

Water budgets of the two Olentangy River experimental wetlands in 2001

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Introduction

Hydrologic conditions are extremely important for the maintenance of wetland structure and function. Biota, water quality and vegetation dynamic determine a wetland's overall water budget (Mitsch and Gosselink, 2000). Since 1994, a combination of manual and automated observations has provided a wealth of information on the daily, and even hourly, water fluxes of the two experimental wetlands at the Olentangy River Wetland Research Park (ORWRP). Previous annual water budgets and flood event descriptions for the experimental wetlands are presented by Wu et al. (1995), Nairn et al. (1996), Mitsch (1996), Wang et al. (1997, 1998), Wang and Mitsch (1999), Zhang et al. (2000), and Zhang and Mitsch (2001). These reports, provide estimates of daily water fluxes and flooding events of the

two Olentangy River experimental wetlands for each year. As part of a long-term wetland ecosystem study begun in 1994 in the two experimental wetland basins, the water budget for 2001 is presented here. To allow water budgets to be compiled on a consistent basis, there is a need to follow previous procedures and modeling approaches while integrating observations, in part because of the very abundance of data and also because of the periodic occurrence of atypical events such as floods and equipment malfunctions. These procedures were used as a model in developing the 2001 wetland water budgets.

Methods

Locations of the inflow and outflows are shown in Figure 1. The following general equation (Mitsch and Gosselink, 2000) was used to determine a water budget for each

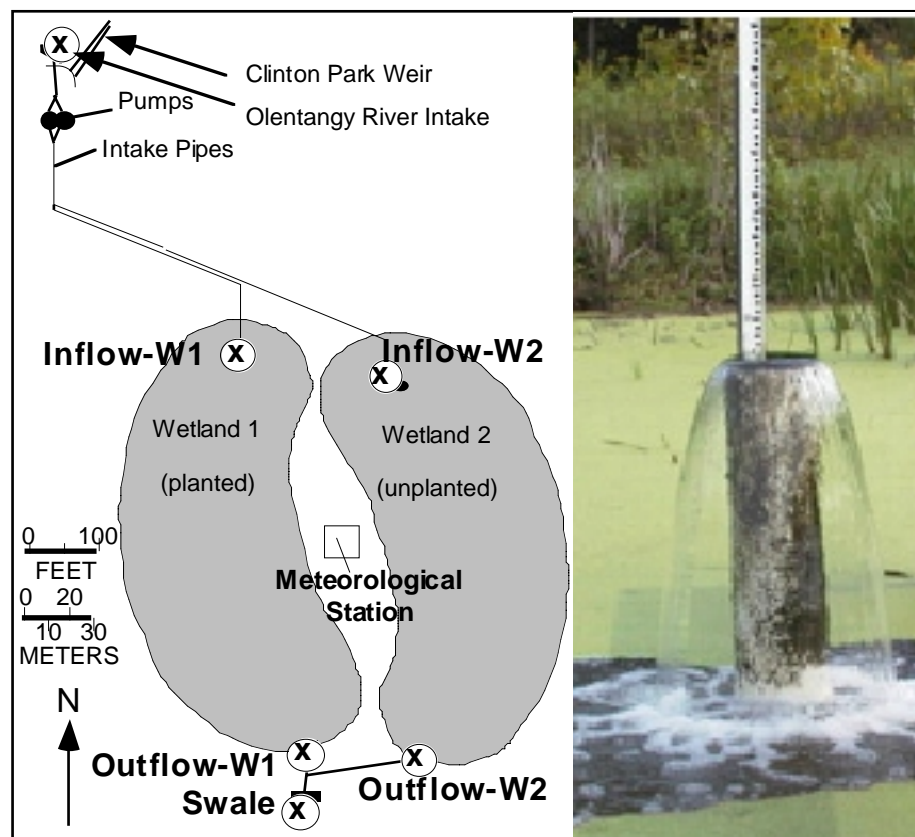


Figure 1. Location of pumped inflow and outflow of Wetland 1 and Wetland 2 at ORWRP. Hydrologic sampling stations are marked and the inflow of Wetland 1 is shown on the right.

ORWRP experimental wetland:

$$S_i + F_i + P - S_o - ET - G_o - \Delta V = 0 \quad (1)$$

where,

S_i = pumped inflow (surface)

F_i = flood inflow (due to floods on the Olentangy River)

P = precipitation

S_o = surface outflow

ET = evapotranspiration

G_o = ground water outflow (seepage)

ΔV = change in volume

All parameters were developed in equivalent units for a budget calculation; either average flow rate (i.e., gpm) over a given time period, or total depth (i.e., cm) over a given time period, where total area was taken as a nominal 10,000 m³ (1 ha) for each wetland.

A 4-hour time increment was used as the basis for computing all parameters in 2001. However, the budget is reported only for daily values.

Pumped Inflow (S_i)

Twice-daily (morning and evening) readings of both instantaneous and total integrated volume of pumping rates were collected by staff and students from the flow monitors in each pipe going to each wetland. Many gaps have continued to exist in the data when flow gauges clogged or when readings were missed. When data from only one wetland inflow were available, the missing flow rate was assumed to be the same as the available flow rate (the protocol for the experimental wetlands has been, since the start, to deliver the same flow to each wetland at all times). When both flow gauges were malfunctioning, flow was estimated for both from the best estimate of previous readings or from pump settings (number of turns open) also, staff gages were installed on the inflow pipe of each inflow pipe (Figure 1). A calibration curve was developed for water height of inflow plume versus flow as measured by both the meter and by velocity calibration (Figure 2). When

pumps were shut down, either by site managers or by accident, the time of shutdown was estimated from field records and flow was prorated for only the period when pumps were not operating.

For the 2001 budget, readings from the inflow meters were interpolated to determine 4-hour total flow increments, in gallons, for each wetland. Water level recorder data charts, when available, were used to determine exact times of power outages or other unusual occurrences.

Flood Inflow (F_i)

There was no surface flood in the experimental basins in 2001.

Precipitation (P)

Precipitation was measured from two-per-day site monitorings of a precipitation gage that were emptied after each recording or from liquid precipitation data from the OSU Agronomy Farm weather station, located 1 km from the ORWRP. Liquid precipitation in the form of snow was not easily accounted for during winter.

Surface Outflow (S_o)

Outflow measurements from the experimental wetlands are based on wetland water level and the status of the control weir boxes constructed at the southern edge of the basins (Figure 2). The three important variables needed are: 1) the water level in the basins; 2) the status of weirs or other control devices in the weir boxes; and 3) the crest elevation of the weir or other control device. These data are then used with weir equations that relate head to rate of outflow. When outflow was blocked with debris, outflow was estimated from equation 1.

Wetland Water Level

From the beginning of the project, water level has been recorded twice-per-day by reading a staff gauge located near the outflow. These data are supplemented with

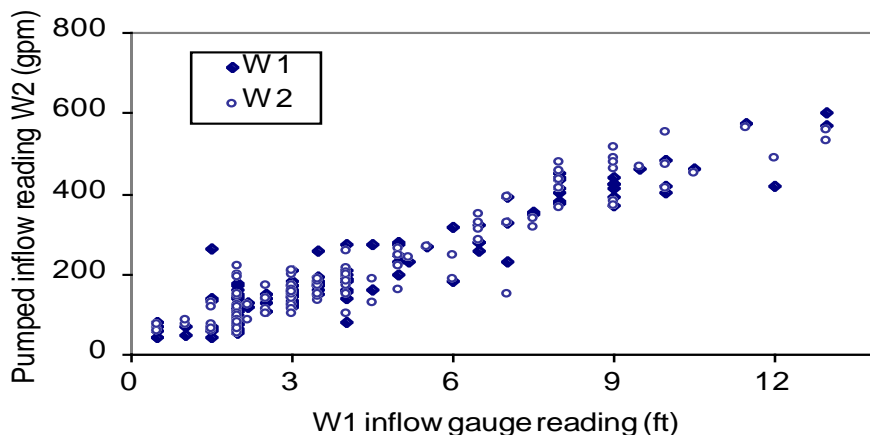


Figure 2. Calibration curves between pumped inflow (gpm) and inflow gauge rading (ft) for W1 and W2 in 2001

continuous water level Ott Thalimedes data loggers installed in 2001 in each wetland.

Weir Box Status

Four different conditions of weir box outflow control have occurred since 1995: v-notch plate in place (V+0); v-notch and one stoplog in place (V+1); v-notch and two stoplogs in place (V+2); and no v-notch or stoplog (noweir). Details of computing outflow with v-notch

were given in Wang and Mitsch (1999). Major changes in hydrological pumping and weirs in 2001 are presented in Table 1. No weir plate was in place for Wetlands 1 and 2 in 2001.

Flow Equations with No Weir

Normally, rating curves developed from velocity readings in the outflow pipes downstream of the weirs were used to estimate outflow. These empirical equations are:

Table 1. Major hydrology events affecting ORWRP hydrology during the year 2001.

Date and time	Pump change		Weir code	Date and time	Pump change		Weir code
	#1 regular	#2 biofriendly			#1 regular	#2 biofriendly	
1/29/01 17:25	off	on	no weir	10/4/01 15:30	off	on	no weir
1/30/01 10:00	off	off	no weir	10/4/01 16:10	off	off	no weir
1/30/01 0:00	on	off	no weir	10/4/01 16:15	on	off	no weir
3/18/01 18:20	on	on	no weir	10/15/01 15:10	on	off	no weir
3/19/01 7:30	off	off	no weir	10/15/01 15:15	off	off	no weir
3/20/01 17:00	off	off	no weir	10/15/01 15:20	on	off	no weir
3/21/01 9:00	off	off	no weir	10/15/01 15:35	off	off	no weir
3/21/01 0:00	on	off	no weir	10/15/01 15:40	on	off	no weir
3/22/01 8:30	on	off	no weir	10/15/01 15:43	off	off	no weir
3/22/01 14:25	off	off	no weir	10/15/01 15:49	on	off	no weir
3/22/01 16:50	on	off	no weir	10/17/01 15:00	on	off	no weir
5/16/01 20:15	off	on	no weir	10/17/01 15:04	off	off	no weir
5/17/01 8:35	off	off	no weir	10/17/01 15:10	on	off	no weir
5/17/01 11:00	off	on	no weir	10/17/01 15:17	off	off	no weir
5/28/01 10:00	off	on	no weir	10/17/01 15:22	on	off	no weir
5/28/01 10:50	off	off	no weir	10/18/01 18:45	on	off	no weir
5/28/01 19:25	off	off	no weir	10/18/01 0:00	off	off	no weir
5/29/01 10:15	off	off	no weir	10/18/01 18:50	off	on	no weir
5/29/01 10:40	off	on	no weir	10/24/01 7:45	off	on	no weir
7/17/01 18:30	off	on	no weir	10/24/01 15:00	off	off	no weir
7/18/01 11:14	off	off	no weir	10/24/01 15:10	on	off	no weir
7/18/01 11:20	off	on	no weir	10/30/01 15:00	on	off	no weir
7/18/01 11:57	off	off	no weir	10/30/01 15:02	off	off	no weir
7/18/01 12:02	off	on	no weir	10/30/01 15:07	on	off	no weir
7/23/01 13:50	off	on	no weir	10/30/01 15:15	off	off	no weir
7/23/01 14:07	off	off	no weir	10/30/01 15:20	on	off	no weir
7/23/01 14:14	off	on	no weir	11/3/01 8:00	off	on	no weir
8/13/01 9:40	on	off	no weir	11/3/01 0:00	off	off	no weir
8/13/01 13:40	off	off	no weir	11/3/01 16:20	off	on	no weir
8/13/01 14:20	on	off	no weir	11/5/01 8:05	off	on	no weir
8/15/01 16:50	on	off	no weir	11/5/01 16:00	off	off	no weir
8/15/01 16:50	off	off	no weir	11/5/01 17:18	off	on	no weir
8/16/01 10:10	off	on	no weir	11/7/01 16:00	off	on	no weir
9/21/01 14:18	off	on	no weir	11/7/01 16:07	off	off	no weir
9/21/01 16:20	off	off	no weir	11/7/01 16:25	on	off	no weir
9/21/01 16:25	off	on	no weir	11/12/01 9:30	off	on	no weir
9/26/01 10:00	off	on	no weir	11/12/01 0:00	off	off	no weir
9/27/01 14:00	off	off	no weir	11/12/01 12:15	off	on	no weir
9/27/01 14:05	off	on	no weir	12/3/01 8:00	off	on	no weir
9/29/01 12:25	off	on	no weir	12/3/01 13:30	off	off	no weir
9/29/01 12:25	off	off	no weir	12/3/01 13:45	on	on	no weir
9/29/01 12:35	on	off	no weir				
10/1/01 0:00	on	on	no weir				
10/1/01 0:00	off	off	no weir				
10/1/01 0:00	on	off	no weir				

for Wetland 1: $S_o = 0.400 H^{3.490}$ (2)

for Wetland 2: $S_o = 0.590 H^{2.747}$ (3)

where

S_o = outflow, cfs,
 H = head, feet

The head here is the elevation above the bottom of the empty weir box.

Evapotranspiration (ET)

For 2001, evapotranspirations was estimated from the data 1999.

Seepage to Ground Water (G_s)

Changes in wetland volume during these periods that were not accounted for by precipitation or evapotranspiration could be used to estimate seepage, as follows:

$G_o = -\Delta V + P - ET$ (4)

Time periods during which the no-inflow/no-outflow criteria were satisfied occurred when pumps were shut down, either for drawdown or for maintenance reasons, and wetland water levels were below the weir.

Change in Volume (ΔV)

Net change in wetland volume over any given period was determined using beginning and ending water levels and the known relationship between water levels and wetland volume.

Results and Discussion

Figures 3 and 4 show pumped inflows and water levels of both Wetland 1 and Wetland 2 in 2001. Annual and monthly hydrologic budgets were summarized for 2001 in

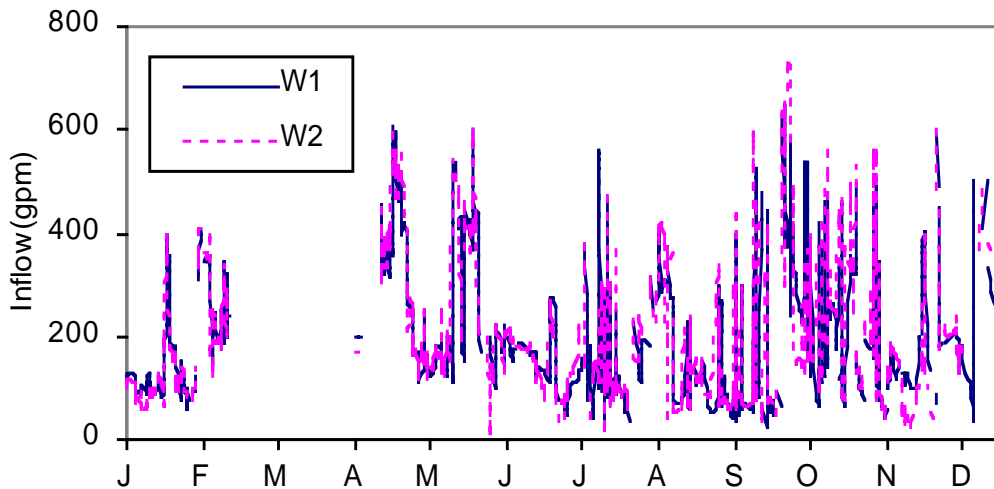


Figure 3. Pumped inflow of Wetland 1 and Wetland 2 in 2001.

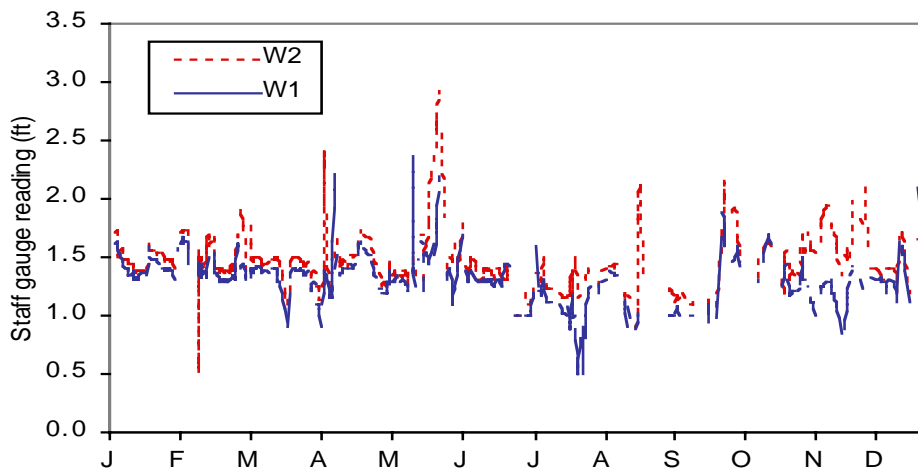


Figure 4. Water level of Wetland 1 and Wetland 2 in 2001.

Table 2.

In 2001, inflows to Wetlands 1 and 2 were 36.9 m and 37.8 m, respectively. Surface outflow for 2001 was estimated to be 27 m for each wetland, approximately 74% and 73% of pumped inflow. Daily flows on which these budgets were based are attached in Appendix A. Highest daily pumped values were 650 gpm on Oct. 1, 2001 and 728 gpm on Oct. 3, 2001 for Wetland 1 (W1) and Wetland 2 (W2), respectively. Table 3 shows monthly detention time of the two Olentangy River experimental wetlands in 2001. The average retention time in 2001 was 2.3 - 2.4 days. By comparison, the retention time was 3.60-3.79 days in 2000, 4.35 - 4.45 days in 1999, 1.8-2.0 days in 1998, 1-2 days in 1997, and 5.3-5.6 days in 1996.

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Table 2. Monthly and annual water budgets of the two Olentangy River experimental wetlands in 2001.

WETLAND 1							WETLAND 2						
Month	inf.(m)	outf(m)	Precip.	ET	Seepage	D vol	Month	inf.(m)	outf.(m)	Precip.	ET	Seepage	D vol
Jan	2.1	3.1	0.0	0.0	-0.9	-0.1	Jan	2.0	2.7	0.0	0.0	-0.8	0.0
Feb	3.0	2.8	0.0	0.1	0.1	0.1	Feb	3.1	2.7	0.0	0.1	0.4	0.0
Mar	3.1	2.3	0.0	0.1	0.7	0.1	Mar	3.2	2.6	0.0	0.1	0.5	0.0
Apr	4.9	2.7	0.1	0.0	2.3	0.0	Apr	5.0	2.6	0.1	0.0	2.4	0.0
May	3.8	3.5	0.2	0.1	0.4	0.0	May	3.8	3.3	0.2	0.1	0.3	0.3
Jun	2.4	2.5	0.1	0.0	0.0	0.0	Jun	2.5	2.3	0.1	0.0	0.6	-0.3
Jul	2.0	0.8	0.1	0.2	1.1	0.0	Jul	2.1	0.9	0.1	0.2	1.1	0.0
Aug	3.0	1.1	0.0	0.1	1.8	0.0	Aug	3.2	1.6	0.0	0.1	1.5	0.0
Sept	1.6	0.6	0.2	0.1	1.2	0.0	Sept	1.8	0.6	0.2	0.1	1.3	0.0
Oct	3.7	3.3	0.2	0.1	0.4	0.0	Oct	3.9	3.3	0.2	0.1	0.6	0.0
Nov	2.4	1.2	0.1	0.0	1.2	0.0	Nov	2.1	1.4	0.1	0.0	0.6	0.1
Dec	4.7	3.2	0.1	0.0	1.5	0.1	Dec	5.2	3.3	0.1	0.0	2.0	0.0
Total	36.9	27.2	1.1	0.9	9.9	0.1	Total	37.8	27.4	1.1	0.9	10.6	0.1

Table 3. Monthly retention days of the experimental wetlands in 2001.

Month	Detention day	
	W1	W2
1	3.8	3.6
2	2.3	2.2
3	2.3	2.2
4	1.5	1.4
5	2.1	2.2
6	2.9	2.6
7	2.5	2.4
8	2.0	1.9
9	3.0	2.6
10	2.2	1.9
11	2.5	3.6
12	1.3	1.4
average	2.4	2.3

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Appendix A. Daily water budgets (cm) of the two Olentangy River experimental wetlands in 2001.

Date	W1, (cm)						Date	W2, (cm)					
	Inf.	Outf.	Precip.	ET	Seep.	D vol		Inf.	Outf.	Precip.	ET	Seep.	D vol
1/1/01	2.2	5.8	0.0	0.0	-3.6	0.0	1/1/01	2.5	5.8	0.0	0.0		0.0
1/2/01	2.8	5.8	0.0	0.0	-4.3	1.3	1/2/01	3.2	5.8	0.0	0.0	-2.6	0.0
1/3/01	9.3	4.5	0.0	0.0	20.7	-15.9	1/3/01	9.5	5.3	0.0	0.0	4.6	-0.5
1/4/01	6.4	20.4	0.0	0.0	-15.4	1.4	1/4/01	5.7	17.5	0.0	0.0	-24.0	12.2
1/5/01	5.7	18.9	0.0	0.0	-14.5	1.2	1/5/01	4.2	16.7	0.0	0.0	-11.7	-0.8
1/6/01	5.4	17.7	0.0	0.1	-12.4	0.1	1/6/01	4.2	16.2	0.0	0.1	-11.7	-0.5
1/7/01	5.3	17.6	0.0	0.1	-14.2	1.9	1/7/01	4.0	14.7	0.0	0.1	-9.2	-1.6
1/8/01	5.2	15.8	0.0	0.2	-14.3	3.6	1/8/01	4.0	8.8	0.0	0.2	0.9	-5.9
1/9/01	5.3	12.2	0.0	0.1	-9.6	2.5	1/9/01	3.9	10.1	0.0	0.2	-7.7	1.4
1/10/01	5.3	9.7	0.0	0.0	-5.7	1.2	1/10/01	4.2	8.8	0.0	0.0	-3.2	-1.3
1/11/01	3.7	8.6	0.0	0.1	-6.0	1.1	1/11/01	3.4	7.8	0.0	0.1	-3.6	-1.0
1/12/01	5.7	7.5	0.0	0.1	-2.0	0.1	1/12/01	4.6	7.3	0.0	0.1	-2.3	-0.5
1/13/01	5.2	7.4	0.0	0.2	-2.6	0.2	1/13/01	4.9	6.9	0.0	0.2	-1.9	-0.4
1/14/01	5.0	7.2	0.1	0.2	-3.6	1.2	1/14/01	5.3	6.3	0.1	0.2	-0.5	-0.6
1/15/01	7.0	6.0	0.0	0.2	0.8	0.0	1/15/01	8.3	5.4	0.0	0.2	3.7	-1.0
1/16/01	3.8	6.0	0.0	0.1	-1.7	-0.6	1/16/01	6.1	5.1	0.0	0.1	1.2	-0.3
1/17/01	5.2	6.6	0.0	0.1	-0.8	-0.7	1/17/01	4.6	5.4	0.0	0.1	-1.2	0.3
1/18/01	10.7	7.3	0.0	0.2	3.2	0.0	1/18/01	11.0	5.4	0.0	0.2	5.3	0.0
1/19/01	7.0	7.3	0.1	0.2	0.4	-0.8	1/19/01	6.8	5.4	0.1	0.2	1.3	0.0
1/20/01	9.1	8.1	0.0	0.1	6.5	-5.6	1/20/01	8.3	6.2	0.0	0.1	1.1	0.8
1/21/01	10.4	13.7	0.0	0.2	-4.5	1.0	1/21/01	8.9	10.4	0.0	0.2	-5.8	4.1
1/22/01	8.3	12.7	0.0	0.2	-6.0	1.4	1/22/01	7.4	10.7	0.0	0.2	-3.8	0.3
1/23/01	7.1	11.2	0.0	0.0	-4.2	0.0	1/23/01	6.5	10.2	0.0	0.0	-3.2	-0.5

Date	W1, (cm)						Date	W2, (cm)					
	Inf.	Outf.	Precip.	ET	Seep.	D vol		Inf.	Outf.	Precip.	ET	Seep.	D vol
1/24/01	5.8	11.2	0.0	0.1	-5.7	0.2	1/24/01	6.4	10.2	0.0	0.1	-3.8	0.0
1/25/01	7.3	11.0	0.0	0.0	-4.1	0.4	1/25/01	7.6	9.5	0.0	0.0	-1.3	-0.6
1/26/01	9.2	10.5	0.1	0.1	-2.5	1.2	1/26/01	8.3	9.5	0.1	0.1	-1.3	0.0
1/27/01	6.3	9.4	0.1	0.1	-4.3	1.3	1/27/01	4.9	9.2	0.1	0.1	-3.9	-0.4
1/28/01	5.2	8.1	0.0	0.0	-2.7	-0.2	1/28/01	4.1	7.8	0.0	0.0	-2.3	-1.4
1/29/01	5.2	8.3	0.8	0.1	-2.5	0.0	1/29/01	5.1	7.4	0.8	0.2	-1.3	-0.4
1/30/01	15.8	8.3	0.6	0.2	8.1	-0.4	1/30/01	15.8	7.8	0.6	0.2	7.9	0.4
1/31/01	17.8	8.7	0.0	0.2	8.6	0.4	1/31/01	19.8	9.5	0.0	0.2	8.5	1.7
2/1/01	21.9	8.3	0.0	0.1	13.5	-0.1	2/1/01	22.2	10.3	0.0	0.1	11.1	0.8
2/2/01	20.8	8.4	0.0	0.4	18.9	-6.8	2/2/01	21.2	8.1	0.0	0.4	14.8	-2.1
2/3/01	19.0	15.2	0.0	0.2	7.0	-3.5	2/3/01	19.4	13.4	0.0	0.2	0.6	5.2
2/4/01	18.1	18.7	0.1	0.0	0.6	-1.2	2/4/01	18.4	16.1	0.1	0.1	-0.4	2.7
2/5/01	8.5	19.9	0.0	0.1	-13.8	2.3	2/5/01	8.5	16.5	0.0	0.1	-8.5	0.4
2/6/01	8.1	17.7	0.3	0.4	-9.0	-0.8	2/6/01	7.8	16.3	0.3	0.4	-8.4	-0.2
2/7/01	9.4	18.5	0.0	0.6	-15.8	6.1	2/7/01	9.3	16.6	0.0	0.6	-8.2	0.3
2/8/01	8.0	12.4	0.0	0.5	-7.4	2.6	2/8/01	9.0	12.1	0.0	0.5	1.0	-4.5
2/9/01	10.7	9.8	0.6	0.5	1.0	0.0	2/9/01	9.8	10.2	0.6	0.5	1.7	-1.9
2/10/01	14.0	9.8	0.0	0.4	4.3	-0.4	2/10/01	13.5	10.2	0.0	0.4	2.9	0.0
2/11/01	11.5	10.2	0.0	0.1	0.2	1.0	2/11/01	12.5	10.0	0.0	0.1	2.5	-0.1
2/12/01	13.5	9.1	0.0	0.1	3.9	0.4	2/12/01	15.5	8.7	0.0	0.1	7.9	-1.3
2/13/01	10.1	8.7	0.0	0.3	-0.1	1.3	2/13/01	10.1	7.9	0.0	0.3	2.8	-0.9
2/14/01	8.1	7.5	1.1	0.5	1.4	-0.2	2/14/01	8.3	6.4	1.1	0.5	3.9	-1.5
2/15/01	8.1	7.7	0.0	0.5	-0.1	-0.1	2/15/01	8.3	7.1	0.0	0.5	0.0	0.7
2/16/01	8.1	7.8	0.1	0.1	4.3	-3.9	2/16/01	8.3	12.7	0.1	0.1	-10.1	5.6
2/17/01	8.1	11.7	0.0	0.1	-2.3	-1.3	2/17/01	8.3	13.6	0.0	0.1	-6.2	0.9
2/18/01	8.1	13.1	0.0	0.0	-7.4	2.4	2/18/01	8.3	13.4	0.0	0.0	-5.0	-0.2
2/19/01	8.1	10.7	0.0	0.1	-4.5	1.8	2/19/01	8.3	10.5	0.0	0.1	0.5	-2.9
2/20/01	9.5	8.9	0.0	0.1	-1.6	2.0	2/20/01	9.7	7.6	0.0	0.1	4.9	-2.9
2/21/01	8.1	6.8	0.0	0.2	-0.1	1.1	2/21/01	8.2	5.9	0.0	0.2	3.9	-1.7
2/22/01	7.8	5.7	0.0	0.4	1.8	0.0	2/22/01	6.9	5.4	0.0	0.4	1.5	-0.4
2/23/01	9.2	5.7	0.0	0.1	3.4	0.0	2/23/01	9.5	5.7	0.0	0.1	3.4	0.2
2/24/01	7.0	5.7	0.0	0.2	0.9	0.2	2/24/01	7.1	5.3	0.0	0.2	2.0	-0.4
2/25/01	7.9	5.6	0.2	0.6	2.2	-0.2	2/25/01	8.0	5.4	0.2	0.6	2.2	0.1
2/26/01	7.8	5.8	0.0	0.4	1.7	-0.1	2/26/01	7.9	5.3	0.0	0.4	2.4	-0.1
2/27/01	17.2	5.9	0.0	0.5	11.5	-0.6	2/27/01	17.8	5.9	0.0	0.5	10.9	0.6
2/28/01	10.4	6.5	0.0	0.3	4.9	-1.4	2/28/01	10.7	6.1	0.0	0.3	4.0	0.2
3/1/01	8.5	7.9	0.0	0.3	8.0	-7.7	3/1/01	8.7	7.3	0.0	0.3	-0.1	1.2
3/2/01	8.5	15.6	0.0	0.3	-13.3	5.9	3/2/01	8.7	14.9	0.0	0.3	-14.2	7.6
3/3/01	10.4	9.7	0.0	0.1	-0.5	1.1	3/3/01	10.7	22.1	0.0	0.1	-18.7	7.2
3/4/01	10.4	8.6	0.2	0.2	-0.7	2.5	3/4/01	10.7	14.0	0.2	0.2	4.9	-8.2
3/5/01	10.6	6.1	0.0	0.3	5.9	-1.7	3/5/01	10.9	10.6	0.0	0.3	3.4	-3.4
3/6/01	8.5	7.9	0.0	0.4	-1.4	1.7	3/6/01	8.7	7.3	0.0	0.4	4.3	-3.3
3/7/01	12.3	6.2	0.0	0.4	6.9	-1.2	3/7/01	12.6	14.5	0.0	0.4	-9.5	7.2
3/8/01	12.8	7.4	0.0	0.1	6.0	-0.8	3/8/01	13.1	11.3	0.0	0.1	5.1	-3.3
3/9/01	12.8	8.2	0.0	0.1	5.2	-0.7	3/9/01	13.1	8.0	0.0	0.1	8.2	-3.2
3/10/01	12.4	8.9	0.0	0.3	2.9	0.2	3/10/01	12.7	8.3	0.0	0.3	3.9	0.2
3/11/01	11.6	8.7	0.0	0.4	2.4	0.2	3/11/01	11.9	8.0	0.0	0.4	3.9	-0.3
3/12/01	12.4	8.5	0.8	0.3	3.6	0.7	3/12/01	12.7	7.6	0.8	0.3	6.0	-0.4
3/13/01	12.6	7.8	0.2	0.4	4.9	-0.2	3/13/01	13.0	6.7	0.2	0.4	6.9	-0.9
3/14/01	14.4	8.0	0.0	0.4	5.8	0.2	3/14/01	14.8	6.8	0.0	0.5	7.5	0.1
3/15/01	11.8	7.9	0.0	0.4	3.3	0.2	3/15/01	12.2	7.1	0.0	0.5	4.4	0.3
3/16/01	9.8	7.7	0.3	0.5	2.6	-0.7	3/16/01	10.0	7.5	0.3	0.5	1.9	0.4
3/17/01	6.4	8.3	0.0	0.1	-1.9	-0.2	3/17/01	6.5	7.8	0.0	0.1	-1.6	0.3
3/18/01	5.7	8.5	0.0	0.1	-3.5	0.5	3/18/01	5.7	7.9	0.0	0.2	-2.5	0.2
3/19/01	3.9	8.0	0.0	0.3	-6.1	1.8	3/19/01	0.8	8.1	0.0	0.3	-7.7	0.2
3/20/01	1.3	6.2	0.0	0.1	-6.3	1.3	3/20/01	0.0	8.2	0.0	0.1	-8.3	0.1
3/21/01	5.4	4.9	0.0	0.1	-1.6	2.0	3/21/01	5.6	6.9	0.0	0.1	-0.3	-1.2
3/22/01	10.8	2.9	0.0	0.3	6.4	1.3	3/22/01	11.2	4.5	0.0	0.3	8.9	-2.5

30 ♦ The Olentangy River Wetland Research Park

Date	W1, (cm)						Date	W2, (cm)					
	Inf.	Outf.	Precip.	ET	Seep.	D vol		Inf.	Outf.	Precip.	ET	Seep.	D vol
3/23/01	14.4	1.7	0.0	0.4	11.9	0.4	3/23/01	14.8	2.3	0.0	0.4	14.2	-2.1
3/24/01	13.0	1.2	0.0	0.5	15.8	-4.5	3/24/01	13.4	1.8	0.0	0.5	11.6	-0.5
3/25/01	12.8	5.7	0.0	0.3	9.5	-2.8	3/25/01	13.1	5.8	0.0	0.3	3.1	4.0
3/26/01	12.8	8.5	0.0	0.6	3.3	0.3	3/26/01	13.1	8.3	0.0	0.6	1.6	2.6
3/27/01	12.8	8.1	0.0	0.5	4.1	-0.1	3/27/01	13.1	8.4	0.0	0.6	4.2	0.0
3/28/01	11.9	8.2	0.0	0.3	3.5	-0.1	3/28/01	12.2	8.4	0.0	0.3	3.5	0.0
3/29/01	8.4	8.3	0.0	0.4	-0.3	0.1	3/29/01	8.6	8.2	0.0	0.4	0.2	-0.2
3/30/01	7.8	8.1	0.0	0.4	-1.6	0.9	3/30/01	8.0	7.7	0.0	0.4	0.3	-0.5
3/31/01	6.8	7.3	0.0	0.4	-0.9	0.0	3/31/01	7.0	7.0	0.0	0.4	0.1	-0.7
4/1/01	9.5	7.2	2.1	0.1	3.8	0.5	4/1/01	9.8	6.7	2.1	0.1	5.4	-0.3
4/2/01	5.5	6.7	0.0	0.1	-3.7	2.3	4/2/01	5.6	6.2	0.0	0.1	-0.2	-0.5
4/3/01	4.7	4.4	0.0	0.1	0.4	-0.1	4/3/01	4.8	4.5	0.0	0.1	1.9	-1.7
4/4/01	5.8	4.6	0.0	0.1	1.7	-0.6	4/4/01	5.9	4.8	0.0	0.1	0.6	0.3
4/5/01	6.8	5.1	0.0	0.2	-0.4	1.8	4/5/01	6.0	5.3	0.0	0.2	0.2	0.4
4/6/01	12.8	3.3	0.2	0.2	7.7	1.8	4/6/01	12.2	3.8	0.2	0.2	9.8	-1.4
4/7/01	10.8	1.5	0.0	0.1	10.0	-0.7	4/7/01	9.3	2.2	0.0	0.1	8.6	-1.6
4/8/01	8.3	2.2	0.0	0.1	10.5	-4.6	4/8/01	7.5	3.1	0.0	0.1	3.4	0.9
4/9/01	5.8	6.8	0.5	0.1	-1.4	0.8	4/9/01	5.9	27.9	0.5	0.1	-46.5	24.8
4/10/01	5.8	5.9	1.8	0.2	0.2	1.3	4/10/01	5.9	6.0	1.8	0.2	23.3	-21.9
4/11/01	16.2	4.6	2.7	0.2	12.4	1.7	4/11/01	16.8	4.8	2.7	0.2	15.8	-1.3
4/12/01	19.7	3.0	0.0	0.2	25.6	-9.0	4/12/01	25.7	3.0	0.0	0.2	24.2	-1.7
4/13/01	13.5	12.0	0.0	0.1	17.2	-15.8	4/13/01	15.5	3.0	0.0	0.1	12.4	0.0
4/14/01	15.1	27.9	0.0	0.1	-30.3	17.4	4/14/01	15.6	7.9	0.0	0.1	2.7	4.9
4/15/01	16.7	10.4	0.5	0.1	3.3	3.4	4/15/01	17.2	12.0	0.5	0.1	1.6	4.1
4/16/01	17.3	7.0	0.0	0.1	10.6	-0.3	4/16/01	17.1	7.2	0.0	0.1	14.6	-4.8
4/17/01	18.1	7.3	0.0	0.2	11.5	-0.8	4/17/01	17.3	7.2	0.0	0.2	9.8	0.1
4/18/01	14.5	8.1	0.0	0.1	6.6	-0.3	4/18/01	13.2	7.6	0.0	0.1	5.1	0.4
4/19/01	17.0	8.5	0.0	0.0	8.7	-0.2	4/19/01	17.5	7.4	0.0	0.0	10.3	-0.2
4/20/01	19.9	8.7	2.4	0.2	14.1	-0.7	4/20/01	20.2	6.9	2.4	0.2	16.1	-0.5
4/21/01	24.6	9.4	0.0	0.1	14.7	0.4	4/21/01	24.6	8.8	0.0	0.1	13.9	1.9
4/22/01	32.8	9.0	0.0	0.1	24.9	-1.3	4/22/01	30.6	8.7	0.0	0.1	22.0	-0.1
4/23/01	31.2	10.3	0.0	0.2	22.9	-2.1	4/23/01	29.6	9.3	0.0	0.2	19.6	0.6
4/24/01	30.0	12.4	0.0	0.2	21.8	-4.3	4/24/01	30.3	11.4	0.0	0.2	16.7	2.1
4/25/01	25.3	16.7	0.0	0.1	9.1	-0.6	4/25/01	27.0	16.0	0.0	0.1	6.3	4.6
4/26/01	25.0	17.3	0.0	0.1	6.2	1.4	4/26/01	27.4	16.3	0.0	0.1	10.8	0.3
4/27/01	18.8	16.0	0.0	0.2	0.2	2.4	4/27/01	19.5	15.6	0.0	0.2	4.4	-0.7
4/28/01	15.0	13.6	0.0	0.2	0.5	0.8	4/28/01	15.4	14.2	0.0	0.2	2.3	-1.4
4/29/01	13.6	12.8	0.0	0.2	-1.6	2.2	4/29/01	14.1	14.0	0.0	0.2	0.3	-0.3
4/30/01	14.0	10.6	0.0	0.1	-0.1	3.3	4/30/01	14.6	10.8	0.0	0.1	6.8	-3.1
5/1/01	10.9	7.2	0.0	0.0	3.1	0.5	5/1/01	12.3	7.4	0.0	0.0	8.4	-3.5
5/2/01	4.8	6.7	0.0	0.2	-2.8	0.7	5/2/01	5.0	7.1	0.0	0.2	-1.9	-0.3
5/3/01	6.1	5.9	0.0	0.1	-1.3	1.3	5/3/01	6.1	6.7	0.0	0.1	-0.2	-0.4
5/4/01	8.6	4.6	0.0	0.0	3.4	0.6	5/4/01	8.6	5.0	0.0	0.0	5.2	-1.6
5/5/01	8.7	4.0	0.0	0.0	4.5	0.2	5/5/01	8.1	3.6	0.0	0.0	5.9	-1.4
5/6/01	8.3	3.8	0.0	0.0	5.4	-0.9	5/6/01	7.8	3.4	0.0	0.0	4.7	-0.2
5/7/01	8.1	4.7	0.1	0.1	8.6	-5.1	5/7/01	7.7	3.4	0.1	0.1	4.2	0.1
5/8/01	14.2	9.8	1.3	0.0	2.0	3.7	5/8/01	13.9	8.5	1.3	0.0	1.5	5.1
5/9/01	7.3	6.1	0.0	0.1	0.6	0.6	5/9/01	7.4	5.7	0.0	0.1	4.6	-2.9
5/10/01	9.5	5.5	0.1	0.0	4.4	-0.3	5/10/01	9.3	5.0	0.1	0.0	5.0	-0.6
5/11/01	9.8	5.8	0.2	0.1	5.1	-0.9	5/11/01	9.0	4.9	0.2	0.1	4.4	-0.1
5/12/01	9.5	6.7	0.4	0.2	1.9	1.1	5/12/01	9.0	4.0	0.4	0.2	6.1	-0.9
5/13/01	7.9	5.7	0.0	1.4	0.9	-0.1	5/13/01	7.9	4.3	0.0	1.4	1.9	0.3
5/14/01	8.4	5.7	0.1	0.0	2.1	0.6	5/14/01	8.1	4.9	0.1	0.0	2.7	0.6
5/15/01	10.8	5.1	2.5	0.0	7.5	0.8	5/15/01	10.4	5.0	2.5	0.0	7.8	0.1
5/16/01	16.9	4.3	4.6	0.1	16.6	0.4	5/16/01	16.7	4.2	4.6	0.1	17.8	-0.8
5/17/01	9.7	3.9	2.0	0.3	8.2	-0.7	5/17/01	9.8	3.1	2.0	0.3	9.5	-1.1
5/18/01	15.9	4.7	2.7	0.0	16.6	-2.6	5/18/01	16.6	3.8	2.7	0.0	14.8	0.7
5/19/01	18.3	7.2	0.0	0.0	9.3	1.8	5/19/01	20.2	7.3	0.0	0.0	9.3	3.6

Date	W1, (cm)						Date	W2, (cm)					
	Inf.	Outf.	Precip.	ET	Seep.	D vol		Inf.	Outf.	Precip.	ET	Seep.	D vol
5/20/01	17.4	5.4	0.0	0.0	19.0	-7.0	5/20/01	18.2	5.4	0.0	0.0	14.8	-2.0
5/21/01	15.4	12.5	0.8	0.0	9.5	-5.8	5/21/01	16.2	10.5	0.8	0.0	1.3	5.2
5/22/01	23.7	18.2	0.6	0.0	-2.6	8.7	5/22/01	22.5	15.2	0.6	0.0	3.2	4.7
5/23/01	22.1	9.6	0.2	2.3	11.0	-0.5	5/23/01	21.9	8.6	0.2	2.3	17.8	-6.6
5/24/01	20.6	10.1	2.8	0.0	15.3	-2.0	5/24/01	20.5	8.8	2.8	0.0	14.4	0.2
5/25/01	13.7	12.1	0.1	0.1	0.2	1.4	5/25/01	14.1	14.7	0.1	0.1	-6.6	5.9
5/26/01	24.2	10.7	0.2	0.2	18.0	-4.5	5/26/01	24.4	10.7	0.2	0.2	17.7	-4.1
5/27/01	20.5	15.2	0.3	0.1	6.9	-1.4	5/27/01	20.3	15.2	0.3	0.1	0.9	4.5
5/28/01	5.4	16.6	0.0	0.3	2.4	-13.9	5/28/01	5.0	16.7	0.0	0.3	-13.5	1.5
5/29/01	5.2	30.5	0.1	0.1	4.3	-29.6	5/29/01	5.2	30.5	0.1	0.1	-39.1	13.8
5/30/01	8.6	60.1	0.0	0.1	-73.8	22.3	5/30/01	9.0	60.1	0.0	0.1	-80.7	29.6
5/31/01	9.2	37.8	0.0	0.5	-29.1	0.0	5/31/01	9.3	37.8	0.0	0.5	-6.8	-22.3
6/1/01	9.2	37.8	2.7	0.0	-40.9	15.1	6/1/01	9.3	37.8	2.7	0.0	-25.8	0.0
6/2/01	7.2	22.7	0.9	0.1	-34.3	19.6	6/2/01	7.1	15.4	0.9	0.1	14.9	-22.4
6/3/01	6.2	3.2	0.0	0.0	2.5	0.6	6/3/01	6.8	3.7	0.0	0.0	14.9	-11.8
6/4/01	7.8	2.6	0.1	0.2	5.7	-0.6	6/4/01	8.0	4.1	0.1	0.2	3.3	0.5
6/5/01	9.7	3.2	0.0	0.1	8.5	-2.1	6/5/01	10.1	8.4	0.0	0.1	-2.7	4.3
6/6/01	9.6	5.3	1.4	0.2	7.4	-1.9	6/6/01	9.6	11.2	1.4	0.2	-3.2	2.8
6/7/01	10.3	7.2	0.0	0.1	5.6	-2.7	6/7/01	9.0	8.7	0.0	0.1	2.7	-2.5
6/8/01	10.7	9.9	0.0	0.2	7.9	-7.3	6/8/01	10.7	7.2	0.0	0.2	4.7	-1.5
6/9/01	9.9	17.2	0.0	0.2	-9.1	1.5	6/9/01	10.9	12.3	0.0	0.2	-6.8	5.1
6/10/01	8.5	15.7	0.0	0.2	-16.3	8.9	6/10/01	10.9	13.8	0.0	0.2	-4.5	1.4
6/11/01	7.7	6.8	0.2	0.2	0.1	0.8	6/11/01	8.6	5.4	0.2	0.2	11.6	-8.4
6/12/01	3.0	6.0	0.8	0.2	-0.3	-2.1	6/12/01	3.1	4.5	0.8	0.2	0.0	-0.9
6/13/01	7.8	8.1	0.0	0.3	-0.9	0.3	6/13/01	7.8	7.6	0.0	0.3	-3.2	3.1
6/14/01	9.9	7.8	0.0	0.0	1.2	0.9	6/14/01	10.2	8.1	0.0	0.0	1.5	0.5
6/15/01	9.9	6.8	0.0	0.0	2.1	1.0	6/15/01	9.9	7.7	0.0	0.0	2.6	-0.4
6/16/01	10.0	5.9	0.0	0.1	3.6	0.5	6/16/01	10.0	6.7	0.0	0.1	4.1	-1.0
6/17/01	8.8	5.4	0.0	0.0	3.6	-0.2	6/17/01	9.0	3.8	0.0	0.0	8.0	-2.9
6/18/01	8.9	5.6	0.0	0.1	3.2	0.0	6/18/01	9.1	4.5	0.0	0.1	3.7	0.7
6/19/01	8.4	5.7	0.0	0.1	2.6	0.0	6/19/01	8.1	5.4	0.0	0.1	1.7	0.8
6/20/01	8.4	5.7	0.2	0.2	2.8	-0.1	6/20/01	7.8	5.8	0.2	0.2	1.6	0.4
6/21/01	7.8	5.8	1.2	0.5	2.7	0.1	6/21/01	7.3	5.7	1.2	0.5	2.4	-0.1
6/22/01	7.4	5.6	0.8	0.6	1.9	0.0	6/22/01	7.0	5.6	0.8	0.6	1.7	-0.1
6/23/01	5.6	5.6	0.0	0.0	-0.5	0.5	6/23/01	6.2	5.2	0.0	0.0	1.5	-0.4
6/24/01	5.3	5.1	0.0	0.0	0.8	-0.7	6/24/01	5.4	4.7	0.0	0.0	1.2	-0.5
6/25/01	7.1	5.8	0.0	0.0	1.0	0.2	6/25/01	7.3	5.8	0.0	0.0	0.2	1.2
6/26/01	13.1	5.6	0.0	0.1	7.0	0.5	6/26/01	14.1	5.5	0.0	0.1	8.9	-0.3
6/27/01	13.6	5.0	0.0	0.1	8.6	-0.1	6/27/01	13.3	4.7	0.0	0.1	9.3	-0.8
6/28/01	10.8	5.1	0.0	0.0	9.1	-3.4	6/28/01	10.3	4.2	0.0	0.0	6.6	-0.5
6/29/01	3.5	8.6	0.3	0.0	-3.5	-1.2	6/29/01	4.4	3.9	0.3	0.0	1.1	-0.3
6/30/01	1.6	9.8	0.0	0.1	-10.2	1.9	6/30/01	2.4	4.6	0.0	0.1	-2.9	0.6
7/1/01	3.8	7.9	1.0	0.5	-5.5	1.8	7/1/01	4.3	6.6	1.0	0.5	-3.9	2.0
7/2/01	2.5	6.1	0.0	0.7	-8.5	4.2	7/2/01	2.7	5.9	0.0	0.7	-3.0	-0.8
7/3/01	3.3	1.9	0.4	0.7	0.5	0.6	7/3/01	3.6	3.3	0.4	0.7	2.5	-2.5
7/4/01	4.1	1.3	0.3	0.6	2.7	-0.2	7/4/01	4.0	0.6	0.3	0.7	5.8	-2.7
7/5/01	2.7	1.5	0.0	1.0	0.9	-0.7	7/5/01	3.3	1.0	0.0	1.0	1.0	0.3
7/6/01	4.9	2.2	0.0	0.6	1.9	0.2	7/6/01	6.5	2.2	0.0	0.6	2.5	1.2
7/7/01	7.2	1.9	0.0	0.4	4.2	0.6	7/7/01	8.8	2.4	0.0	0.4	5.8	0.2
7/8/01	8.9	1.3	0.1	0.8	6.9	0.0	7/8/01	10.7	1.9	0.1	0.8	8.4	-0.4
7/9/01	11.1	1.3	0.0	0.9	9.2	-0.3	7/9/01	10.5	1.3	0.0	0.9	8.9	-0.6
7/10/01	10.4	1.6	0.3	0.8	9.9	-1.6	7/10/01	10.7	1.6	0.3	0.8	8.4	0.2
7/11/01	11.3	3.2	0.0	0.7	7.2	0.2	7/11/01	12.6	2.9	0.0	0.8	7.6	1.3
7/12/01	9.2	3.0	0.0	0.7	10.0	-4.4	7/12/01	11.3	2.9	0.0	0.7	7.6	0.0
7/13/01	9.0	7.4	0.0	0.6	-2.0	2.9	7/13/01	5.5	4.2	0.0	0.6	-0.5	1.3
7/14/01	6.7	4.5	0.0	0.3	1.4	0.6	7/14/01	7.6	4.5	0.0	0.3	2.5	0.3
7/15/01	6.9	3.8	0.0	0.7	3.1	-0.8	7/15/01	9.5	4.0	0.0	0.7	5.2	-0.5
7/16/01	7.8	4.6	0.0	1.4	-0.3	2.1	7/16/01	11.4	6.2	0.0	1.4	1.6	2.2
7/17/01	8.8	2.5	0.9	1.3	5.8	0.0	7/17/01	9.2	2.8	0.9	1.3	9.4	-3.4

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Date	W1, (cm)						Date	W2, (cm)					
	Inf.	Outf.	Precip.	ET	Seep.	D vol		Inf.	Outf.	Precip.	ET	Seep.	D vol
7/18/01	5.4	2.8	0.0	1.0	1.6	0.0							
7/19/01	8.5	2.5	0.1	1.0	5.2	-0.1	7/19/01	9.0	2.8	0.1	1.0	5.3	0.0
7/20/01	8.3	2.7	0.0	0.7	4.9	0.0	7/20/01	8.9	2.7	0.0	0.7	5.5	-0.1
7/21/01	6.4	2.7	0.0	0.7	3.2	-0.2	7/21/01	5.2	2.7	0.0	0.7	1.9	-0.1
7/22/01	6.2	3.0	0.0	0.7	1.4	1.2	7/22/01	4.4	3.0	0.0	0.7	0.5	0.3
7/23/01	6.1	1.8	0.0	0.5	3.7	0.2	7/23/01	4.2	1.8	0.0	0.5	3.0	-1.1
7/24/01	5.8	1.6	0.0	0.9	3.2	0.2	7/24/01	5.5	1.8	0.0	0.9	2.8	0.0
7/25/01	4.8	1.4	5.1	0.6	7.8	0.1	7/25/01	4.8	1.8	5.1	0.6	7.5	0.0
7/26/01	3.6	1.3	0.0	0.5	2.1	-0.3	7/26/01	4.7	1.8	0.0	0.5	2.4	0.0
7/27/01	3.5	1.6	0.0	0.6	0.9	0.4	7/27/01	5.3	2.0	0.0	0.6	2.6	0.2
7/28/01	4.0	1.2	0.0	0.6	2.9	-0.7	7/28/01	3.6	3.2	0.0	0.6	-1.4	1.2
7/29/01	3.8	1.9	1.2	0.5	1.3	1.3	7/29/01	3.7	3.9	1.2	0.5	-0.3	0.8
7/30/01	5.0	0.6	0.1	0.5	3.3	0.6	7/30/01	6.2	6.5	0.1	0.5	-3.3	2.6
7/31/01	8.8	0.0	0.0	0.5	8.4	-0.2	7/31/01	9.1	1.9	0.0	0.5	11.3	-4.6
8/1/01	5.9	0.2	0.0	0.4	5.5	-0.2	8/1/01	6.0	2.0	0.0	0.4	3.5	0.1
8/2/01	9.1	0.4	0.3	0.3	8.8	-0.2	8/2/01	9.6	1.3	0.3	0.3	8.9	-0.7
8/3/01	9.0	0.5	0.1	0.2	8.9	-0.6	8/3/01	10.5	2.0	0.1	0.2	7.6	0.7
8/4/01	9.2	1.1	0.0	0.2	10.2	-2.3	8/4/01	10.5	4.1	0.0	0.2	4.3	2.0
8/5/01	9.4	3.4	0.0	0.2	7.0	-1.2	8/5/01	10.4	5.2	0.0	0.2	3.9	1.1
8/6/01	13.1	4.7	0.0	0.4	8.0	0.0	8/6/01	13.6	4.1	0.0	0.4	10.2	-1.1
8/7/01	15.0	4.7	0.0	0.4	9.9	0.0	8/7/01	15.9	4.1	0.0	0.4	11.4	0.0
8/8/01	14.8	4.7	0.0	0.3	9.3	0.5	8/8/01	14.0	4.1	0.0	0.3	9.6	0.0
8/9/01	14.5	4.2	0.0	0.3	10.9	-0.9	8/9/01	13.8	3.9	0.0	0.3	9.9	-0.2
8/10/01	14.4	5.1	0.0	0.4	9.1	-0.2	8/10/01	13.5	5.2	0.0	0.5	6.6	1.3
8/11/01	16.9	5.3	0.0	0.4	11.5	-0.3	8/11/01	19.8	5.4	0.0	0.4	13.7	0.2
8/12/01	17.7	5.6	0.0	0.7	12.0	-0.5	8/12/01	23.3	5.8	0.0	0.7	16.4	0.4
8/13/01	16.5	6.1	0.2	0.5	11.5	-1.4	8/13/01	19.1	6.1	0.2	0.5	12.3	0.3
8/14/01	19.1	7.5	0.0	0.6	11.0	-0.1	8/14/01	19.6	6.3	0.0	0.6	12.5	0.2
8/15/01	14.0	7.6	0.0	0.3	5.8	0.2	8/15/01	16.2	6.6	0.0	0.3	9.0	0.3
8/16/01	10.3	7.4	0.0	0.5	1.8	0.5	8/16/01	11.2	6.6	0.0	0.5	4.1	0.0
8/17/01	9.8	6.8	0.0	0.8	2.3	-0.1	8/17/01	11.4	6.7	0.0	0.8	3.7	0.2
8/18/01	6.8	7.0	2.2	1.2	0.5	0.4	8/18/01	7.6	6.9	2.2	1.2	1.7	0.1
8/19/01	4.3	6.5	0.2	0.8	-4.5	1.6	8/19/01	3.9	6.2	0.2	0.8	-2.3	-0.6
8/20/01	4.6	4.9	0.0	0.7	-2.4	1.4	8/20/01	3.7	4.4	0.0	0.7	0.5	-1.8
8/21/01	4.1	3.5	0.0	0.6	-1.5	1.5	8/21/01	3.8	2.9	0.0	0.6	1.8	-1.5
8/22/01	5.3	2.0	0.4	0.3	2.0	1.4	8/22/01	4.9	2.1	0.4	0.3	3.7	-0.8
8/23/01	8.4	0.7	0.8	0.2	9.1	-0.8	8/23/01	8.4	1.3	0.8	0.3	8.3	-0.7
8/24/01	7.1	1.5	0.0	0.2	5.1	0.3	8/24/01	6.7	1.8	0.0	0.2	4.2	0.4
8/25/01	7.9	1.2	0.0	0.2	6.2	0.2	8/25/01	7.8	1.8	0.0	0.2	5.8	0.0
8/26/01	5.9	1.0	0.0	0.3	4.5	0.1	8/26/01	6.2	1.2	0.0	0.3	5.3	-0.6
8/27/01	5.9	0.8	0.0	0.3	5.3	-0.6	8/27/01	6.6	0.6	0.0	0.3	6.3	-0.6
8/28/01	6.8	1.4	0.0	0.3	5.2	-0.1	8/28/01	6.7	21.1	0.0	0.3	-35.3	20.5
8/29/01	7.5	1.6	0.0	0.3	6.1	-0.4	8/29/01	6.3	21.9	0.0	0.3	-16.6	0.8
8/30/01	7.4	1.9	0.0	0.3	5.8	-0.6	8/30/01	6.4	3.9	0.0	0.3	20.3	-18.0
8/31/01	3.7	2.5	0.0	0.3	1.4	-0.4	8/31/01	4.9	3.3	0.0	0.3	1.9	-0.6
9/1/01	3.2	3.0	0.0	0.1	0.3	-0.1	9/1/01	4.5	3.1	0.0	0.1	1.5	-0.2
9/2/01	3.5	3.1	3.2	0.4	4.0	-0.9	9/2/01	4.3	2.7	3.2	0.4	4.7	-0.4
9/3/01	3.7	4.0	0.0	0.1	-0.6	0.2	9/3/01	4.1	1.1	0.0	0.1	4.7	-1.7
9/4/01	4.0	3.8	0.9	0.1	1.0	0.0	9/4/01	3.9	1.3	0.9	0.1	3.1	0.3
9/5/01	7.5	3.8	0.0	0.3	3.4	0.0	9/5/01	6.9	1.3	0.0	0.3	5.2	0.0
9/6/01	5.4	3.8	0.0	0.8	-0.2	1.1	9/6/01	4.0	1.3	0.0	0.8	2.0	0.0
9/7/01	4.3	2.6	0.0	0.0	1.0	0.6	9/7/01	5.7	1.6	0.0	0.0	3.7	0.3
9/8/01	3.5	2.1	0.3	0.0	1.4	0.3	9/8/01	4.0	1.7	0.3	0.0	2.5	0.1
9/9/01	2.8	1.8	0.1	0.1	0.6	0.5	9/9/01	3.6	1.9	0.1	0.1	1.6	0.2
9/10/01	3.1	1.3	0.5	0.0	2.3	0.0	9/10/01	3.6	2.6	0.5	0.0	0.9	0.7
9/11/01	5.0	1.3	0.0	1.3	2.4	0.0	9/11/01	4.2	2.8	0.0	1.3	-0.1	0.2
9/12/01	5.4	1.3	2.4	0.0	6.7	-0.2	9/12/01	5.0	2.4	2.4	0.0	5.4	-0.4
9/13/01	4.1	1.5	0.0	0.0	3.2	-0.6	9/13/01	4.3	1.7	0.0	0.0	3.4	-0.7
9/14/01	3.3	2.1	0.1	0.5	0.5	0.4	9/14/01	4.0	1.9	0.1	0.5	1.5	0.2

Date	W1, (cm)						Date	W2, (cm)					
	Inf.	Outf.	Precip.	ET	Seep.	D vol		Inf.	Outf.	Precip.	ET	Seep.	D vol
9/15/01	3.4	1.7	0.0	0.2	1.1	0.4	9/15/01	3.9	1.8	0.0	0.2	2.0	-0.1
9/16/01	3.5	1.3	0.0	0.2	2.0	0.0	9/16/01	3.8	2.1	0.0	0.2	1.3	0.3
9/17/01	3.6	1.3	0.0	0.1	2.2	0.0	9/17/01	3.7	2.2	0.0	0.1	1.2	0.2
9/18/01	7.1	1.3	0.0	0.2	5.5	0.0	9/18/01	7.2	1.9	0.0	0.2	5.5	-0.4
9/19/01	3.8	1.3	0.0	1.0	1.6	0.0	9/19/01	3.8	1.5	0.0	1.0	1.6	-0.3
9/20/01	3.3	1.3	3.1	0.2	4.9	0.0	9/20/01	2.7	1.4	3.1	0.2	4.3	-0.1
9/21/01	3.8	1.3	0.1	0.2	2.3	0.1	9/21/01	3.5	1.5	0.1	0.2	1.8	0.1
9/22/01	3.4	1.2	0.0	1.0	1.2	0.0	9/22/01	3.6	2.0	0.0	1.0	0.0	0.5
9/23/01	2.9	1.1	8.9	0.1	10.6	-0.1	9/23/01	3.1	2.1	8.9	0.1	9.6	0.1
9/24/01	2.7	1.2	0.0	0.1	1.9	-0.4	9/24/01	3.0	2.2	0.0	0.1	0.8	0.0
9/25/01	3.6	1.6	1.7	0.2	4.0	-0.6	9/25/01	4.0	2.2	1.7	0.2	3.2	0.1
9/26/01	3.0	2.2	0.1	0.0	0.9	0.0	9/26/01	3.4	2.3	0.1	0.0	1.0	0.1
9/27/01	2.1	2.2	0.0	0.3	-0.8	0.4	9/27/01	2.2	2.2	0.0	0.3	0.0	-0.2
9/28/01	4.4	1.7	0.0	0.0	2.4	0.3	9/28/01	4.0	1.5	0.0	0.0	3.1	-0.7
9/29/01	10.3	1.5	0.0	0.0	8.7	0.1	9/29/01	10.7	1.5	0.0	0.0	9.2	0.0
9/30/01	23.7	1.4	0.0	0.0	22.3	0.0	9/30/01	26.1	1.5	0.0	0.0	24.5	0.0
10/1/01	24.6	1.4	0.0	0.1	23.2	0.0	10/1/01	29.7	1.5	0.0	0.1	28.1	0.0
10/2/01	19.7	1.4	0.0	0.0	25.1	-6.9	10/2/01	25.9	1.5	0.0	0.0	24.3	0.0
10/3/01	23.1	8.2	0.0	0.0	39.3	-24.4	10/3/01	27.1	5.2	0.0	0.0	18.1	3.7
10/4/01	14.9	32.6	2.4	0.0	-23.0	7.7	10/4/01	19.5	18.0	2.4	0.0	-8.9	12.8
10/5/01	18.9	24.9	10.1	0.0	2.5	1.6	10/5/01	15.8	27.1	10.1	0.0	-10.3	9.1
10/6/01	18.4	23.3	0.0	0.1	-9.3	4.4	10/6/01	13.5	31.9	0.0	0.1	-23.2	4.8
10/7/01	15.2	19.0	0.0	1.9	-13.7	8.1	10/7/01	13.2	24.1	0.0	1.9	-4.9	-7.8
10/8/01	13.1	10.9	0.0	2.2	-0.1	0.1	10/8/01	13.2	22.3	0.0	2.2	-9.4	-1.8
10/9/01	14.4	10.8	0.0	0.0	6.0	-2.4	10/9/01	13.2	24.7	0.0	0.0	-13.9	2.5
10/10/01	12.9	13.1	0.0	0.2	1.4	-1.8	10/10/01	12.8	23.5	0.0	0.2	-9.7	-1.2
10/11/01	13.9	15.0	0.0	1.3	-6.8	4.4	10/11/01	14.3	15.6	0.0	1.3	5.2	-7.9
10/12/01	12.5	10.5	0.0	0.1	1.5	0.4	10/12/01	13.0	9.6	0.0	0.1	9.4	-6.0
10/13/01	8.9	10.2	0.0	0.0	-3.8	2.5	10/13/01	10.0	8.0	0.0	0.0	3.6	-1.6
10/14/01	7.7	7.7	0.0	2.0	-2.5	0.6	10/14/01	10.0	7.1	0.0	2.0	1.9	-0.9
10/15/01	5.5	7.1	0.0	0.2	-3.1	1.4	10/15/01	7.1	6.5	0.0	0.2	1.1	-0.6
10/16/01	6.6	5.7	0.0	0.1	-0.5	1.3	10/16/01	6.1	4.5	0.0	0.1	3.5	-2.0
10/17/01	8.5	4.4	2.9	0.0	6.6	0.3	10/17/01	8.5	2.8	2.9	0.0	10.3	-1.7
10/18/01	11.4	4.1	0.0	0.0	7.3	0.0	10/18/01	11.3	2.4	0.0	0.0	9.3	-0.4
10/19/01	13.1	4.1	0.0	0.1	9.2	-0.3	10/19/01	12.5	2.4	0.0	0.1	10.1	0.0
10/20/01	12.8	4.4	0.0	1.1	8.6	-1.3	10/20/01	13.0	3.3	0.0	1.1	7.8	0.9
10/21/01	12.9	5.7	0.0	0.1	9.8	-2.7	10/21/01	15.2	5.3	0.0	0.1	7.9	2.0
10/22/01	10.6	8.4	0.0	0.0	6.9	-4.7	10/22/01	13.9	6.9	0.0	0.0	5.4	1.6
10/23/01	9.2	13.1	0.0	0.0	1.7	-5.7	10/23/01	12.6	10.3	0.0	0.0	-1.1	3.4
10/24/01	8.8	18.8	0.4	0.0	-8.0	-1.6	10/24/01	8.1	12.1	0.4	0.0	-5.5	1.9
10/25/01	10.8	20.4	0.0	0.0	-13.9	4.3	10/25/01	10.0	13.2	0.0	0.0	-4.2	1.0
10/26/01	7.2	16.2	0.0	0.1	-15.5	6.5	10/26/01	6.7	12.8	0.0	0.1	-5.9	-0.3
10/27/01	3.6	9.7	0.0	0.0	-10.5	4.4	10/27/01	3.0	9.5	0.0	0.0	-3.1	-3.4
10/28/01	8.5	5.3	0.0	0.0	2.1	1.0	10/28/01	7.8	4.8	0.0	0.0	7.6	-4.6
10/29/01	17.7	4.3	0.0	0.1	13.1	0.2	10/29/01	18.8	3.5	0.0	0.1	16.5	-1.3
10/30/01	15.5	4.1	0.0	0.1	12.4	-1.1	10/30/01	15.2	3.2	0.0	0.1	12.1	-0.3
10/31/01	6.6	5.2	0.0	0.5	4.8	-3.9	10/31/01	7.4	3.3	0.0	0.5	3.6	0.0
11/1/01	5.4	9.1	0.0	0.0	-5.6	1.8	11/1/01	7.2	6.8	0.0	0.0	-3.1	3.5
11/2/01	5.0	7.3	0.0	0.0	-5.9	3.6	11/2/01	7.4	8.3	0.0	0.0	-2.6	1.6
11/3/01	7.2	3.7	0.8	0.0	4.7	-0.4	11/3/01	8.5	6.5	0.8	0.0	4.6	-1.8
11/4/01	11.6	4.1	0.0	0.0	7.3	0.1	11/4/01	12.6	5.4	0.0	0.0	8.2	-1.1
11/5/01	7.3	4.0	0.0	0.0	3.4	-0.1	11/5/01	6.9	5.2	0.0	0.0	1.9	-0.2
11/6/01	10.6	4.1	0.0	0.1	6.6	-0.1	11/6/01	13.1	4.7	0.0	0.1	8.8	-0.5
11/7/01	13.9	4.3	0.5	0.0	12.0	-1.8	11/7/01	15.3	4.9	0.5	0.0	10.7	0.2
11/8/01	8.6	6.1	0.2	0.1	4.0	-1.3	11/8/01	8.7	6.1	0.2	0.1	1.6	1.2
11/9/01	7.0	7.4	1.8	0.1	-0.2	1.4	11/9/01	6.6	7.4	1.8	0.1	-0.5	1.3
11/10/01	3.4	6.0	1.8	0.0	-1.0	0.2	11/10/01	3.6	6.0	1.8	0.0	0.9	-1.4
11/11/01	4.9	5.8	0.0	0.0	-2.4	1.5	11/11/01	3.9	5.8	0.0	0.0	-1.7	-0.2
11/12/01	4.4	4.3	0.0	0.0	-1.4	1.6	11/12/01	5.1	4.3	0.0	0.0	2.3	-1.5

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Date	W1, (cm)					Date	W2, (cm)						
	Inf.	Outf.	Precip.	ET	Seep.		D vol	Inf.	Outf.	Precip.	ET	Seep.	D vol
11/13/01	6.3	2.7	0.1	0.0	3.2	0.5	11/13/01	6.6	2.7	0.1	0.0	5.5	-1.6
11/14/01	6.6	2.3	0.0	0.5	2.4	1.4	11/14/01	6.5	2.3	0.0	0.6	4.2	-0.5
11/15/01	8.8	0.9	0.0	0.1	9.1	-1.2	11/15/01	9.7	0.9	0.0	0.1	10.1	-1.4
11/16/01	7.9	2.1	0.0	0.2	6.9	-1.3	11/16/01	9.4	2.1	0.0	0.2	5.8	1.2
11/17/01	7.9	3.4	0.0	0.0	5.7	-1.2	11/17/01	9.3	3.4	0.0	0.0	4.6	1.3
11/18/01	7.4	4.7	0.0	0.1	2.8	-0.2	11/18/01	6.2	4.7	0.0	0.1	0.1	1.2
11/19/01	6.5	4.8	0.0	0.0	2.1	-0.5	11/19/01	2.8	4.8	0.0	0.0	-2.2	0.2
11/20/01	6.1	5.3	0.0	0.0	1.0	-0.2	11/20/01	2.3	5.3	0.0	0.0	-3.5	0.5
11/21/01	5.8	5.5	0.0	0.0	-0.8	1.2	11/21/01	2.2	5.5	0.0	0.0	-3.5	0.2
11/22/01	6.3	4.3	0.0	0.1	0.7	1.2	11/22/01	2.0	4.3	0.0	0.1	-1.2	-1.2
11/23/01	6.2	3.1	0.0	0.3	2.1	0.7	11/23/01	1.9	3.1	0.0	0.3	-0.3	-1.2
11/24/01	5.9	2.4	0.0	0.0	3.1	0.5	11/24/01	1.9	2.4	0.0	0.0	0.2	-0.7
11/25/01	6.9	1.9	1.6	0.0	5.6	0.9	11/25/01	3.2	1.9	1.6	0.0	3.3	-0.5
11/26/01	10.1	1.0	0.2	0.0	8.8	0.5	11/26/01	7.0	1.0	0.2	0.0	7.1	-0.9
11/27/01	12.6	0.4	0.0	0.0	12.7	-0.5	11/27/01	10.8	0.4	0.0	0.0	10.9	-0.5
11/28/01	18.4	1.0	0.0	0.1	20.3	-3.0	11/28/01	19.9	7.2	0.0	0.1	5.7	6.8
11/29/01	12.4	4.0	0.2	0.0	11.1	-2.5	11/29/01	12.8	9.5	0.2	0.0	1.3	2.2
11/30/01	7.7	6.5	0.0	0.1	3.0	-2.0	11/30/01	7.4	9.8	0.0	0.1	-2.9	0.4
12/1/01	2.1	8.5	0.5	0.0	-5.3	-0.6	12/1/01	1.2	17.9	0.5	0.0	-24.2	8.1
12/2/01	4.5	9.1	0.0	0.0	-3.2	-1.4	12/2/01	2.7	28.5	0.0	0.0	-36.4	10.6
12/3/01	13.0	10.5	0.0	0.0	-0.3	2.8	12/3/01	11.9	36.1	0.0	0.0	-31.8	7.6
12/4/01	21.5	7.7	0.0	0.0	11.3	2.5	12/4/01	21.1	27.4	0.0	0.0	2.3	-8.6
12/5/01	9.0	5.3	0.0	0.0	7.7	-3.9	12/5/01	10.4	19.6	0.0	0.0	-1.3	-7.9
12/6/01	9.9	9.2	0.0	0.0	19.1	-18.4	12/6/01	11.8	12.8	0.0	0.0	5.7	-6.7
12/7/01	10.3	27.5	0.0	0.0	-16.2	-1.1	12/7/01	12.1	17.2	0.0	0.0	-9.4	4.3
12/8/01	10.4	28.6	0.1	0.0	-33.0	14.8	12/8/01	11.9	9.5	0.1	0.0	10.1	-7.6
12/9/01	10.6	13.8	0.0	0.1	-10.9	7.7	12/9/01	11.8	7.1	0.0	0.1	7.1	-2.4
12/10/01	10.8	6.1	0.1	0.0	4.7	0.1	12/10/01	11.6	5.8	0.1	0.0	7.2	-1.3
12/11/01	11.0	6.0	2.0	0.0	6.9	0.1	12/11/01	11.4	5.7	2.0	0.0	7.7	-0.1
12/12/01	9.9	5.9	0.1	0.0	4.2	-0.1	12/12/01	10.5	5.7	0.1	0.0	4.9	-0.1
12/13/01	9.2	6.0	0.0	0.0	2.9	0.4	12/13/01	9.1	4.9	0.0	0.0	5.0	-0.8
12/14/01	10.0	5.6	0.0	0.0	4.5	0.0	12/14/01	9.3	3.9	0.0	0.0	6.4	-1.0
12/15/01	15.3	5.6	0.3	0.0	9.0	1.0	12/15/01	16.9	4.9	0.3	0.0	11.3	1.0
12/16/01	21.4	4.6	10.4	0.0	28.0	-0.9	12/16/01	25.7	5.7	10.4	0.0	29.6	0.8
12/17/01	26.6	5.5	0.1	0.0	21.1	0.0	12/17/01	22.4	5.9	0.1	0.0	16.5	0.1
12/18/01	27.3	5.4	0.0	0.0	21.7	0.1	12/18/01	25.9	5.9	0.0	0.0	20.1	0.0
12/19/01	27.3	5.4	0.0	0.0	20.7	1.2	12/19/01	34.3	5.9	0.0	0.0	28.5	0.0
12/20/01	27.1	4.2	0.0	0.0	24.4	-1.5	12/20/01	34.0	4.8	0.0	0.0	30.2	-1.0
12/21/01	23.6	5.7	0.0	0.0	29.5	-11.6	12/21/01	24.0	4.9	0.0	0.0	19.1	0.1
12/22/01	19.7	17.2	0.0	0.2	-0.1	2.4	12/22/01	18.0	14.6	0.0	0.2	-6.6	9.7
12/23/01	16.5	14.8	0.0	0.1	1.4	0.2	12/23/01	15.6	15.8	0.0	0.1	-1.6	1.2
12/24/01	17.1	14.6	0.0	0.1	-3.5	5.9	12/24/01	17.9	14.8	0.0	0.1	4.0	-1.0
12/25/01	16.9	8.8	0.0	0.1	3.8	4.3	12/25/01	18.7	8.9	0.0	0.1	15.7	-5.9
12/26/01	16.1	4.5	0.0	0.0	12.4	-0.7	12/26/01	18.9	4.5	0.0	0.0	18.9	-4.5
12/27/01	15.3	5.2	0.0	0.0	16.4	-6.3	12/27/01	19.1	3.5	0.0	0.0	16.4	-0.9
12/28/01	14.6	11.5	0.0	0.0	13.2	-10.1	12/28/01	19.2	5.6	0.0	0.0	11.5	2.1
12/29/01	14.8	21.6	0.0	0.1	8.4	-15.2	12/29/01	19.6	8.3	0.0	0.1	8.5	2.7
12/30/01	15.5	36.8	0.0	0.1	-29.8	8.5	12/30/01	20.0	11.7	0.0	0.1	4.9	3.4
12/31/01	16.2	28.3	0.0	0.0	-40.4	28.3	12/31/01	20.5	20.0	0.0	0.0	-7.8	8.3