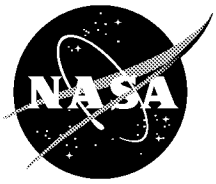
NASA/TM—2000–209891, Vol. 223



Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)

Forrest G. Hall and Sara K. Conrad, Editors

Volume 223

BOREAS TGB-1/TGB-3 Water Table and Peat Temperature Data over the NSA

Jill L. Bubier, University of New Hampshire, Durham
Neil Comer and Tim R. Moore, McGill University, Montreal, Quebec

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

November 2000

The NASA STI Program Office ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the lead center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

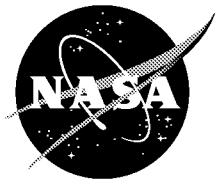
- TECHNICAL PUBLICATION. Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.
- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.
- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and mission, often concerned with subjects having substantial public interest.
- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- Access the NASA STI Program Home Page at http://www.sti.nasa.gov/STI-homepage.html
- E-mail your question via the Internet to help@sti.nasa.gov
- Fax your question to the NASA Access Help Desk at (301) 621-0134
- Telephone the NASA Access Help Desk at (301) 621-0390
- Write to:
  NASA Access Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

NASA/TM—2000–209891, Vol. 223



Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)

Forrest G. Hall and Sara K. Conrad, Editors

Volume 223

BOREAS TGB-1/TGB-3 Water Table and Peat Temperature Data over the NSA

Jill L. Bubier, University of New Hampshire, Durham
Neil Comer and Tim R. Moore, McGill University, Montreal, Quebec

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

November 2000

Available from:

NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320
Price Code: A17

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Price Code: A10

BOREAS TGB-1, TGB-3 Water Table and Peat Temperature Data over the NSA

Jill L. Bubier, Neil Comer, Tim R. Moore

Summary

The BOREAS TGB-1 and TGB-3 teams collected several data sets that contributed to understanding the measured trace gas fluxes over sites in the NSA. This data set contains continuous and manual measurements of water level and air and soil temperatures at the four subsites within the NSA Tower Fen site complex. The measurements were taken to understand the thermal and hydrological gradients associated with each plant community present in the fen. Measurements were taken from May to September 1994 and May to October 1996. The data are provided in tabular ASCII files.

Table of Contents

1. Data Set Overview

1.1 Data Set Identification

BOREAS TGB-01/TGB-03 Water Table and Peat Temperature Data over the NSA

1.2 Data Set Introduction

The Trace Gas Biogeochemistry (TGB)-01 and -03 teams collected automated and manual water table, surface fluctuations, and thermal profile measurements at the Northern Study Area (NSA) Tower Fen (TF) site. These measurements complement the Net Ecosystem Exchange (NEE) measurements to help understand the environmental controls on NEE. Measurements were made from the period of snow melt and thaw through the full growing season to the fall freeze.

1.3 Objective/Purpose

Continuous measurements of water level and air and soil temperatures were taken to understand the thermal and hydrological gradients associated with each plant community. Measurements were taken at the four subsites within the fen in the NSA. The locations represent the range of plant communities, water chemistry, and peatland types found in northern peatlands, including bog, rich fen, poor fen, and collapse scar (pH ranges from 3.8 to 7.2).

1.4 Summary of Parameters and Variables

The water table level, surface fluctuations, and peat temperatures were measured at four locations in the NSA TF site. The water table and peat temperatures were measured at multiple depths for each subsite studied.

1.5 Discussion

NEE was measured at four subsites in the NSA fen, designated as collapse bog (CB), collapse fen (CF), TF, and Zoltai fen (ZF). Each collar location is further designated by a spur (1, 2, 3, or 4) along the boardwalk at each subsite and by the microtopography or dominant ground cover of the collar location: pal=palsa, hk=hummock, hw=hollow, lwn=lawn, moat=open water at the edge of the collapse scars, b_moss=brown moss, sph=sphagnum, and lich=lichen. Continuous water table and temperatures were recorded at each of the subsites to accompany the NEE measurements. Temperatures of the air, 5-cm, 10-cm, 20-cm, and 50-cm peat depth were measured at each subsite. Temperatures correspond to the collar location at the subsite. In cases where the continuous data were missing, manual soil temperatures were recorded. Continuous water level measurements were taken at each subsite and are designated by the subsite abbreviation and the number of the spur (e.g., CBWL1=collapse bog, water level, spur 1).

1.6 Related Data Sets

BOREAS TGB-04 Water and Sediment Temperature Data over the NSA
BOREAS TGB-01/TGB-03 NEE Data over the NSA Fen

2. Investigator(s)

2.1 Investigator(s) Name and Title

Dr. Timothy R. Moore
Professor
Geography Department
McGill University

2.2 Title of Investigation

Carbon Dioxide and Methane Exchanges Between Wetland and Upland Soils and the Atmosphere

2.3 Contact Information

Contact 1:

Dr. Tim R. Moore
Department of Geography
805 Sherbrooke St. W.
Montreal, Quebec H3A 2K6
(514) 398-4961
moore@felix.geog.mcgill.ca

Contact 2:
Dr. Jill Bubier
Institute for the Study of Earth, Oceans, and Space
Complex Systems Research Center
University of New Hampshire
Durham, NH 03824
(603) 862-4208
(603) 862-0188 (fax)
jill.bubier@unh.edu

Contact 3:
Jeffrey A. Newcomer
Raytheon ITSS
Code 923
NASA GSFC
Greenbelt, MD 20771
(301) 286-7858
(301) 286-0239 (fax)
Jeffrey.Newcomer@gsfc.nasa.gov

3. Theory of Measurements

Water Table and Surface Fluctuation: A potentiometer (variable resistor) attached to a float determines the voltage measured by the datalogging device. The potentiometer is calibrated for 1 mV = 1 mm of float movement. A datalogger measures this voltage.

Temperature Profiles: Copper-constantan thermocouple wire induces a current between the two dissimilar metals according to the temperature at the junction of the two wires. When these junctions are placed at known depths along a rod driven into the ground, a temperature profile can be measured by a datalogger, if the temperature of the opposite junction is known. This temperature is known by a direct measurement from the datalogger. To permit all temperatures to be measured by one datalogger, a multiplexer was used to make more measurements than the datalogger alone would allow.

4. Equipment

4.1 Sensor/Instrument Description

Instrumentation at all four sites included Campbell Scientific CR10 dataloggers, Campbell Scientific AM416 multiplexers, and 20 turn potentiometers. Multiplexers were used to measure an array of thermocouple rods measuring temperature profiles at several locations within each site. Potentiometers were attached to floats within wells dug into the wetlands to measure the fluctuations of water tables. Surface level fluctuations (where made) used the same method, with the beaded cable connected to a "bog shoe" that sat on the wetland surface and moved up and down with the surface. All data were collected every 1 minute and averaged and saved by the datalogger every 30 minutes.

Continuous water table measurements were made with a float and counterweight attached to a wheel and a potentiometer mounted on a platform that rested on top of a wooden post anchored in the clay below the peat. The potentiometer was wired to either a CR10 or CR7 datalogger (Campbell Scientific, Inc., Logan, UT) and recorded the change in water level in mV. Wells were constructed of PVC tubing. Peat temperatures were recorded with type T thermocouples (copper-constantan) attached at four levels (5, 10, 20, and 50 cm) to wooden stakes and inserted into the peat during the fall of 1995. The thermocouples were wired to either CR10 or CR7 dataloggers and calibrated to reference temperatures.

4.1.1 Collection Environment
Samples were collected under all environmental conditions.

4.1.2 Source/Platform
The datalogger and multiplexers were mounted on the ground. Water level recorders and surface bog shoe supports were mounted on poles driven deeply into the peat to avoid vertical movement. Thermocouple rods were driven into peat at assigned depths.

4.1.3 Source/Platform Mission Objectives
The objective was to collect continuous water table and surface fluctuations and thermal profile measurements of four sites near the NSA TF: TF< ZF, CF, and CB.

4.1.4 Key Variables
Water table measurements referenced to the wetland surface. Surface fluctuation measurements referenced to arbitrary datum. Temperature profiles (four measurements) at various locations within each site.

4.1.5 Principles of Operation
Water Table and Surface Fluctuation: A potentiometer (variable resistor) attached to a float determines the voltage measured by the datalogging device. The potentiometer is calibrated for 1 mV = 1 mm of float movement. A datalogger measures this voltage.

Temperature Profiles: Copper-constantan thermocouple wire induces a current between the two dissimilar metals according to the temperature at the junction of the two wires. By placing these junctions at known depths along a rod driven into the ground, a temperature profile can be measured by a datalogger, if the temperature of the opposite junction is known. This temperature is known by a direct measurement from the datalogger. To permit all temperatures to be measured by one datalogger, a multiplexer was used to make more measurements than the datalogger alone would allow.

4.1.6 Sensor/Instrument Measurement Geometry
Water Table: Referenced to the average wetland surface height, so a measurement of 0 represents a water table at the wetland surface, and negative values indicate a water table below the wetland surface. Regular manual measurements of water table depth were taken (weekly) for calibration of the electronic readings.

Surface Fluctuations: Measured similarly to water table and referenced to an arbitrary datum below the surface determined at the beginning of the measurement period. This was possible because the mounting poles for the water table and surface were sufficiently deep into the peat to prevent their movement as well.

Ground Temperatures: Referenced to the average wetland surface height. Measurement depths were set at 5 cm, 10 cm, 20 cm, and 40 cm.

4.1.7 Manufacturer of Sensor/Instrument
Thermocouple wire: Type T, Supplier Electrosonic
Dataloggers and Multiplexers:
Campbell Scientific,
Canada Corporation
11564-149th Street
Edmonton, AB
Canada, T5M 1W7
(403) 454-2505
(403) 454-2655 (fax)

Water Table and Surface Measurement:
Bournes Precision Twenty turn potentiometers manufactured by
Electrosonic, Inc.
110 Gordon Baker Road
Willowdale, ON,
Canada M2H 3B3

The potentiometers were enclosed in PVC electrical boxes and connected to aluminum wheels upon which beaded cable and a float (or bog shoe) are attached. They are calibrated for 1 mV of voltage change = 1 mm of float height change. These water level recorders were manufactured by TGB-04.

4.2 Calibration

Ground Temperatures: No calibration was necessary because the principle of induced current from the contact of dissimilar metals applies.

Water Levels and Surface Fluctuations: Potentiometers and machined aluminum wheels were calibrated from previous experiments. Weekly manual measurements of water table depth were taken to ensure proper calibration of the electronic measurements.

4.2.1 Specifications

Ground Temperatures: Type T thermocouple rated at +/- 0.01 °C maximum error. Water and Surface Levels: Maximum error of 1 mm.

4.2.1.1 Tolerance

- Ground Temperatures: Range allowable: +/-62.5 °C of datalogger temperature (0-2.5 mV to datalogger).
- Water and Surface Levels: Range allowable: largely dependent upon length of beaded cable (0-2.5 V to datalogger).

4.2.2 Frequency of Calibration

Instruments were calibrated once before field deployment. Weekly manual measurements of ground temperatures and water and surface levels were also performed.

4.2.3 Other Calibration Information

No corrections were required according to the calibration methods described above.

5. Data Acquisition Methods

Ground Temperatures: Four thermocouples were affixed within each thermocouple rod and sealed in a waterproof epoxy. Thermocouple wires from each thermocouple rod were wired into the Campbell multiplexer to allow for approximately 16-20 separate measurements at each site. The multiplexer was then connected to the CR10 datalogger and a reference thermocouple was run between the datalogger and multiplexer to measure the multiplexer temperature that served as a reference for all measurements. The datalogger was then instructed to use this multiplexer temperature as the basis for the calculation of all the temperatures found on the thermocouple rods (by differential voltage measurements).

Water Level and Surface Fluctuation Recorders: The potentiometer varied the voltage measured by the datalogger as the float (or bog shoe) on the beaded cable rose and lowered due to water table changes. The datalogger measured this changing voltage, which was easily converted into a height change since the potentiometers were calibrated to 1 mV of change being equal to 1 mm of vertical water change.

Temperature and water level were measured continuously and averaged every hour on the CR10 or CR7 dataloggers. Manual measurements of air temperature, peat temperature, and water table position were made at the same time as the NEE measurements.

6. Observations

6.1 Data Notes

None.

6.2 Field Notes

Throughout the summer, there were no unusual occurrences that would interrupt the data other than standard maintenance, which could have affected the measured parameters for short periods of time (less than 30 minutes).

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage

The collars were placed so as to cover the environmental gradients in the TF complex, an area approximately 6 km^2. Global Positioning System (GPS) coordinates based on the North Amercian Datum of 1983 (NAD83) for the major sampling locations are:

Site	NLat	SDev	WLon	SDev	Elev	SDev
Collapse Bog (CB)	55°55'4.931"	2.75	98°25'5.294"	1.18	217.20	3.86
Collapse Fen (CF)	55°54'59.959"	5.60	98°25'6.109"	1.90	218.40	7.62
Zoltai Fen (ZF)	55°55'5.477"	2.07	98°25'26.396"	1.29	217.10	3.11

Collapse Bog (CB) collars were located in a small, circular collapse scar (75 m diameter) almost completely surrounded by permafrost peat plateau, behind the generator shed. Three spurs were located perpendicular to the boardwalk. Spur 1 was adjacent to the moat, or open water lagg area; spur 2 was in a hummock-hollow area; and spur 3 was in the center of the collapse scar. In addition to the collars in the collapse scar, this subsite had two collars on the palsa (frozen peat plateau) adjacent to the collapse scar. Collar designations were as follows:

```
CB1moat   = collapse bog, spur 1, moat
CB2hk     = collapse bog, spur 2, hummock
CB2hw     = collapse bog, spur 2, hollow
CB3hk     = collapse bog, spur 3, hummock
CBpalmoss = collapse bog, palsa, moss
Cbpallich = collapse bog, palsa, lichen
```

Collapse Fen (CF) collars were located in a small, linear collapse feature that was east of and accessed from the main trail to the tower hut. Four spurs were located perpendicular to the main boardwalk. Spur 1 was located adjacent to the moat; spur 2 was in a uniform lawn of Sphagnum riparium; spur 3 was in a small treed ridge; and spur 4 was on the far edge of the collapse scar where the influence of groundwater was apparent. Collar designations were as follows:

```
CF1moat  = collapse fen, spur 1, moat
CF2lwn   = collapse fen, spur 2, lawn
CF3hka   = collapse fen, spur 3, hummock (a)
CF3hkb   = collapse fen, spur 3, hummock (b)
CF4bmoss = collapse fen, spur 4, brown moss
CF4sph   = collapse fen, spur 4, sphagnum
```

Tower Fen (TF) collars were located along the boardwalk to the micrometeorological tower in the NSA fen. Four spurs were located perpendicular to the main boardwalk. Spur 1 was just beyond the moat at the beginning of the boardwalk in a treed area of tamarack (Larix laricina), spur 2 was in a tall shrub zone (Betula glandulosa), spur 3 was in a low shrub zone just before the hut, and spur 4 was just beyond the hut in a mixed low shrub/sedge zone. Collar designations were as follows:

```
TF1hk = tower fen, spur 1, hummock
TF2hk = tower fen, spur 2, hummock
TF2hw = tower fen, spur 2, hollow
TF3hk = tower fen, spur 3, hummock
TF3hw = tower fen, spur 3, hollow
TF4hw = tower fen, spur 4, hollow
```

Zoltai Fen (ZF) collars were located in a sedge-dominated (Carex spp.) fen area of the peatland complex, north of the fen tower, and accessed from Rt. 391. Three spurs were located perpendicular to the main boardwalk. Spur 1 was on a treed ridge; spur 2 was in a shrub-dominated hummock-hollow area; and spur 3 was in a wet, sedge-dominated area near the edge of a palsa. Collar designations were as follows:

```
ZF1hk    = zoltai fen, spur 1, hummock
ZF2hk    = zoltai fen, spur 2, hummock
ZF2hw    = zoltai fen, spur 2, hollow
ZF3bmoss = zoltai fen, spur 3, brown moss
ZF3hw    = zoltai fen, spur 3, hollow (Sphagnum)
ZF3hk    = zoltai fen, spur 3, hummock (Sphagnum)
```

7.1.2 Spatial Coverage Map
Not available.

7.1.3 Spatial Resolution
Measurements were taken at collar sites that spanned the full range of hydrologic, plant community, and water chemistry gradients found in the larger peatland complex.

7.1.4 Projection
Not applicable.

7.1.5 Grid Description
Not applicable.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage
The first version of the data was collected during the summer of 1994 between 26-May and 16-Sep. Water table and temperature measurements were recorded continuously from approximately 04-May-1996 to 23-October-1996.

7.2.2 Temporal Coverage Map
Not applicable.

7.2.3 Temporal Resolution
The data were collected continuously at a frequency of 30 minutes. The value represents the averaged data values for the previous 30 minutes.

7.3 Data Characteristics

7.3.1 Parameter/Variable

The parameters contained in the data files on the CD-ROM are:

Column Name
SITE_NAME
SUB_SITE
DATE_OBS
TIME_OBS
SITE_COMMENTS
CONTINUOUS_WATER_LVL_1HW
CONTINUOUS_WATER_LVL_2HK
CONTINUOUS_WATER_LVL_2HW
CONTINUOUS_WATER_LVL_3HW
CONTINUOUS_WATER_LVL_4HW
MANUAL_WATER_LVL_1HW
MANUAL_WATER_LVL_2HW
MANUAL_WATER_LVL_3HW
MANUAL_WATER_LVL_4HW
BOG_SHOE_1HW
BOG_SHOE_3HW
AIR_TEMP
PEAT_TEMP_1HW_10CM
PEAT_TEMP_1HW_20CM
PEAT_TEMP_1HW_50CM
PEAT_TEMP_1HW_100CM
PEAT_TEMP_1HK_5CM
PEAT_TEMP_1HK_10CM
PEAT_TEMP_1HK_20CM
PEAT_TEMP_1HK_50CM
PEAT_TEMP_2HW_5CM
PEAT_TEMP_2HW_10CM
PEAT_TEMP_2HW_20CM
PEAT_TEMP_2HW_50CM
PEAT_TEMP_2HW_100CM
PEAT_TEMP_2HK_5CM
PEAT_TEMP_2HK_10CM
PEAT_TEMP_2HK_20CM
PEAT_TEMP_2HK_50CM
PEAT_TEMP_2HK_100CM
PEAT_TEMP_3HW_5CM
PEAT_TEMP_3HW_10CM
PEAT_TEMP_3HW_20CM
PEAT_TEMP_3HW_50CM
PEAT_TEMP_3HW_100CM
PEAT_TEMP_3HK_5CM
PEAT_TEMP_3HK_10CM
PEAT_TEMP_3HK_20CM
PEAT_TEMP_3HK_50CM
PEAT_TEMP_3HKA_5CM
PEAT_TEMP_3HKA_10CM
PEAT_TEMP_3HKA_20CM

PEAT_TEMP_3HKA_50CM
PEAT_TEMP_3HKB_5CM
PEAT_TEMP_3HKB_10CM
PEAT_TEMP_3HKB_20CM
PEAT_TEMP_3HKB_50CM
PEAT_TEMP_4HW_5CM
PEAT_TEMP_4HW_10CM
PEAT_TEMP_4HW_20CM
PEAT_TEMP_4HW_50CM
PEAT_TEMP_1MOAT_5CM
PEAT_TEMP_1MOAT_10CM
PEAT_TEMP_1MOAT_20CM
PEAT_TEMP_1MOAT_50CM
PEAT_TEMP_2LAWN_5CM
PEAT_TEMP_2LAWN_10CM
PEAT_TEMP_2LAWN_20CM
PEAT_TEMP_2LAWN_50CM
CRTFCN_CODE
REVISION_DATE

7.3.2 Variable Description/Definition

The descriptions of the parameters contained in the data files on the CD-ROM are:

Column Name	Description
SITE_NAME	The identifier assigned to the site by BOREAS, in the format SSS-TTT-CCCCC, where SSS identifies the portion of the study area: NSA, SSA, REG, TRN, and TTT identifies the cover type for the site, 999 if unknown, and CCCCC is the identifier for site, exactly what it means will vary with site type.
SUB_SITE	The identifier assigned to the sub-site by BOREAS, in the format GGGGG-IIIII, where GGGGG is the group associated with the sub-site instrument, e.g. HYD06 or STAFF, and IIIII is the identifier for sub-site, often this will refer to an instrument.
DATE_OBS	The date on which the data were collected.
TIME_OBS	The Greenwich Mean Time (GMT) when the data were collected.
SITE_COMMENTS	Descriptive information to clarify or enhance the site information.
CONTINUOUS_WATER_LVL_1HW	Water level position "a", negative numbers indicate the level is below the peat surface, positive values indicate the level is above the peat surface.
CONTINUOUS_WATER_LVL_2HK	Water level position at the hummocks, negative numbers indicate the level is below the peat surface-- positive values indicate the level is above the peat surface.
CONTINUOUS_WATER_LVL_2HW	Water level position "b", negative numbers indicate the level is below the peat surface-- positive values indicate the level is above the

	peat surface.
CONTINUOUS_WATER_LVL_3HW	Water level position "c", negative numbers indicate the level is below the peat surface--positive values indicate the level is above the peat surface.
CONTINUOUS_WATER_LVL_4HW	Water level position "d", negative numbers indicate the level is below the peat surface--positive values indicate the level is above the peat surface.
MANUAL_WATER_LVL_1HW	Water level position "a", negative numbers indicate the level is below the peat surface--positive values indicate the level is above the peat surface. Data was taken manually.
MANUAL_WATER_LVL_2HW	Water level position "b", negative numbers indicate the level is below the peat surface--positive values indicate the level is above the peat surface. Data was taken manually.
MANUAL_WATER_LVL_3HW	Water level position "c", negative numbers indicate the level is below the peat surface--positive values indicate the level is above the peat surface. Data was taken manually.
MANUAL_WATER_LVL_4HW	Water level position "d", negative numbers indicate the level is below the peat surface--positive values indicate the level is above the peat surface. Data was taken manually.
BOG_SHOE_1HW	Bog shoe at position "a" which measured movements of the peat surface relative to an arbitrary datum.
BOG_SHOE_3HW	Bog shoe at position "c" which measured movements of the peat surface relative to an arbitrary datum.
AIR_TEMP	The measured air temperature.
PEAT_TEMP_1HW_10CM	Peat temperature at collar 1, located on a hollow 0.1m below the peat surface.
PEAT_TEMP_1HW_20CM	Peat temperature at collar 1, located on a hollow 0.2m below the peat surface.
PEAT_TEMP_1HW_50CM	Peat temperature at collar 1, located on a hollow 0.5m below the peat surface.
PEAT_TEMP_1HW_100CM	Peat temperature at collar 1, located on a hollow 1.0m below the peat surface.
PEAT_TEMP_1HK_5CM	Peat temperature at collar 1, located on a hummock .05m below the peat surface.
PEAT_TEMP_1HK_10CM	Peat temperature at collar 1, located on a hummock .1m below the peat surface.
PEAT_TEMP_1HK_20CM	Peat temperature at collar 1, located on a hummock .2m below the peat surface.
PEAT_TEMP_1HK_50CM	Peat temperature at collar 1, located on a hummock .5m below the peat surface.
PEAT_TEMP_2HW_5CM	Peat temperature at collar 2, located on hollows 0.05m below the peat surface.
PEAT_TEMP_2HW_10CM	Peat temperature at collar 2, located on hollows 0.1m below the peat surface.
PEAT_TEMP_2HW_20CM	Peat temperature at collar 2, located on hollows 0.2m below the peat surface.

PEAT_TEMP_2HW_50CM	Peat temperature at collar 2, located on hollows 0.5m below the peat surface.
PEAT_TEMP_2HW_100CM	Peat temperature at collar 2, located on hollows 1.0m below the peat surface.
PEAT_TEMP_2HK_5CM	Peat temperature at collar 2, located on hummocks 0.05m below the peat surface.
PEAT_TEMP_2HK_10CM	Peat temperature at collar 2, located on hummocks 0.1m below the peat surface.
PEAT_TEMP_2HK_20CM	Peat temperature at collar 2, located on hummocks 0.2m below the peat surface.
PEAT_TEMP_2HK_50CM	Peat temperature at collar2, located on hummocks 0.5m below the peat surface.
PEAT_TEMP_2HK_100CM	Peat temperature at collar 2 located on hummocks 1m below the peat surface.
PEAT_TEMP_3HW_5CM	Peat temperature at collar 3, located on hollows 0.05m below the peat surface.
PEAT_TEMP_3HW_10CM	Peat temperature at collar 3, located on hollows 0.1m below the peat surface.
PEAT_TEMP_3HW_20CM	Peat temperature at collar 3, located on hollows 0.2m below the peat surface.
PEAT_TEMP_3HW_50CM	Peat temperature at collar 3, located on hollows 0.5m below the peat surface.
PEAT_TEMP_3HW_100CM	Peat temperature at collar 3, located on hollows 1m below the peat surface.
PEAT_TEMP_3HK_5CM	Peat temperature at collar 3, located on hummocks 0.05m below the peat surface.
PEAT_TEMP_3HK_10CM	Peat temperature at collar 3, located on hummocks 0.1m below the peat surface.
PEAT_TEMP_3HK_20CM	Peat temperature at collar 3, located on hummocks 0.2m below the peat surface.
PEAT_TEMP_3HK_50CM	Peat temperature at collar 3, located on hummocks 0.5m below the peat surface.
PEAT_TEMP_3HKA_5CM	Peat temperature at collar 3, located on hummocks, at position "a" 0.05m below the peat surface.
PEAT_TEMP_3HKA_10CM	Peat temperature at collar 3, located on hummocks, position "a" 0.1m below the peat surface.
PEAT_TEMP_3HKA_20CM	Peat temperature at collar 3, located on hummocks, at position "a" 0.2m below the peat surface.
PEAT_TEMP_3HKA_50CM	Peat temperature at collar 3, located on hummocks, at position "a" 0.5m below the peat surface.
PEAT_TEMP_3HKB_5CM	Peat temperature at collar 3, located on hummocks, at position "b" 0.05m below the peat surface.
PEAT_TEMP_3HKB_10CM	Peat temperature at collar 3, located on hummocks, at position "b" 0.1m below the peat surface.
PEAT_TEMP_3HKB_20CM	Peat temperature at collar 3, located on hummocks, at position "b" 0.2m below the peat surface.
PEAT_TEMP_3HKB_50CM	Peat temperature at collar 3, located on

	hummocks, at position "b" 0.5m below the peat surface.
PEAT_TEMP_4HW_5CM	Peat temperature at collar 4, located on hollows 05m below the peat surface.
PEAT_TEMP_4HW_10CM	Peat temperature at collar 4, located on hollows .1m below the peat surface.
PEAT_TEMP_4HW_20CM	Peat temperature at collar 4, located on hollows .2m below the peat surface.
PEAT_TEMP_4HW_50CM	Peat temperature at collar 4, located on hollows .5m below the peat surface.
PEAT_TEMP_1MOAT_5CM	Peat temperature at collar 1, located on a moat .05m below the peat surface.
PEAT_TEMP_1MOAT_10CM	Peat temperature at collar 1, located on a moat .1m below the peat surface.
PEAT_TEMP_1MOAT_20CM	Peat temperature at collar 1, located on a moat .2m below the peat surface.
PEAT_TEMP_1MOAT_50CM	Peat temperature at collar 1, located on a moat .5m below the peat surface.
PEAT_TEMP_2LAWN_5CM	Peat temperature at collar 2, located on the lawn .05m below the peat surface.
PEAT_TEMP_2LAWN_10CM	Peat temperature at collar 2, located on the lawn .1m below the peat surface.
PEAT_TEMP_2LAWN_20CM	Peat temperature at collar 2, located on the lawn .2m below the peat surface.
PEAT_TEMP_2LAWN_50CM	Peat temperature at collar 2, located on the lawn .5m below the peat surface.
CRTFCN_CODE	The BOREAS certification level of the data. Examples are CPI (Checked by PI), CGR (Certified by Group), PRE (Preliminary), and CPI-??? (CPI but questionable).
REVISION_DATE	The most recent date when the information in the referenced data base table record was revised.

7.3.3 Unit of Measurement

The measurement units for the parameters contained in the data files on the CD-ROM are:

Column Name	Units
SITE_NAME	[none]
SUB_SITE	[none]
DATE_OBS	[DD-MON-YY]
TIME_OBS	[HHMM GMT]
SITE_COMMENTS	[none]
CONTINUOUS_WATER_LVL_1HW	[millimeters]
CONTINUOUS_WATER_LVL_2HK	[millimeters]
CONTINUOUS_WATER_LVL_2HW	[millimeters]
CONTINUOUS_WATER_LVL_3HW	[millimeters]
CONTINUOUS_WATER_LVL_4HW	[millimeters]
MANUAL_WATER_LVL_1HW	[millimeters]
MANUAL_WATER_LVL_2HW	[millimeters]
MANUAL_WATER_LVL_3HW	[millimeters]
MANUAL_WATER_LVL_4HW	[millimeters]
BOG_SHOE_1HW	[millimeters]
BOG_SHOE_3HW	[millimeters]

AIR_TEMP	[degrees Celsius]
PEAT_TEMP_1HW_10CM	[degrees Celsius]
PEAT_TEMP_1HW_20CM	[degrees Celsius]
PEAT_TEMP_1HW_50CM	[degrees Celsius]
PEAT_TEMP_1HW_100CM	[degrees Celsius]
PEAT_TEMP_1HK_5CM	[degrees Celsius]
PEAT_TEMP_1HK_10CM	[degrees Celsius]
PEAT_TEMP_1HK_20CM	[degrees Celsius]
PEAT_TEMP_1HK_50CM	[degrees Celsius]
PEAT_TEMP_2HW_5CM	[degrees Celsius]
PEAT_TEMP_2HW_10CM	[degrees Celsius]
PEAT_TEMP_2HW_20CM	[degrees Celsius]
PEAT_TEMP_2HW_50CM	[degrees Celsius]
PEAT_TEMP_2HW_100CM	[degrees Celsius]
PEAT_TEMP_2HK_5CM	[degrees Celsius]
PEAT_TEMP_2HK_10CM	[degrees Celsius]
PEAT_TEMP_2HK_20CM	[degrees Celsius]
PEAT_TEMP_2HK_50CM	[degrees Celsius]
PEAT_TEMP_2HK_100CM	[degrees Celsius]
PEAT_TEMP_3HW_5CM	[degrees Celsius]
PEAT_TEMP_3HW_10CM	[degrees Celsius]
PEAT_TEMP_3HW_20CM	[degrees Celsius]
PEAT_TEMP_3HW_50CM	[degrees Celsius]
PEAT_TEMP_3HW_100CM	[degrees Celsius]
PEAT_TEMP_3HK_5CM	[degrees Celsius]
PEAT_TEMP_3HK_10CM	[degrees Celsius]
PEAT_TEMP_3HK_20CM	[degrees Celsius]
PEAT_TEMP_3HK_50CM	[degrees Celsius]
PEAT_TEMP_3HKA_5CM	[degrees Celsius]
PEAT_TEMP_3HKA_10CM	[degrees Celsius]
PEAT_TEMP_3HKA_20CM	[degrees Celsius]
PEAT_TEMP_3HKA_50CM	[degrees Celsius]
PEAT_TEMP_3HKB_5CM	[degrees Celsius]
PEAT_TEMP_3HKB_10CM	[degrees Celsius]
PEAT_TEMP_3HKB_20CM	[degrees Celsius]
PEAT_TEMP_3HKB_50CM	[degrees Celsius]
PEAT_TEMP_4HW_5CM	[degrees Celsius]
PEAT_TEMP_4HW_10CM	[degrees Celsius]
PEAT_TEMP_4HW_20CM	[degrees Celsius]
PEAT_TEMP_4HW_50CM	[degrees Celsius]
PEAT_TEMP_1MOAT_5CM	[degrees Celsius]
PEAT_TEMP_1MOAT_10CM	[degrees Celsius]
PEAT_TEMP_1MOAT_20CM	[degrees Celsius]
PEAT_TEMP_1MOAT_50CM	[degrees Celsius]
PEAT_TEMP_2LAWN_5CM	[degrees Celsius]
PEAT_TEMP_2LAWN_10CM	[degrees Celsius]
PEAT_TEMP_2LAWN_20CM	[degrees Celsius]
PEAT_TEMP_2LAWN_50CM	[degrees Celsius]
CRTFCN_CODE	[none]
REVISION_DATE	[DD-MON-YY]

7.3.4 Data Source

The sources of the parameter values contained in the data files on the CD-ROM are:

Column Name	Data Source
SITE_NAME	Assigned by BORIS
SUB_SITE	Assigned by BORIS
DATE_OBS	Investigator
TIME_OBS	Investigator
SITE_COMMENTS	Investigator
CONTINUOUS_WATER_LVL_1HW	Potentiometer
CONTINUOUS_WATER_LVL_2HK	Potentiometer
CONTINUOUS_WATER_LVL_2HW	Potentiometer
CONTINUOUS_WATER_LVL_3HW	Potentiometer
CONTINUOUS_WATER_LVL_4HW	Potentiometer
MANUAL_WATER_LVL_1HW	Potentiometer
MANUAL_WATER_LVL_2HW	Potentiometer
MANUAL_WATER_LVL_3HW	Potentiometer
MANUAL_WATER_LVL_4HW	Potentiometer
BOG_SHOE_1HW	Potentiometer
BOG_SHOE_3HW	Potentiometer
AIR_TEMP	Copper-constantan thermocouple wire
PEAT_TEMP_1HW_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_1HW_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_1HW_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_1HW_100CM	Copper-constantan thermocouple wire
PEAT_TEMP_1HK_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_1HK_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_1HK_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_1HK_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HW_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HW_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HW_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HW_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HW_100CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HK_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HK_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HK_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HK_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_2HK_100CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HW_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HW_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HW_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HW_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HW_100CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HK_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HK_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HK_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HK_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKA_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKA_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HK_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HK_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKA_5CM	Copper-constantan thermocouple wire

PEAT_TEMP_3HKA_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKA_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKA_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKB_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKB_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKB_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_3HKB_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_4HW_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_4HW_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_4HW_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_4HW_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_1MOAT_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_1MOAT_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_1MOAT_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_1MOAT_50CM	Copper-constantan thermocouple wire
PEAT_TEMP_2LAWN_5CM	Copper-constantan thermocouple wire
PEAT_TEMP_2LAWN_10CM	Copper-constantan thermocouple wire
PEAT_TEMP_2LAWN_20CM	Copper-constantan thermocouple wire
PEAT_TEMP_2LAWN_50CM	Copper-constantan thermocouple wire
CRTFCN_CODE	Assigned by BORIS
REVISION_DATE	Assigned by BORIS

7.3.5 Data Range

The following table gives information about the parameter values found in the data files on the CD-ROM.

Column Name	Minimum Data Value	Maximum Data Value	Missng Data Value	Unrel Data Value	Below Detect Limit	Data Not Cllctd
SITE_NAME	NSA-FEN-FLXTR	NSA-FEN-FLXTR	None	None	None	None
SUB_SITE	TGB03-WAT01	TGB03-WATZF	None	None	None	None
DATE_OBS	26-MAY-94	23-OCT-96	None	None	None	None
TIME_OBS	0	2300	None	None	None	None
SITE_COMMENTS	N/A	N/A	None	None	None	None
CONTINUOUS_WATER_LVL_1HW	-171.5	9	-999	None	None	Blank
CONTINUOUS_WATER_LVL_2HK	-240	-157	-999	None	None	Blank
CONTINUOUS_WATER_LVL_2HW	-142	59	-999	None	None	Blank
CONTINUOUS_WATER_LVL_3HW	-175	89	-999	None	None	Blank
CONTINUOUS_WATER_LVL_4HW	-109	56	-999	None	None	Blank
MANUAL_WATER_LVL_1HW	-16	5	-999	None	None	Blank
MANUAL_WATER_LVL_2HW	-25	7	-999	None	None	Blank
MANUAL_WATER_LVL_3HW	-13	21.5	-999	None	None	Blank
MANUAL_WATER_LVL_4HW	-8.7	5	-999	None	None	Blank
BOG_SHOE_1HW	6	114	-999	None	None	Blank
BOG_SHOE_3HW	-29	131	-999	None	None	Blank
AIR_TEMP	-14.68	41.5	-999	None	None	Blank
PEAT_TEMP_1HW_10CM	3.993	20.98	-999	-888	None	Blank
PEAT_TEMP_1HW_20CM	3.51	62.58	-999	-888	None	Blank
PEAT_TEMP_1HW_50CM	-2.95	12.43	-999	-888	None	Blank

PEAT_TEMP_1HW_100CM	-.31	57	-999	-888	None	Blank
PEAT_TEMP_1HK_5CM	-2.336	27.18	-999	None	None	Blank
PEAT_TEMP_1HK_10CM	-1.479	23.82	-999	None	None	Blank
PEAT_TEMP_1HK_20CM	-.992	18.66	-999	None	None	Blank
PEAT_TEMP_1HK_50CM	-1.713	9.05	-999	None	None	Blank
PEAT_TEMP_2HW_5CM	-.53	17.99	-999	None	None	Blank
PEAT_TEMP_2HW_10CM	-.802	17.18	-999	None	None	Blank
PEAT_TEMP_2HW_20CM	-2.34	14.89	-999	None	None	Blank
PEAT_TEMP_2HW_50CM	-3.02	11.36	-999	None	None	Blank
PEAT_TEMP_2HW_100CM	-2.54	8.01	-999	None	None	Blank
PEAT_TEMP_2HK_5CM	-4.305	28.42	-999	None	None	Blank
PEAT_TEMP_2HK_10CM	-1.485	24.89	-999	None	None	Blank
PEAT_TEMP_2HK_20CM	-1.603	16.68	-999	None	None	Blank
PEAT_TEMP_2HK_50CM	-1.949	12.86	-999	None	None	Blank
PEAT_TEMP_2HK_100CM	-1.676	4.63	-999	None	None	Blank
PEAT_TEMP_3HW_5CM	-.807	22.81	-999	None	None	Blank
PEAT_TEMP_3HW_10CM	-1.733	20.04	-999	-888	None	Blank
PEAT_TEMP_3HW_20CM	-2.796	26.71	-999	-888	None	Blank
PEAT_TEMP_3HW_50CM	-3.06	13.51	-999	-888	None	Blank
PEAT_TEMP_3HW_100CM	-2.33	10.08	-999	-888	None	Blank
PEAT_TEMP_3HK_5CM	-.262	23.2	-999	None	None	Blank
PEAT_TEMP_3HK_10CM	-.136	19.63	-999	None	None	Blank
PEAT_TEMP_3HK_20CM	-.253	14.75	-999	None	None	Blank
PEAT_TEMP_3HK_50CM	-.034	11.53	-999	None	None	Blank
PEAT_TEMP_3HKA_5CM	-3.152	25.35	-999	None	None	Blank
PEAT_TEMP_3HKA_10CM	-.33	28.29	-999	None	None	Blank
PEAT_TEMP_3HKA_20CM	-.217	14.56	-999	None	None	Blank
PEAT_TEMP_3HKA_50CM	-.129	10.58	-999	None	None	Blank
PEAT_TEMP_3HKB_5CM	-1.687	14.82	-999	None	None	Blank
PEAT_TEMP_3HKB_10CM	.024	11.47	-999	None	None	Blank
PEAT_TEMP_3HKB_20CM	1.911	9.49	-999	None	None	Blank
PEAT_TEMP_3HKB_50CM	3.587	8.34	-999	None	None	Blank
PEAT_TEMP_4HW_5CM	-.425	21.65	-999	None	None	Blank
PEAT_TEMP_4HW_10CM	-.357	17.8	-999	None	None	Blank
PEAT_TEMP_4HW_20CM	-.364	15.02	-999	None	None	Blank
PEAT_TEMP_4HW_50CM	-.064	10.83	-999	None	None	Blank
PEAT_TEMP_1MOAT_5CM	-.233	30.46	-999	None	None	Blank
PEAT_TEMP_1MOAT_10CM	-.189	23.83	-999	None	None	Blank
PEAT_TEMP_1MOAT_20CM	-.583	17.34	-999	None	None	Blank
PEAT_TEMP_1MOAT_50CM	-.905	12.05	-999	None	None	Blank
PEAT_TEMP_2LAWN_5CM	-.394	26.22	-999	None	None	Blank
PEAT_TEMP_2LAWN_10CM	1.938	17.64	-999	None	None	Blank
PEAT_TEMP_2LAWN_20CM	2.653	14.62	-999	None	None	Blank
PEAT_TEMP_2LAWN_50CM	4.542	10.68	-999	None	None	Blank
CRTFCN_CODE	CPI	CPI	None	None	None	None
REVISION_DATE	28-OCT-96	01-DEC-97	None	None	None	Blank

Minimum Data Value -- The minimum value found in the column.
Maximum Data Value -- The maximum value found in the column.
Missng Data Value -- The value that indicates missing data. This is used to indicate that an attempt was made to determine the parameter value, but the attempt was unsuccessful.
Unrel Data Value -- The value that indicates unreliable data. This is used to indicate an attempt was made to determine the

```
                      parameter value, but the value was deemed to be
                      unreliable by the analysis personnel.
Below Detect Limit -- The value that indicates parameter values below the
                      instruments detection limits.  This is used to
                      indicate that an attempt was made to determine the
                      parameter value, but the analysis personnel determined
                      that the parameter value was below the detection
                      limit of the instrumentation.
Data Not Cllctd    -- This value indicates that no attempt was made to
                      determine the parameter value.  This usually
                      indicates that BORIS combined several similar but
                      not identical data sets into the same data base table
                      but this particular science team did not
                      measure that parameter.

Blank -- Indicates that blank spaces are used to denote that type of value.
N/A   -- Indicates that the value is not applicable to the respective column.
None  -- Indicates that no values of that sort were found in the column.
-------------------------------------------------------------------------------
```

7.4 Sample Data Record

The following are wrapped versions of sample data records from a selected file on the CD-ROM:

```
SITE_NAME,SUB_SITE,DATE_OBS,TIME_OBS,SITE_COMMENTS,CONTINUOUS_WATER_LVL_1HW,
CONTINUOUS_WATER_LVL_2HK,CONTINUOUS_WATER_LVL_2HW,CONTINUOUS_WATER_LVL_3HW,
CONTINUOUS_WATER_LVL_4HW,MANUAL_WATER_LVL_1HW,MANUAL_WATER_LVL_2HW,
MANUAL_WATER_LVL_3HW,MANUAL_WATER_LVL_4HW,BOG_SHOE_1HW,BOG_SHOE_3HW,AIR_TEMP,
PEAT_TEMP_1HW_10CM,PEAT_TEMP_1HW_20CM,PEAT_TEMP_1HW_50CM,PEAT_TEMP_1HW_100CM,
PEAT_TEMP_1HK_5CM,PEAT_TEMP_1HK_10CM,PEAT_TEMP_1HK_20CM,PEAT_TEMP_1HK_50CM,
PEAT_TEMP_2HW_5CM,PEAT_TEMP_2HW_10CM,PEAT_TEMP_2HW_20CM,PEAT_TEMP_2HW_50CM,
PEAT_TEMP_2HW_100CM,PEAT_TEMP_2HK_5CM,PEAT_TEMP_2HK_10CM,PEAT_TEMP_2HK_20CM,
PEAT_TEMP_2HK_50CM,PEAT_TEMP_2HK_100CM,PEAT_TEMP_3HW_5CM,PEAT_TEMP_3HW_10CM,
PEAT_TEMP_3HW_20CM,PEAT_TEMP_3HW_50CM,PEAT_TEMP_3HW_100CM,PEAT_TEMP_3HK_5CM,
PEAT_TEMP_3HK_10CM,PEAT_TEMP_3HK_20CM,PEAT_TEMP_3HK_50CM,PEAT_TEMP_3HKA_5CM,
PEAT_TEMP_3HKA_10CM,PEAT_TEMP_3HKA_20CM,PEAT_TEMP_3HKA_50CM,PEAT_TEMP_3HKB_5CM,
PEAT_TEMP_3HKB_10CM,PEAT_TEMP_3HKB_20CM,PEAT_TEMP_3HKB_50CM,PEAT_TEMP_4HW_5CM,
PEAT_TEMP_4HW_10CM,PEAT_TEMP_4HW_20CM,PEAT_TEMP_4HW_50CM,PEAT_TEMP_1MOAT_5CM,
PEAT_TEMP_1MOAT_10CM,PEAT_TEMP_1MOAT_20CM,PEAT_TEMP_1MOAT_50CM,
PEAT_TEMP_2LAWN_5CM,PEAT_TEMP_2LAWN_10CM,PEAT_TEMP_2LAWN_20CM,
PEAT_TEMP_2LAWN_50CM,CRTFCN_CODE,REVISION_DATE
'NSA-FEN-FLXTR','TGB03-WAT01',04-MAY-96,1100,'NSA FEN TOWER',,,-999.0,,,,-999.0,
,,,,-999.0,,,,,.274,.06,0.0,-.248,-999.0,-999.0,-999.0,-999.0,,.013,-999.0,
-.088,-.247,,-999.0,-999.0,-999.0,-999.0,,,,,,,,,,,,,,,,,,,,,,,,'CPI',01-DEC-97
'NSA-FEN-FLXTR','TGB03-WAT01',04-MAY-96,1200,'NSA FEN TOWER',,,-999.0,,,,-999.0,
,,,,-999.0,,,,,.337,-.238,-.354,-.494,-999.0,-999.0,-999.0,-999.0,,-.345,-999.0,
-.316,-.33,,-999.0,-999.0,-999.0,-999.0,,,,,,,,,,,,,,,,,,,,,,,,'CPI',01-DEC-97
```

8. Data Organization

8.1 Data Granularity

The smallest unit of orderable data is the water table, surface fluctuations, and peat temperature for a given site on a given day.

8.2 Data Format(s)

The Compact Disk-Read-Only Memory (CD-ROM) files contain American Standard Code for Information Interchange (ASCII) numerical and character fields of varying length separated by commas. The character fields are enclosed with single apostrophe marks. There are no spaces between the fields.

Each data file on the CD-ROM has four header lines of Hyper-Text Markup Language (HTML) code at the top. When viewed with a Web browser, this code displays header information (data set title, location, date, acknowledgments, etc.) and a series of HTML links to associated data files and related data sets. Line 5 of each data file is a list of the column names, and line 6 and following lines contain the actual data.

9. Data Manipulations

9.1 Formulae

None.

9.1.1 Derivation Techniques and Algorithms

Not applicable.

9.2 Data Processing Sequence

9.2.1 Processing Steps

Temperature and water table data from the CR10 and CR7 dataloggers were downloaded every 3-4 days and entered into spreadsheets back at the lab.

9.2.2 Processing Changes

Not applicable.

9.3 Calculations

If a -888 is present in the data set, it represents a measurement that was taken, but discarded. If a -999 is present, then no data were taken.

9.3.1 Special Corrections/Adjustments

Not applicable.

9.3.2 Calculated Variables

Not applicable.

9.4 Graphs and Plots

None given.

10. Errors

10.1 Sources of Error

Instrument error could be caused by wire disconnection or shorting, multiplexer or datalogger malfunction, or battery failure.

10.2 Quality Assessment

10.2.1 Data Validation by Source

All data were plotted to determine if there were any outlying data points that were obviously incorrect.

10.2.2 Confidence Level/Accuracy Judgment

The confidence level in the data set is quite high, since no complicated calculations are required and the instrumentation has been used before on similar projects by the members of TGB-03 and TGB-04. Accuracy of the electronically gathered data is also high when compared to manual measurements taken by field workers on a weekly basis.

10.2.3 Measurement Error for Parameters

Ground Temperatures: Type T thermocouple rated at +/- 0.01 °C maximum error. Water and Surface Levels: Maximum error of 1 mm.

10.2.4 Additional Quality Assessments

None required.

10.2.5 Data Verification by Data Center

Data were examined for general consistency and clarity.

11. Notes

11.1 Limitations of the Data

None given.

11.2 Known Problems with the Data

None.

11.3 Usage Guidance

None required.

11.4 Other Relevant Information

None.

12. Application of the Data Set

The water table and peat temperature data can be used in connection with the chamber flux and tower flux data to determine the CO_2 exchange between the atmosphere and the peatland soils. The remote sensing images, the chamber plant community data, and the chamber NEE data can be used to scale the CO_2 fluxes from the plot scale to wetland landscape.

13. Future Modifications and Plans

These data are in draft format.

14. Software

14.1 Software Description

Not applicable.

14.2 Software Access

Not applicable.

15. Data Access

The NSA water table and peat temperature data are available from the Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

15.1 Contact Information

For BOREAS data and documentation please contact:

ORNL DAAC User Services
Oak Ridge National Laboratory
P.O. Box 2008 MS-6407
Oak Ridge, TN 37831-6407
Phone: (423) 241-3952
Fax: (423) 574-4665
E-mail: ornldaac@ornl.gov or ornl@eos.nasa.gov

15.2 Data Center Identification

Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) for Biogeochemical Dynamics http://www-eosdis.ornl.gov/.

15.3 Procedures for Obtaining Data

Users may obtain data directly through the ORNL DAAC online search and order system [http://www-eosdis.ornl.gov/] and the anonymous FTP site [ftp://www-eosdis.ornl.gov/data/] or by contacting User Services by electronic mail, telephone, fax, letter, or personal visit using the contact information in Section 15.1.

15.4 Data Center Status/Plans

The ORNL DAAC is the primary source for BOREAS field measurement, image, GIS, and hardcopy data products. The BOREAS CD-ROM and data referenced or listed in inventories on the CD-ROM are available from the ORNL DAAC.

16. Output Products and Availability

16.1 Tape Products

None.

16.2 Film Products

None.

16.3 Other Products

These data are available on the BOREAS CD-ROM series.

17. References

17.1 Platform/Sensor/Instrument/Data Processing Documentation

Campbell Scientific Corporation AM416 Manual.

Campbell Scientific Corporation CR10 Manual.

17.2 Journal Articles and Study Reports

Bubier, J.L., T.T. Moore, L. Bellisario, N.T. Comer, and P.M. Crill. 1995. Ecological controls on methane emissions from a northern peatland complex in the zone of discontinuous permafrost, Manitoba, Canada. Global Biogeochemical Cycles. Volume 9, Number 4, pp. 455-470.

Newcomer, J., D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers, eds. 2000. Collected Data of The Boreal Ecosystem-Atmosphere Study. NASA. CD-ROM.

Roulet, N., S. Hardill, and N. Comer. 1991. Continuous measurement of the depth of water table (inundation) in wetlands with fluctuation surfaces. Hydrological Processes. Volume 5, pp. 399-403.

Sellers, P. and F. Hall. 1994. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1994-3.0, NASA BOREAS Report (EXPLAN 94).

Sellers, P. and F. Hall. 1996. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1996-2.0, NASA BOREAS Report (EXPLAN 96).

Sellers, P., F. Hall, and K.F. Huemmrich. 1996. Boreal Ecosystem-Atmosphere Study: 1994 Operations. NASA BOREAS Report (OPS DOC 94).

Sellers, P., F. Hall, and K.F. Huemmrich. 1997. Boreal Ecosystem-Atmosphere Study: 1996 Operations. NASA BOREAS Report (OPS DOC 96).

Sellers, P., F. Hall, H. Margolis, B. Kelly, D. Baldocchi, G. den Hartog, J. Cihlar, M.G. Ryan, B. Goodison, P. Crill, K.J. Ranson, D. Lettenmaier, and D.E. Wickland. 1995. The boreal ecosystem-atmosphere study (BOREAS): an overview and early results from the 1994 field year. Bulletin of the American Meteorological Society. 76(9):1549-1577.

Sellers, P.J., F.G. Hall, R.D. Kelly, A. Black, D. Baldocchi, J. Berry, M. Ryan, K.J. Ranson, P.M. Crill, D.P. Lettenmaier, H. Margolis, J. Cihlar, J. Newcomer, D. Fitzjarrald, P.G. Jarvis, S.T. Gower, D. Halliwell, D. Williams, B. Goodison, D.E. Wickland, and F.E. Guertin. 1997. BOREAS in 1997: Experiment Overview, Scientific Results and Future Directions. Journal of Geophysical Research 102(D24): 28,731-28,770.

17.3 Archive/DBMS Usage Documentation

None.

18. Glossary of Terms

None given.

19. List of Acronyms

```
ASCII   - American Standard Code for Information Interchange
BOREAS  - BOReal Ecosystem-Atmosphere Study
BORIS   - BOREAS Information System
CB      - Collapse Bog
CD-ROM  - Compact Disk-Read-Only Memory
CF      - Collapse Fen
DAAC    - Distributed Active Archive Center
EOS     - Earth Observing System
EOSDIS  - EOS Data and Information System
GIS     - Geographic Information System
GSFC    - Goddard Space Flight Center
HTML    - HyperText Markup Language
NASA    - National Aeronautics and Space Administration
NEE     - Net Ecosystem Exchange
NSA     - Northern Study Area
ORNL    - Oak Ridge National Laboratory
PANP    - Prince Albert National Park
SSA     - Southern Study Area
TF      - Tower Fen
TGB     - Trace Gas Biogeochemistry
URL     - Uniform Resource Locator (a World Wide Web address)
ZF      - Zoltai Fen
```

20. Document Information

20.1 Document Revision Date

Written:
Last updated: 11-Jun-1999

20.2 Document Review Date(s)

BORIS Review: 12-Mar-98
Science Review: 8-May-1998

20.3 Document ID

20.4 Citation

When using these data, please contact the investigators listed in Section 2.3 and cite any relevant papers in Section 17.2.

If using data from the BOREAS CD-ROM series, also reference the data as:

Moore, T.R., " Carbon Dioxide and Methane Exchanges Between Wetland and Upland Soils and the Atmosphere." In Collected Data of The Boreal Ecosystem-Atmosphere Study. Eds. J. Newcomer, D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers. CD-ROM. NASA, 2000.

Also, cite the BOREAS CD-ROM set as:

Newcomer, J., D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers, eds. Collected Data of The Boreal Ecosystem-Atmosphere Study. NASA. CD-ROM. NASA, 2000.

20.5 Document Curator

20.6 Document URL

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	November 2000	Technical Memorandum

4. TITLE AND SUBTITLE
Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)
BOREAS TGB-1/TGB-3 Water Table and Peat Temperature Data over the NSA

5. FUNDING NUMBERS
923
RTOP: 923-462-33-01

6. AUTHOR(S)
Jill L. Bubier, Neil Comer, and Tim R. Moore
Forrest G. Hall and Sara K. Conrad, Editors

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS (ES)
Goddard Space Flight Center
Greenbelt, Maryland 20771

8. PEFORMING ORGANIZATION REPORT NUMBER
2000-03136-0

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS (ES)
National Aeronautics and Space Administration
Washington, DC 20546-0001

10. SPONSORING / MONITORING AGENCY REPORT NUMBER
TM—2000–209891
Vol. 223

11. SUPPLEMENTARY NOTES
J.L. Bubier: University of New Hampshire, Durham; N. Comer and T.R. Moore: McGill University, Montreal, Quebec; S.K. Conrad: Raytheon ITSS

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Unclassified–Unlimited
Subject Category: 43
Report available from the NASA Center for AeroSpace Information,
7121 Standard Drive, Hanover, MD 21076-1320. (301) 621-0390.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

The BOREAS TGB-1 and TGB-3 teams collected several data sets that contributed to understanding the measured trace gas fluxes over sites in the NSA. This data set contains continuous and manual measurements of water level and air and soil temperatures at the four subsites within the NSA Tower Fen site complex. The measurements were taken to understand the thermal and hydrological gradients associated with each plant community present in the fen. Measurements were taken from May to September 1994 and May to October 1996. The data are provided in tabular ASCII files.

14. SUBJECT TERMS
BOREAS, trace gas biogeochemistry.

15. NUMBER OF PAGES
23

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL