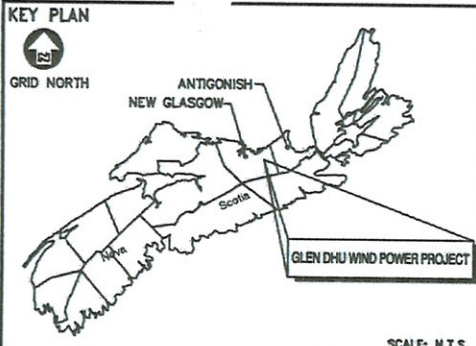
The sound levels measured in this test represent a small sample of the ambient sound levels in the proposed project area. The data indicate that there are ambient sources of sounds which may exceed the provincial night time guidelines. These sounds may be generated by wind in the trees and may vary from site to site depending on the type of vegetation, local topography and localized wind velocities. It is noted that the trees in the study areas were largely deciduous and in their fall foliage condition.

To put sound levels into a familiar context, typical rural night time sound levels are in the range of 20 to 40 dBA depending on the wind conditions. The typical noise level in a living room is between 40-50 dBA and in a business office is between 60-70 dBA. A person standing 100m (300 ft) from a car traveling at 40mph will be exposed to approximately 55 dBA. A person standing 100m (300 ft) from a truck traveling at 30 mph will be exposed to 65 dBA. Jet aircraft passing at 250 m will create 105 db(A). The human pain threshold for noise occurs at 140 dBA.

Wind direction relative to the source is a significant factor in assessing noise level from anthropogenic sources. With the wind blowing towards a receptor, at 40 m (130 feet) distance, a large wind turbine will produce a typical sound pressure level of 50 to 60 dBA. Further away, at 500 m (1650 feet) approximately this level drops to 25 to 35 dBA. With the wind blowing away from the receptor these sound levels will decrease by approximately 10 dBA.

5.0 CONCLUSIONS

The sound level measurements collected in the 48 hour period in October 2007 at four locations within the Glen Dhu wind farm site are considered representative of typical background sound levels for the area in autumn conditions. The locations selected are near the boundaries of the proposed wind farm and are considered to reflect the conditions to which on-site or neighbouring human and ecological receptors would be exposed. Under some wind conditions with fall foliage present, background sound levels may exceed provincial guidelines for night time sound levels.

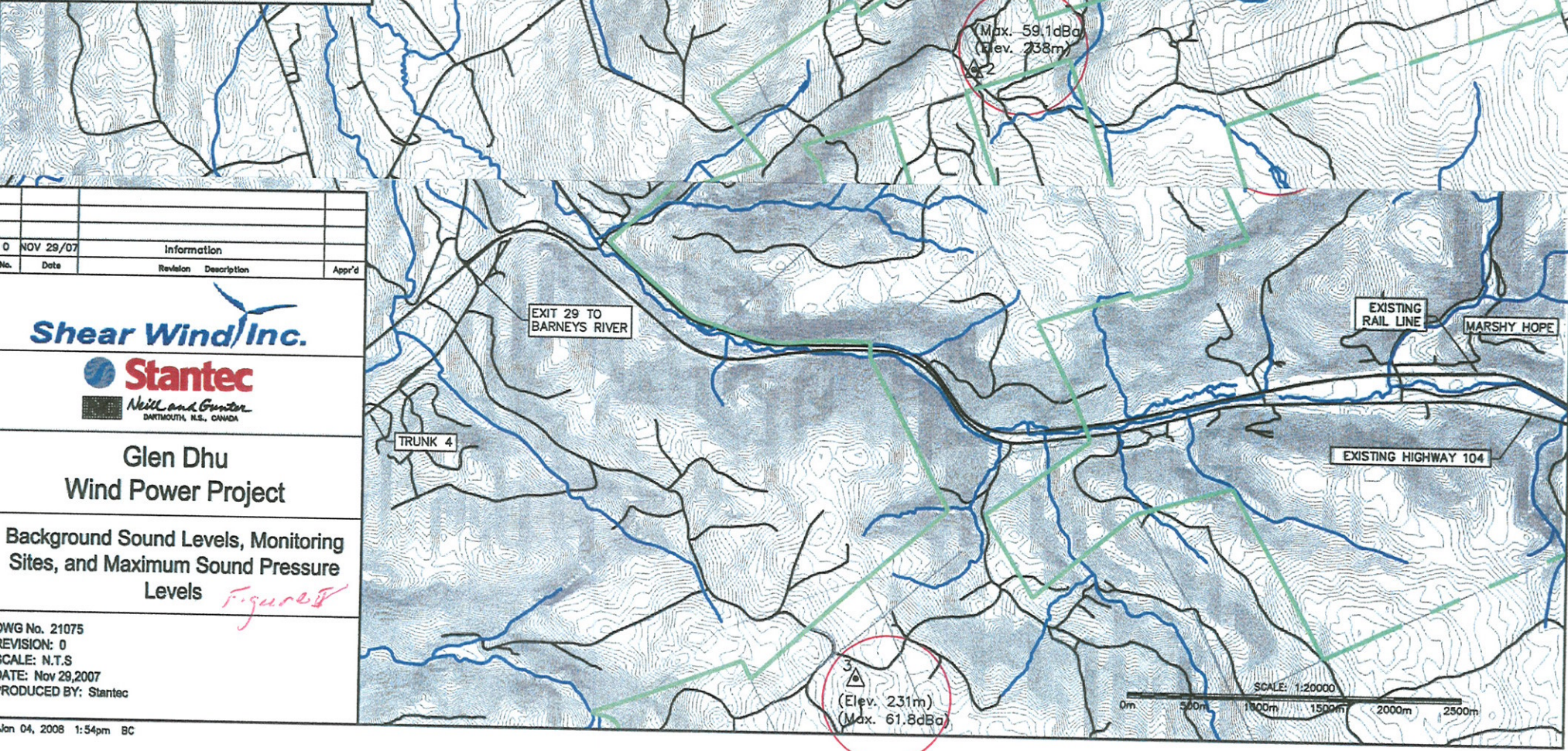


GRID NORTH

SCALE: N.T.S.

LEGEND:

2A
▲ MONITORING LOCATION
(Elev. 238m)
(Max. 56.7dB)



No.	Date	Revision	Description	Appr'd
0	NOV 29/07		Information	

Shear Wind Inc.

Stantec

Neill and Guntor
DARTMOUTH, N.S., CANADA

**Glen Dhu
Wind Power Project**

Background Sound Levels, Monitoring Sites, and Maximum Sound Pressure Levels *Figure 2*

DWG No. 21075
REVISION: 0
SCALE: N.T.S.
DATE: Nov 29, 2007
PRODUCED BY: Stantec

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Background Sound Level Monitoring
Glen Dhu Wind Energy Project

APPENDIX A
Weather Data for Caribou Point, October 22-24, 2007

Site #1
Nick Williams Cabin: 20557831E, 5052866N, el. 254m
48-Hour Period - Hourly Noise Data
October 22 to 24, 2007



Hourly Data NSEL Guideline

Max: 60.7 dBA
Min: 35.7 dBA
Average: 46.3 dBA

Site #2
Top of Glen Dhu Road: 20560049E, 5052866N, el. 238m
48-Hour Period - Hourly Noise Data
October 22 to 24, 2007



Hourly Data NSEL Guideline

Max: 59.1 dBA
Min: 32.9 dBA
Average: 43.6 dBA

Site #3
Weaver's Met Tower: 20559454E, 5046926N, el. 231m
48-Hour Period - Hourly Noise Data
October 22 to 24, 2007



Max: 61.8 dBA
Min: 34.2 dBA
Average: 47.3 dBA

Hourly Data NSEL Guideline

Site #4
Marshy Hope: 20561537E, 5050231N, el. 245m
48-Hour Period - Hourly Noise Data
October 22 to 24, 2007



— Hourly Data — NSEL Guideline

Max: 56.7 dBA
Min: 35.7 dBA
Average: 43.5 dBA

APPENDIX A
Weather Data for Caribou Point, October 22-24, 2007

**Hourly Data Report for October 22, 2007**

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.
**CARIBOU POINT (AUT)
NOVA SCOTIA**
Latitude: 45° 46.200' N**Longitude:** 62° 40.800' W**Elevation:** 02.40 m**Climate ID:** 8200774**WMO ID:** 71415**TC ID:** WBK

Hourly Data Report for October 22, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Sta Press kPa	Hmdx	Wind Chill	Weather
00:00	14.3	7.2	62	25	15	M	101.26			NA
01:00	14.0	7.4	64	25	13	M	101.26			NA
02:00	14.4	7.7	64	25	11	M	101.30			NA
03:00	14.7	7.9	64	26	17	M	101.33			NA
04:00	14.4	8.3	67	27	20	M	101.47			NA
05:00	14.4	9.4	72	29	24	M	101.51			NA
06:00	13.2	9.1	76	28	15	M	101.58			NA
07:00	13.0	8.8	76	27	17	M	101.65			NA
08:00	13.9	9.5	75	28	20	M	101.72			NA
09:00	15.1	9.4	69	27	17	M	101.73			NA
10:00	15.6	10.2	70	29	19	M	101.76			NA
11:00	15.7	10.6	72	30	17	M	101.78			NA
12:00	15.8	10.7	72	31	15	M	101.76			NA
13:00	16.1	11.0	72	33	9	M	101.69			NA
14:00	16.4	11.6	73	11	6	M	101.69			NA
15:00	16.1	12.0	77	14	11	M	101.65			NA
16:00	15.1	12.0	82	13	13	M	101.63			NA
17:00	14.6	11.5	82	14	9	M	101.61			NA
18:00	15.0	12.3	84	20	9	M	101.61			NA
19:00	16.7	10.9	69	22	9	M	101.62			NA
20:00	15.3	10.4	73	21	11	M	101.63			NA
21:00	15.4	11.4	77	20	17	M	101.59			NA
22:00	14.8	11.0	78	22	7	M	101.53			NA
23:00	14.3	10.8	79	21	9	M	101.45			NA

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**Hourly Data Report for October 23, 2007**

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

CARIBOU POINT (AUT) NOVA SCOTIA
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Latitude: 45° 46.200' N**Longitude:** 62° 40.800' W**Elevation:** 02.40 m**Climate ID:** 8200774**WMO ID:** 71415**TC ID:** WBK

Hourly Data Report for October 23, 2007

T i m e	Temp °C 	Dew Point Temp °C 	Rel Hum % 	Wind Dir 10's deg	Wind Spd km/h 	Visibility km	Stn Press kPa 	Hmdx	Wind Chill	Weather
00:00	14.2	10.5	78	22	9	M	101.44			NA
01:00	13.5	10.3	81	22	9	M	101.45			NA
02:00	13.5	10.6	83	21	13	M	101.36			NA
03:00	12.7	10.3	85	17	9	M	101.26			NA
04:00	13.0	10.3	84	20	15	M	101.19			NA
05:00	12.8	9.4	80	21	22	M	101.13			NA
06:00	12.3	8.9	80	22	24	M	101.10			NA
07:00	12.4	9.0	80	22	20	M	101.06			NA
08:00	12.5	9.8	84	20	28	M	101.06			NA
09:00	13.1	10.5	84	20	24	M	101.01			NA
10:00	13.5	10.8	84	21	22	M	101.00			NA
11:00	14.6	11.6	82	22	19	M	100.97			NA
12:00	16.1	12.5	79	21	13	M	100.83			NA
13:00	16.9	12.9	77	23	13	M	100.74			NA
14:00	18.4	13.1	71	23	17	M	100.57			NA
15:00	19.2	13.8	71	24	13	M	100.52			NA
16:00	19.6	14.0	70	24	13	M	100.47			NA
17:00	19.4	13.8	70	24	11	M	100.44			NA
18:00	19.7	13.8	69	22	26	M	100.34			NA
19:00	18.9	14.0	73	22	26	M	100.29			NA
20:00	18.5	13.9	75	22	30	M	100.20			NA
21:00	17.9	13.9	77	22	32	M	100.13			NA
22:00	18.2	14.4	78	21	32	M	100.07			NA
23:00	18.3	14.4	78	22	32	M	100.06			NA

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Environment Canada's World Wide Web Site.



Hourly Data Report for October 24, 2007

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

Notes on Data Quality.

CARIBOU POINT (AUT) NOVA SCOTIA
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Latitude: 45° 46.200' N

Longitude: 62° 40.800' W

Elevation: 02.40 m

Climate ID: 8200774

WMO ID: 71415

TC ID: WBK

Hourly Data Report for October 24, 2007

Time	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	18.0	14.3	79	22	26	M	100.04			NA
01:00	17.8	14.4	80	21	28	M	99.94			NA
02:00	17.9	14.6	81	23	17	M	99.99			NA
03:00	17.4	14.9	85	23	13	M	100.02			NA
04:00	17.0	15.2	89	23	9	M	100.12			NA
05:00	16.9	15.5	91	26	13	M	100.24			NA
06:00	16.5	15.2	92	25	11	M	100.27			NA
07:00	14.1	12.5	90	30	26	M	100.43			NA
08:00	12.6	10.5	87	33	28	M	100.59			NA
09:00	12.4	10.2	86	33	24	M	100.68			NA
10:00	11.9	8.6	80	33	26	M	100.83			NA
11:00	11.8	8.4	80	33	22	M	100.93			NA
12:00	11.4	7.9	79	33	19	M	101.00			NA
13:00	11.4	7.8	79	33	15	M	101.00			NA
14:00	11.7	8.1	79	33	19	M	101.11			NA
15:00	11.8	7.8	76	33	13	M	101.16			NA
16:00	11.7	7.5	75	33	15	M	101.25			NA
17:00	11.4	7.2	75	36	13	M	101.36			NA
18:00	11.1	7.1	76	3	13	M	101.37			NA
19:00	10.8	6.7	76	1	15	M	101.56			NA
20:00	10.6	7.3	80	2	19	M	101.67			NA
21:00	10.2	7.0	81	3	17	M	101.74			NA
22:00	9.9	6.7	80	3	15	M	101.81			NA
23:00	9.7	6.3	79	4	13	M	101.83			NA

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