Data Processing Report

Groundwater Data Processing for the Loxahatchee River Basin

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Executive Summary

In November 2008, the South Florida Water management District (SFWMD) contracted with the University of Florida (UF) to perform data processing and analysis for a series of twelve groundwater wells in the Loxahatchee River Basin for the period of January to December 2008. This report details the data processing methods of these data. Major project steps are summarized below:

1. Raw (binary) data files were converted to comma separated (.csv) files using the AutoCSV program developed by In-Situ Inc.
2. Major gaps in data were identified. Through conversation with SFWMD and Florida Park Service (FPS) staff, one additional data file was found.
3. Data discontinuities were identified and noted, and where, possible, corrected. Field reconnaissance with FPS staff helped to identify an issue with incorrect cable lengths originally provided for some wells.
4. Probe depth readings were converted to water table elevations and depths based on well elevations, corrected cable lengths, well geometry, and datum information.
5. Time series of water table elevation, depth, groundwater temperature, and groundwater were reviewed for any other issues.
6. Null datasets were created for periods of missing or removed data.
7. Anomalous spikes in temperature and electrical conductivity data due to measurements during downloads and maintenance were removed and smoothed using a running average technique.
8. Anomalous electrical conductivity data was modified to remove discontinuities.
9. Since sensors were not regularly maintained, dissolved oxygen data, while reported in some of the raw (converted) data files, were not used.
10. All data processing and modifications were recorded and are listed in this report.

Results of daily average time series and global, annual, seasonal, and monthly statistics are given in Appendices III and IV. Highlights of the preliminary data analysis include:

1. River stages in the Northwest Fork of the Loxahatchee River correlate well with groundwater elevations, both in upriver and tidal locations, further confirming the reliability of the final groundwater datasets.
2. Trends in EC can be observed over individual tidal cycles as well as over longer seasonal time periods. In general, the EC values recorded were low upstream and increased with proximity to Jupiter Inlet and the Atlantic Ocean.
3. On Transects with multiple wells, observed EC was generally greatest closest to the river and decreased with distance towards the upland.
4. Seasonal variation in groundwater temperature was observed in all twelve groundwater wells. Seasonal amplitude of these variations appears to be greatest at the river and decrease with distance to the river.

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Background

The Loxahatchee River and Estuary are located in southeastern coast of Florida. Historically, the Northwest Fork of the Loxahatchee River was primarily a freshwater system. In 1947, the river inlet at Jupiter was dredged for navigation and has remained permanently open since that time. Drainage patterns within the basin have also been altered significantly due to land development, road construction, such as, Florida Turnpike, and construction of the C-18 and other canals. These anthropogenic activities along with sea level rise have resulted in significant adverse impacts on the ecosystem, including increased saltwater encroachment and undesired vegetation changes in the floodplain. The problem of saltwater intrusion and vegetation degradation in the Loxahatchee River may be partly induced by diminished freshwater input, from both surface water and ground water into the River system.

Finding the characteristics of each hydrologic components and their relationship is important to develop restoration plan for the ecosystem in the Loxahatchee River Basin. In past years, a Loxahatchee floodplain groundwater well network and soil moisture monitoring stations along two transects have been established and the associated data have been collected. In this report, the data collected from the wells includes temperature, water pressure, barometric pressure, DO, and electric conductivity (EC) from January to December 2008, which are raw data in binary format. The overall objective of this project is to process and document ground water data from July 2003 to a format for meaningful use, and to conduct hydrologic analysis based on the ground water data together with soil moisture data and river stage (tidal wave) data.

The objectives of the project include:

- Process and document the ground water data collected from 12 wells in Loxahatchee River Basin
- Conduct hydrologic data analysis based on the ground water, soil moisture, and river stage

To achieve these objectives, specific tasks and deliverables were developed, which are summarized in Table 1. A project kick-off meeting (**Task 1**) was held on December 3rd, 2008 at the offices of the South Florida Water Management District (SFWMD). At this meeting, the University of Florida (UF) introduced the staff needed to complete this work and made a PowerPoint presentation (**Deliverable 1.1**) to the District scientists including a detailed overview of the project objectives, plans, methods, schedule and required deliverables. During this kick-off meeting and discussions, the Consultant and the District agreed on a Project Work Plan that described the objectives for each task in detail, the major questions being addressed by each task, and the rationale for the task.

During the meeting, UF prepared kick-off meeting minutes specifying all points of the project work plan and the main points discussed in the meeting, including all inputs from the District engineers/scientists. These draft minutes were submitted to District staff on December 8th, 2008 and were approved by the district on December 9th, 2008 to serve as the Final Project Work Plan (**Deliverable 1.2**).

Table 1. Project tasks and deliverables. Bolded items have previously been delivered.

TASK	DELIVERABLE
1**. Project Kick-off Meeting and Project Work Plan**	**1.1 Power Point Presentation** **1.2 Agreement document with key points of Project Work Plan**
2. Process and Document 2008 Groundwater Data	2.1 Draft of Data Processing Report
	2.2 Final Data Processing Report
3. Advanced Groundwater data Analysis with Soil and River Data	3.1 Draft of Data Analysis Report
	3.2 Final Data Analysis Report

This report presents **Deliverable 2.1 (Draft of Data Processing Report)**, detailing progress made and issues encountered. Specifically, UF converted all binary files into .csv format; uploaded and managed data on UF HydroBase for graphical data analysis; identified jumps and discontinuities in datasets; and attempted to resolve and field-verify various issues with the data. UF concluded that the major issue with matching tapedowns to measured probe data was the order of field operations.

Until the 1/5/09 data download, tapedown measurements were taken after probe removal. Since hydraulic conductivity is relatively low (especially in the areas with mucky soils), when the probe was removed and replaced for calibration, battery changes, etc. it took several to tens of minutes for the water level in the well to re-equilibrate with the local water table (which is dynamic in the tidally-influenced wells, making estimates of the actual water table level difficult). Since tapedown measurements were made after probe removal, there was no way of telling whether the tapedown was measuring the equilibrium water table level (which should match probe readings) or a transient level due to probe removal (which could be off by as much as a foot or more, depending on the aquifer properties and the delay between probe removal and tapedown measurement). Tapedowns on 1/5/09 included a "spot" reading of water level before probe removal, however the units of measurement are unclear, and unfortunately can not be used at this point. As part of this report, UF has prepared a field sheet detailing the protocol for data collection for future downloads (Appendix V).

Draft Data Processing Report (Deliverable 2.1)

Introduction

As detailed in the project Scope of Work (SOW), the raw binary groundwater data files were converted to text file and MS Excel spreadsheet format for meaningful use and to provide a data processing report describing the methodology, procedure and results. The raw groundwater data, including temperature, electric conductivity (EC), DO, barometric pressure, and H_2O pressure, were collected using TROLL 9000/9500 (In-Situ Inc.) multi-parameter water quality probe from January to December 2008 along 5 Transects on the Northwest Fork of the Loxahatchee River. Three wells are located along Transect 9, three wells along Transect 8, four wells along Transect 7, one well on Transect 3, and one well on Transect 1 (Fig. 1). A summary of all well parameters is given in Tables 2 and 3.
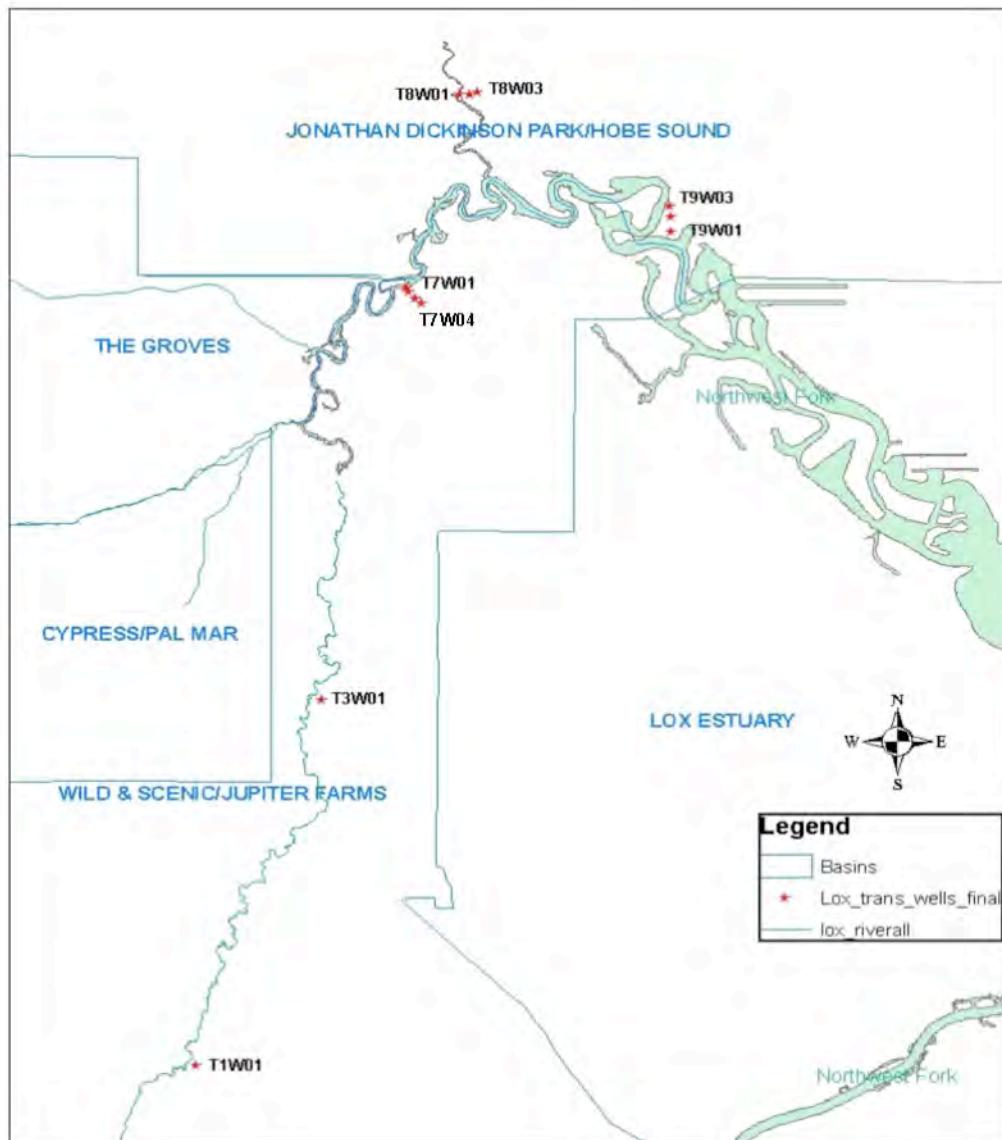
Figure 1. Layout of Transects and wells on the Northwest Fork of the Loxahatchee River.

Table 2. Loxahatchee River well locations and elevations.

Transect	Well	Station Name	Latitude N	Longitude W	WE Elevation NGVD29[1] (ft)	WE Elevation NAVD88[1] (ft)	RAB Reference above benchmark (ft)
T1	W01	T1W01	26.940111	80.172228	13.76	12.267	0.000
T3	W01	T3W01	26.961269	80.164725	8.22	6.731	0.000
T7	W01	T7W01	26.985031	80.159627	4.17	2.681	0.000
T7	W02	T7W02	26.984820	80.159439	4.4	2.911	0.000
T7	W03	T7W03	26.984396	80.159041	4.82	3.331	0.000
T7	W04	T7W04	26.984157	80.158714	12.63	11.141	0.000
T8	W01	T8W01	26.996212	80.156393	3.39	1.901	0.000
T8	W02	T8W02	26.996241	80.155790	4.17	2.677	0.000
T8	W03	T8W03	26.996325	80.155365	10.46	8.967	0.026
T9	W01	T9W01	26.988208	80.144160	4.33	2.834	0.026
T9	W02	T9W02	26.989068	80.144158	5.01	3.514	0.027
T9	W03	T9W03	26.989684	80.144171	12.63	11.134	0.036

[1] Conversions from NGVD29 to NADV88 are based on the VERTCON height conversion method (Milbert, 1999; http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html).

Table 3. Summary of well geometry.

Station Name	Well diameter (in)	Well depth to surface (ft)	Riser length (ft)	Drill tip to screen (ft)	Screen slot size (in)	Screen length (ft)	CL (TROLL depth[1], reported, ft)	CL (TROLL depth[2], measured on 4/21/08, ft)
T1W01	2	5.82	3	0.5	0.010	2	7.5	6.62
T3W01	2	5.76	3	0.5	0.010	5	7.5	7.49
T7W01	2	6.05'	3	0.5	0.010	2	8	8.08
T7W02	2	5.98'	3	0.5	0.010	2	8	6.29
T7W03	2	5.53'	3	0.5	0.010	2	7.5	5.46
T7W04	2	12.04'	3	0.5	0.010	5	14	14.00
T8W01	2	5.32'	3	0.5	0.010	2	7	6.84
T8W02	2	5.25'	3	0.5	0.010	2	7	6.95
T8W03	2	8.65'	3	0.5	0.010	5	10.5	8.85
T9W01	2	6.09'	3	0.5	0.010	2	8	6.40
T9W02	2	6.09'	3	0.5	0.010	5	8	7.94
T9W03	2	13.92'	3	0.5	0.010	5	15.5	15.63

[1] "Reported" TROLL depths are based on data provided by the SFWMD.
[2] "Measured" TROLL depths are based on April 21st, 2008 field measurements by Rob Rossmanith (DEP FPS).

Water Table Depth and Water Table Elevation Calculations

Raw groundwater data were originally downloaded in binary format by FPS personnel. UF used the AutoCSV program developed by In-Situ Inc. to convert all binary files to comma separated (.csv) files containing the following information: Site – Test Name; Site – Unit Name; Time – Time Stamp; Level/Depth (ft); Level/Depth (cm); Temperature (°F);

Temperature (°C); Barometric Pressure (in Hg); Conductivity (mS/cm actual); Conductivity (mS/cm); Clark DO (ug/L); Battery (volts); and Time – Elapsed (Seconds). Note that Level/Depth (cm), Temperature (°C) and Conductivity (mS/cm) are directly converted with the AutoCSV program (whereas they were calculated outside of the program in the previous phase of data processing). Water table depth and elevation were then computed based on recorded water depth above sensor, TROLL 9000/9500 cable length, well elevation, and reference above the benchmark for each well (see Fig. 2).
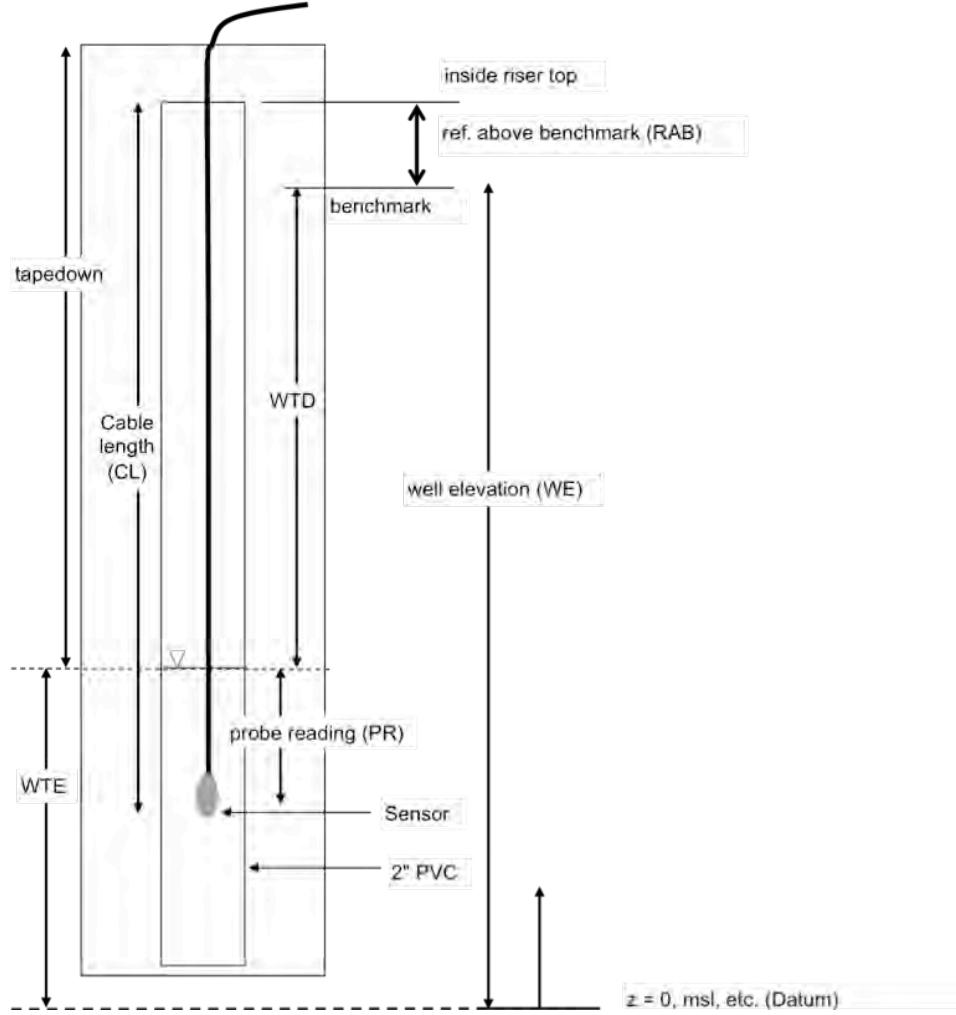
Figure 2. Schematic of well geometry.

Water table depth and water table elevation were computed according to the following relationships:

$$WTD = CL - RAB - PR \qquad (1)$$
$$WTE = WE + RAB - CL + PR \qquad (2)$$

where WTD is the water table depth, CL is the TROLL 9000/9500 cable length, RAB is the reference above benchmark, PR is the probe reading, WTE is the water table elevation, and WE is the well elevation (in reference to a standard datum—i.e., NGVD29 or NADV88). Water table depths are reported in feet and meters, while water table elevation is reported in

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feet and meters in both NGVD29 and NAVD88. Note that RAB is only non-zero for four of the twelve wells (T8W3, T9W1, T9W2, and T9W3—see table 2).

Water Table Depth and Water Table Elevation Quality Assurance/Quality Control
Initially calculated water table depth and elevation data were stored to UF HydroBase for graphical analysis of the data. This tool allowed UF to graphically assess multiple data series at the same time, helping to review and assess the reliability of the data. Rainfall data from the S-46 structure on the Southwest Fork of the Loxahatchee River (DBHYDRO Dbkey K8679) was also uploaded to this server to evaluate the observed changes in water table elevation in relation to local rainfall and identify potential errors of probe response (Fig. 3).
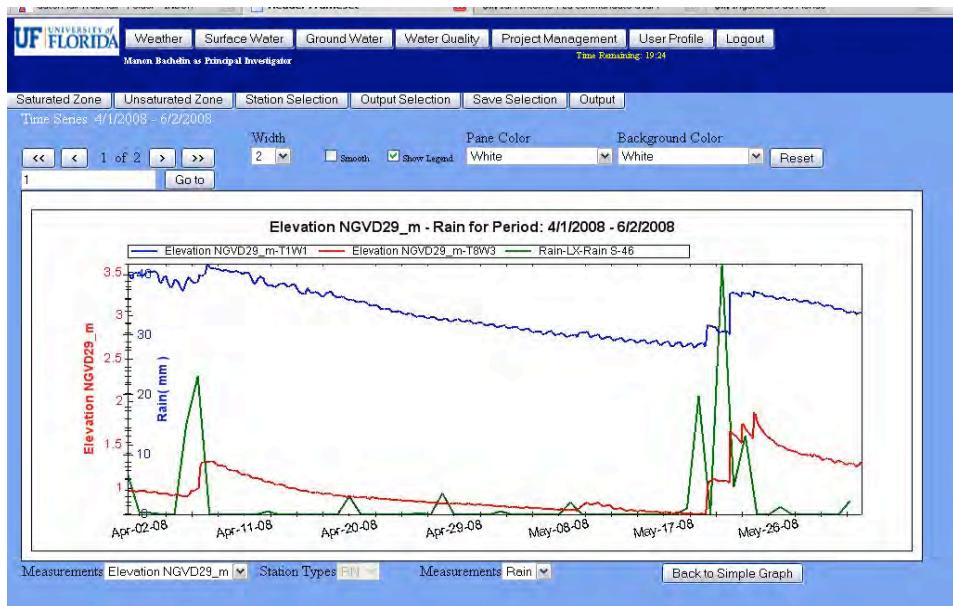
Figure 3. Screen capture of the Loxahatchee groundwater database SQL client used to analyze. Shown are wells T1W1, T8W3 and rainfall for the period 4/1/08 through 6/2/08.

All calculations and field notes made during the data review and verification process for each well are summarized in Table 4.

Finally, the distance from the well benchmark to the water table that is measured when data is downloaded (called a tapedown), was intended to be used to verify probe measurements, since the cable length could change slightly in the well over the data collection period. However, as discussed above, because all of the tapedown measurements were made after probe removal, they are not useful in confirming water levels measured by the probe as there is no way of ascertaining whether the tapedown was measuring the equilibrium water table level (which should match probe readings) or a transient level due to probe removal (which could be off by as much as a foot or more, depending on the aquifer properties and the delay between probe removal and tapedown measurement). As noted in previous Final Data Report, UF suggested a change to the standard operating procedure (SOP) be made so that from that time, tapedowns should be taken first, followed by data collection and other routine maintenance tasks. A field data sheet detailing this process is included as part of this report (Appendix V).

Table 4. Summary of well data start and stop dates/times; water table depth and elevation conversion calculations; data gaps; and summary of field notes by R. Rossmanith. Data gaps indicate missing data from the original binary data files.

Transect Well	Data start	Data end	Benchmarks Elevation (ft,NGVD)	Difference between Benchmark and Top of Riser (ft)	Cable Lenght (ft)	To convert Probe reading to Water Table Depth (ft), substract probe reading from this amount	To convert Probe reading to Water Table Elevation (ft, NGVD), add this amount to probe reading	Gap	Field notes by R. Rossmanith
T1W01	12/13/2007	1/5/2009	13.76	0	6.62	6.62	7.14		8/29/2008 - Conductivity sensor OK - needs calibration / Conductivity sensor could not be found at time of start of test - unit was left running never the less - no conductivity data is available from 7/3/08 to 8/29/08, 10/8/2008 - Calibrated on the
T3W01	12/13/2007	1/5/2009	8.22	0	7.49	7.49	0.73		
T7W01	12/13/2007	1/5/2009	4.17	0	8.083	8.08	-3.91		
T7W02	12/13/2007	1/5/2009	4.4	0	6.292	6.29	-1.89		9/2/2008 - No conductivity sensor detected after download, must go back and resolve/ 9/4/2008: test conductivity sensor, still no readings/ 10/8/2008 - Switched old troll SN 33751w/ new SN 33743 b/c of bad cond sensor. No conducitivity data is available from 7/3/08 to 9/5/08.
T7W03	12/13/2007	1/5/2009	4.82	0	5.458	5.46	0.64	9/16-10/8/2008	
T7W04	12/13/2007	1/5/2009	12.63	0	14	14	1.37	2/22-3/12/2008 6/4-7/2/2008	2/22/2008 - batteries ran out prior to me downloading - this is the problem unit, we are going to get this unit fixed ASAP/ 6/4/2008 - batteries ran out prior to me downloading - this is the problem unit, we are going to get this unit fixed ASAP / 10/8/2008 - calibrated and added new batts
T8W01	12/4/2007	1/5/2009	3.39	0	6.84	6.84	-3.45		
T8W02	12/4/2007	1/5/2009	4.17	0	6.95	6.95	-2.78	4/20-7/7/2008	7/7/2004 - No test started
T8W03	12/4/2007	1/5/2009	10.46	0.026	8.85	8.824	1.636	6/25-7/7/2008	6/25/2008 - batteries ran out prior to me downloading - this is the problem unit, we are going to get this unit fixed ASAP
T9W01	12/14/2007	10/5/2008	4.33	0.026	6.4	6.374	-2.044	10/5/2008- 1/1/2009	1/1/2009 - Bad O ring which kills 3 months of data on a troll.
T9W02	12/14/2007	1/5/2009	5.01	0.027	7.94	7.913	-2.903		
T9W03	12/14/2007	1/5/2009	12.63	0.036	15.63	15.594	-2.694		

Electrical Conductivity Data Calculations and Quality Assurance/Quality Control
Electrical conductivity is the ability of a material to conduct an electrical current, and is a function of temperature. Electrical conductivity data from the TROLL 9000/9500 probes were converted in milliSiemens per centimeter (mS/cm) Conductivity. EC values were then converted to the SI unit of S/m by multiplying the specific conductance in mS/cm by 10.

In addition to these calculations, EC data from each well were reviewed, its reliability assessed, and any necessary changes made. See specific notes on each well's assessment and any changes in Table 5. Corrections made to EC data for each well are listed in the Modified_Data_Reports subdirectory on the enclosed data CD.

Table 5. Summary of EC data review process and modifications

Transect	Well	Notes
1	1	Range of values and direction of trends in wells T1W01 and T3W03 correspond well. Fill missing values with null data. Anomalous low value when replacing probe after download on the 7/3/2008, 9/2/2008 and 10/9/2008 were revised. First data on the 12/13/2007 3:00 PM deleted (already in the previous dataset).
3	1	Range of values and direction of trends in wells T1W01 and T3W03 correspond well. Two first data on the 12/13/2007 deleted (already in the previous dataset).No other changes.
7	1	Two first data on the 12/13/2007 deleted (already in the previous dataset).No other changes.
7	2	Fill missing values with null data. Tow first data on the 12/13/2007 deleted (already in the previous dataset). No other changes.
7	3	Fill missing values with null data. Tow first data on the 12/13/2007 deleted (already in the previous dataset). No other changes.
7	4	Fill missing values with null data. No other changes.
8	1	First data on the 12/4/2007 deleted (already in the previous dataset). No other changes.
8	2	Fill missing values with null data. First data on the 12/4/2007 deleted (already in the previous dataset). No other changes.
8	3	Fill missing values with null data. Anomalous low value when replacing probe after download on the 6/26/2008. First data on the 12/4/2007 deleted (already in the previous dataset).
9	1	No changes
9	2	First data on the 12/14/2007 deleted (already in the previous dataset). No other changes.
9	3	Two first data on the 12/14/2007 deleted (already in the previous dataset). No other changes.

Temperature Data
In general, temperature data appeared relatively stable across all wells throughout the monitoring period. However, there were anomalous spikes in temperature data that correspond to the

uploading date/time of each well and were likely due to sensor out of water and to replace probe after reading. These spikes were replaced by moving average calculations using the previous and next step at both sides of the anomalous data. This had to be done by hand for the large dataset. Corrections made to temperature data for each well are listed in the Modified_Data_Reports subdirectory on the enclosed data CD.

Dissolved Oxygen Data
Since dissolved oxygen (DO) sensors were not regularly maintained, DO data, while reported in some of the raw (converted) data files, were not used. These data were converted from binary to ASCII format when available and are delivered as part of this task with no modifications. These data should be flagged as unreliable in future uses.

Null Values and Data Flags
Database calculation of accurate well statistics requires the inclusion of null values during data gaps (rather than missing values in the datasets). For each data time series (depth, elevation, temperature, EC), 30-minute null data sets were created and added in place of missing or removed data. Null datasets are provided in the Modified_Data_Reports subdirectory on the enclosed data CD.

Missing, deleted, and modified data may be flagged as deemed appropriate by the SFWMD. A summary of all data requiring flagging for any reason is given below and in the ReadMe.txt file on the data CD. The files in the Modified_Data_Reports subdirectory detail these data in several files:

1. Gaps in water level data that were replaced with nulls (summarized in electronic Excel file "Nulls_From_Missing_Data_08.xls" on data CD). Flag as missing.

2. Gaps in EC data that were replaced with nulls (summarized in electronic Excel file "Nulls_From_EC_Missing_Data_08.xls" on data CD). Flag as missing.

3. Temperature modifications (in deg. Celsius). Summarized in electronic Excel file "Temperature_Modifications_08.xls" on data CD. Flag as modified

4. EC Modifications (in S/m actual EC). Summarized in electronic Excel file "EC_Modifications_08.xls" on data CD. Flag as modified.

Preliminary Results

Introduction
The following statistics for ground water elevation and EC data were calculated: mean annual, mean wet season, mean dry season, and average monthly distribution. Some preliminary discussion of observed trends and relationships identified is provided, however, further analysis will be performed during Task 3 (Advanced Groundwater Data Analysis with Soil and River data).

Methods
After all data processing, calculation, converting, and correction steps, UF uploaded all Loxahatchee River groundwater data to its hydrological database (HydroBase). HydroBase is a web-based information system for hydrological data storage, maintenance and mining. Based on industry standard Microsoft SQL server, .NET asp web services, and Java, the application contains powerful on-line web-based graphing, statistical analysis, and reporting capabilities as well as project maintenance and administration. Hydrobase is capable of quick graphical analysis and calculation of daily, weekly, monthly, quarterly, yearly, and entire period statistics including minima, maxima, mean, sum, variance, and standard deviation. See Appendix II for more information on HydroBase.

Mean annual and mean wet and dry season groundwater statistics for the Loxahatchee River were calculated using HydroBase. For this report, wet season was defined as June 1st through October 31st and the dry season was defined as November 1st through May 31st (SFWMD, 2006). Water table depths are available in feet and meters while water table elevations are available in NGVD29 and NAVD88 in both feet and meters in the electronic and online data reports. Data reported in this section of the report are listed in ft NADV88 as requested in the project scope of work.

Results and Discussion
Timelines of average daily water table elevation, water table depth (below benchmark), temperature, and EC are given in Appendix III. Within Appendix III, figures 1 – 12 show average daily water table elevation (in ft, NAVD88); figures 13 – 24 show average daily water table depth below benchmark (in feet); figures 25 – 36 show average daily groundwater temperature (in degrees Celsius); and figures 37 – 48 show average daily EC (in S/m). Summary statistics, including global, annual, and wet/dry season means, minima, maxima, variances, and standard deviations are given in tables 2 – 10 of Appendix IV. Seasonal statistics were calculated for the 2008 wet season, and the 2007-2008 and partial 2008-2009 dry seasons from monthly data, with overall wet/dry season means calculated using all wet/dry months in the period of record.

In general, recorded water table elevations, depths, groundwater temperatures, and EC values were variable across wells and transects, as well as over seasons and years. For example, water table elevations ranged from a maximum of 11.052 ft in the upstream well on Transect 1 (T1-W01) to a minimum of -1.813 ft in the tidal floodplain of Transect 9 (T9-W01). EC values ranged from near zero in many upland wells to a maximum of 2.430 S/m in well T9-W01 during May 2008.

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Correlation with Surface Water Measurements

River stages in the Northwest Fork of the Loxahatchee River (where available) correlate well with groundwater elevations recorded until July 2008, both in upriver and tidal locations, further confirming the reliability of the final groundwater datasets. For example, river stage measured at Lainhart Dam (close to Transect 1) corresponds well with groundwater elevation at T1-W01 (Fig. 4) and river stage measured at RM 9.1 (close to transect 7) corresponds with the tidal wells T7-W01, T7-W02, and T7-W03 (Fig. 5). River stages for the second half of the year are still being processed and further analysis of these correlations will be presented in the final data processing report.
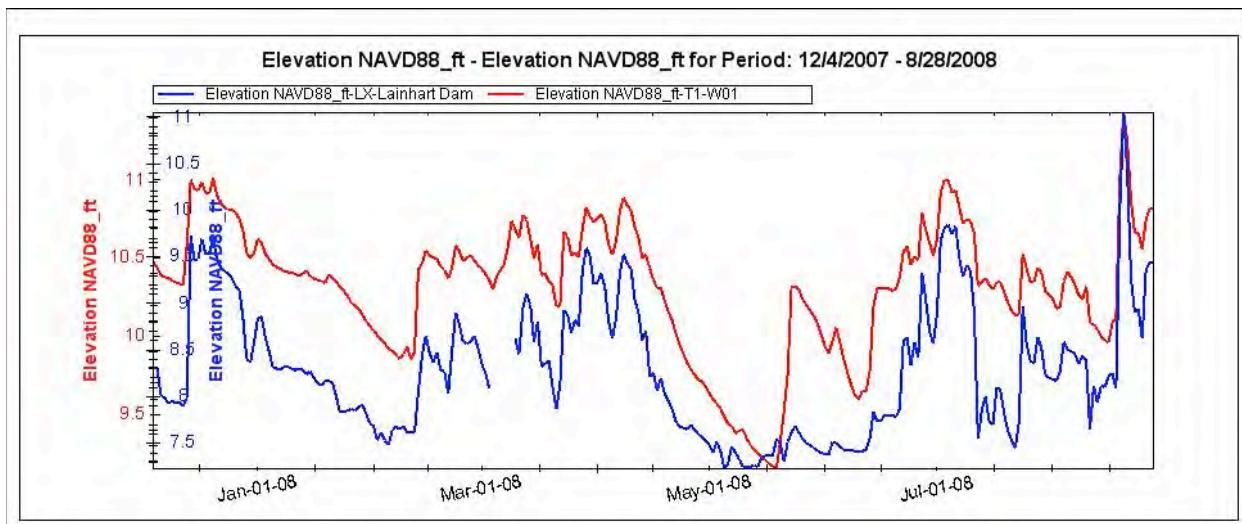
Figure 4. Average daily river stage at Lainhart Dam (blue) and average daily groundwater elevation at well T1-W01 (red). Note: different y-axis scales.
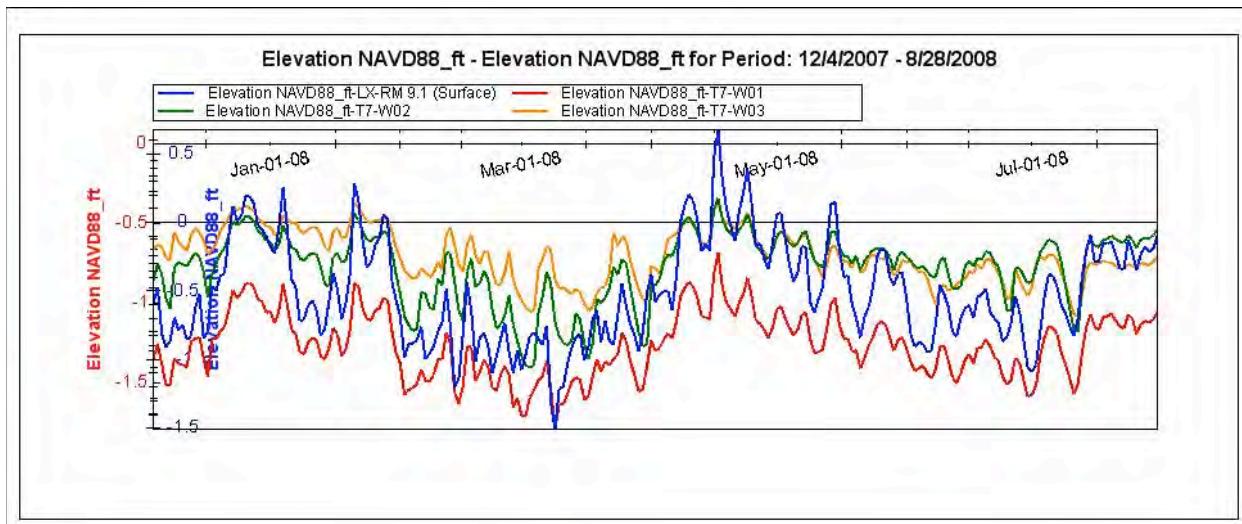
Figure 5. 15-minute river stage at RM 9.1 (blue) and average daily groundwater elevation at wells in the floodplain of Transect 7 (red, green, yellow). Note: different y-axis scales.

<u>Water Table Elevation</u>

Water table elevations were highest in upriver wells (T1-W01; T3-W01) and downriver upland wells (T7-W04; T8-W03) (Fig. 6). In the tidal floodplain, average annual water table elevation was below the datum zero level for many wells.
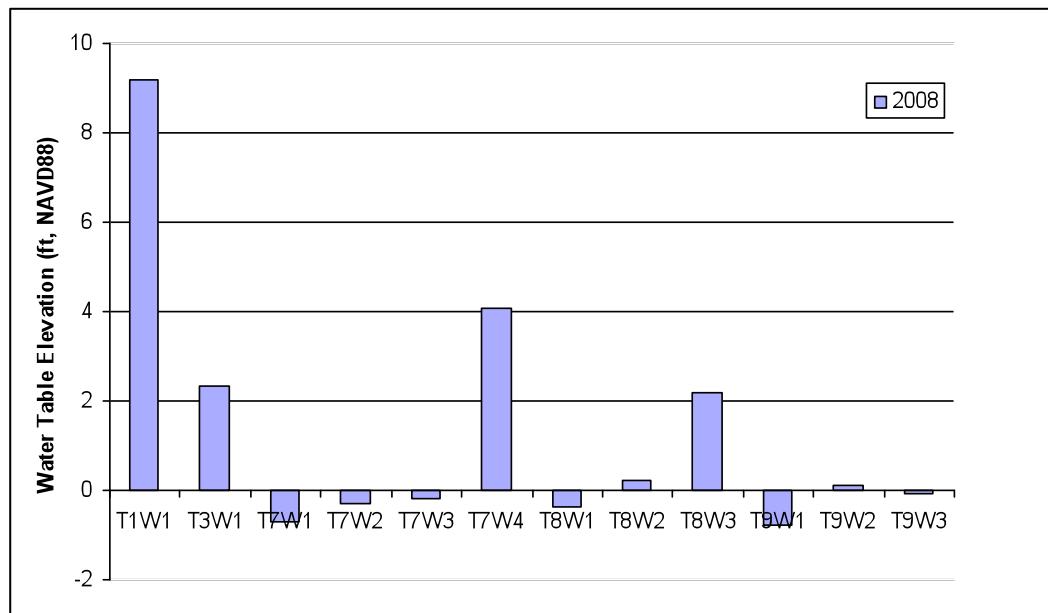
Figure 6. Annual average water table elevation (ft, NAVD88) for all 12 wells in the project.

Water table elevations in higher elevation wells further from the river (T1-W01, T3-W01, T7-W04, T8-W03, and T9-W03) correlate well, showing similar responses to the wet and dry season rainfall patterns (Fig. 7). For example, the impacts of the rainy season in 2008 on the water table elevations are apparent across all these wells.
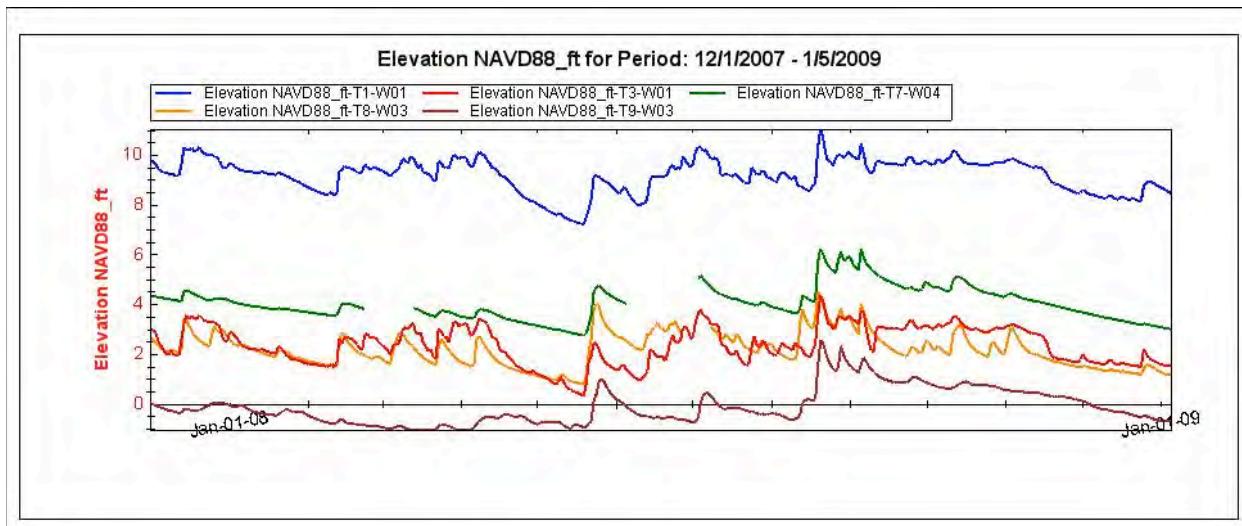
Figure 7. Average daily water table elevation (ft, NAVD88) in higher elevation wells over 2008.

Water table elevations in lower elevation wells closer to the river are more influenced by daily

tidal flooding with elevations often below mean sea level (Fig. 8). Some seasonal wet/dry patterns are still apparent, but much less so, as their signal is damped by daily and monthly tidal fluctuations.
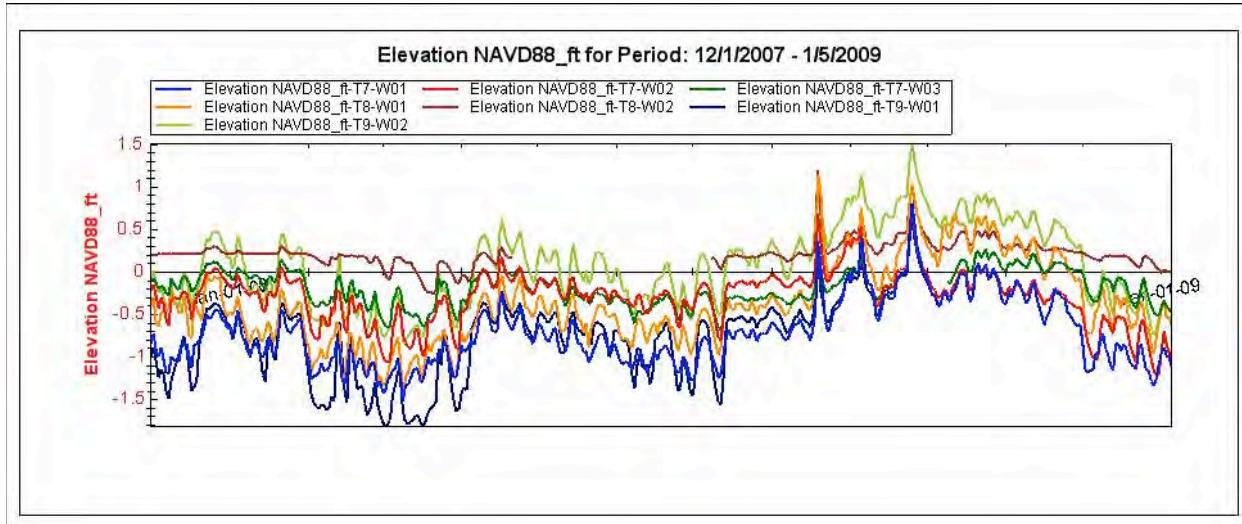
Figure 8. Average daily water table elevation (ft, NAVD88) in lower elevation wells over 2008.

Electrical Conductivity

Trends in EC can be observed over individual tidal cycles as well as over longer seasonal and yearly time periods. In general, the EC values recorded were low upstream and increased with proximity to Jupiter Inlet and the Atlantic Ocean (Fig. 9). The global average EC at well T1-W01 was 0.067 S/m, with very little variation in this value between wet and dry seasons. On the other hand, the average groundwater EC at well T9-W02 was 2.017 S/m (over 30 times greater than T1-W01) and varied significantly between wet and dry seasons. The lowest average groundwater EC was observed in well T7-W04. The extremely fresh nature of this water, combined with the maintenance of a high water table elevation in this location likely play a large role in maintaining the floodplain salinity on Transect 7 below critical threshold for bald cypress health (2 ppt or 0.3125 S/m). The highest annual average EC values were observed in wells T9-W01 and T9-W02 (by one to two orders of magnitude).

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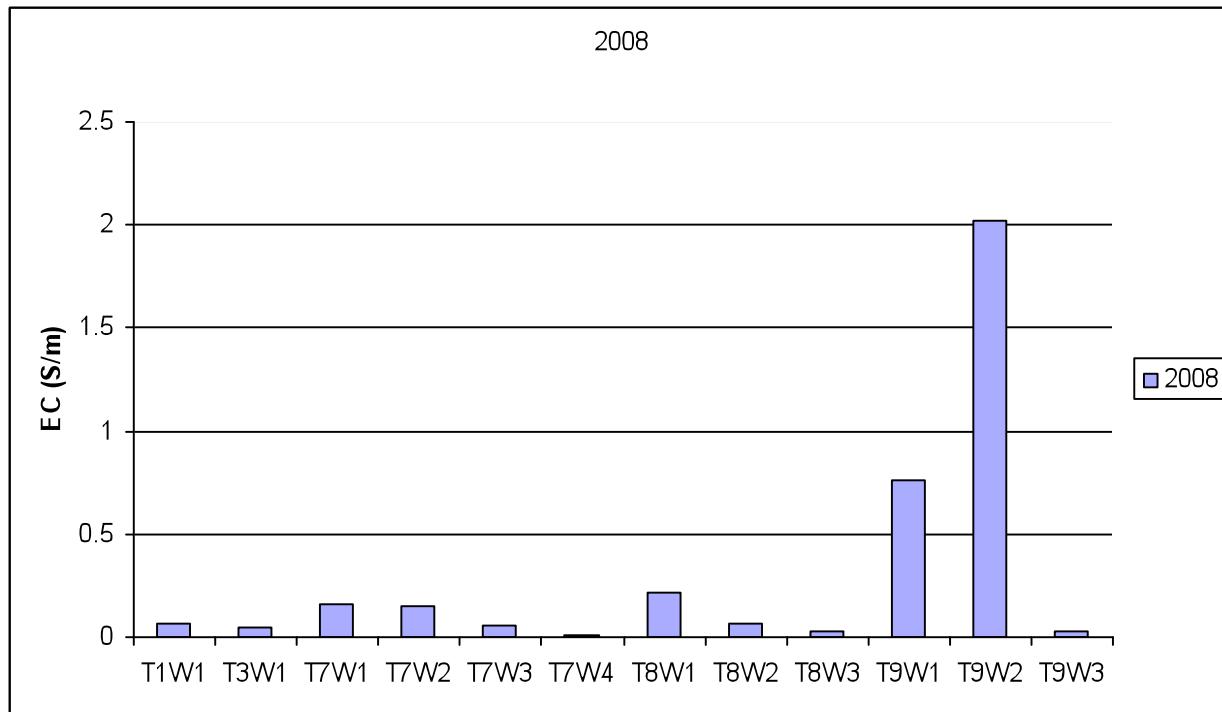
Figure 9. Annual average EC (S/m) for all 12 wells in the project and river EC near Transects 1 and 7.

On Transects with multiple wells, observed EC was generally greatest closest to the river and decreased with distance towards the upland. On Transect 7, this trend reversed in the dry year of 2007, when the EC in well T7-W02 surpassed that of well T7-W01 and remained significantly higher for the duration of the year. In 2008, EC in well T7-W02 slolwy decreased from its 2007 peak value and eventually fell below that of well T7-W01(Fig. 10).
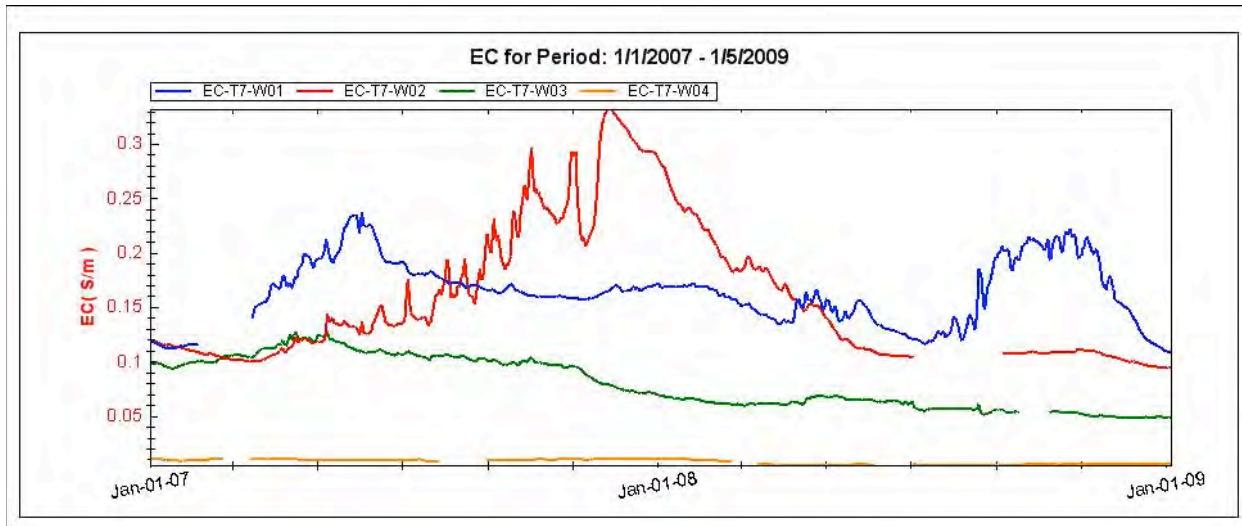
Figure 10. Average daily EC (S/m) for 4 wells on Transect 7.

Temperature

Seasonal variation in groundwater temperature was observed in all twelve groundwater wells (Fig. 11). Seasonal amplitude of these variations appears to be greatest at the river and decease with distance to the river (Fig. 12). This trend could be used to explore mixing ratios between groundwater and surface water in the floodplain. Diurnal variations were also observed in all wells, though tidal wells showed a much greater range of diurnal variation (Fig. 13).
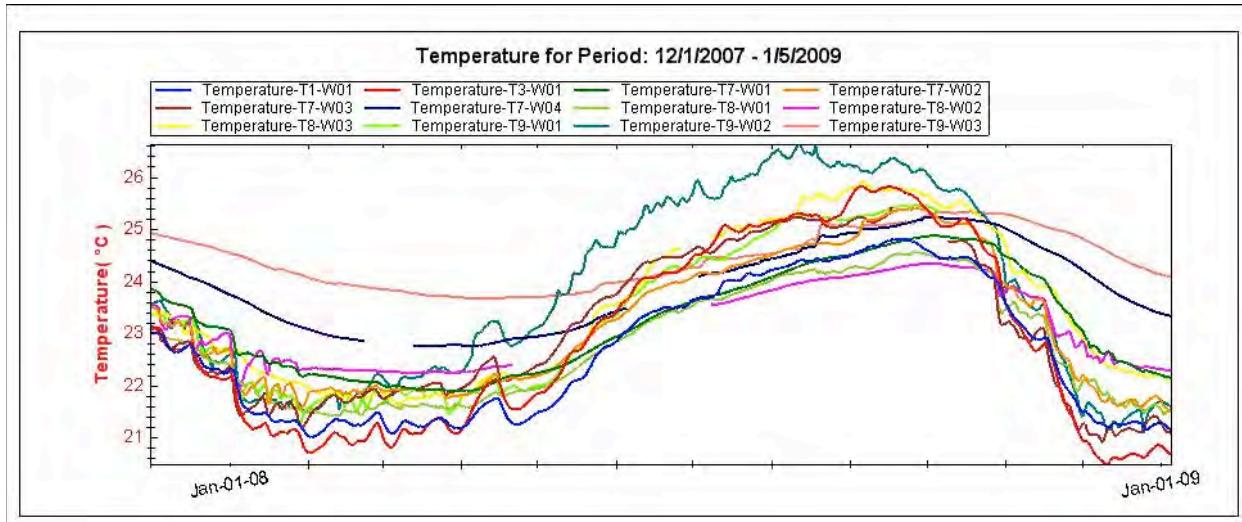
Figure 11. Average daily groundwater temperature (degrees C) for all 12 wells in the project.
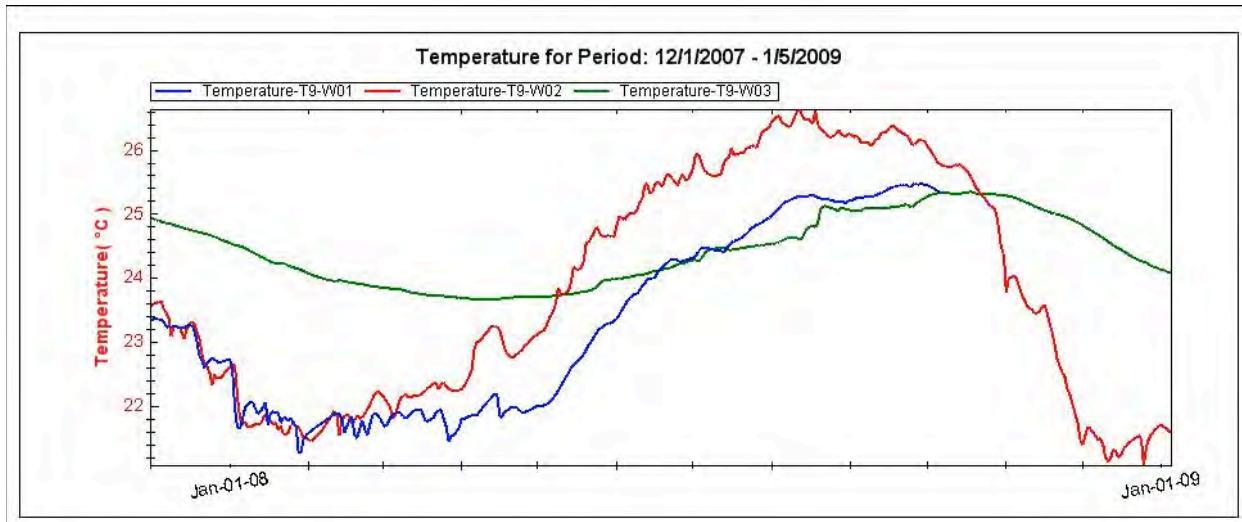
Figure 12. Average daily groundwater temperature (degrees C) wells on Transect 9.
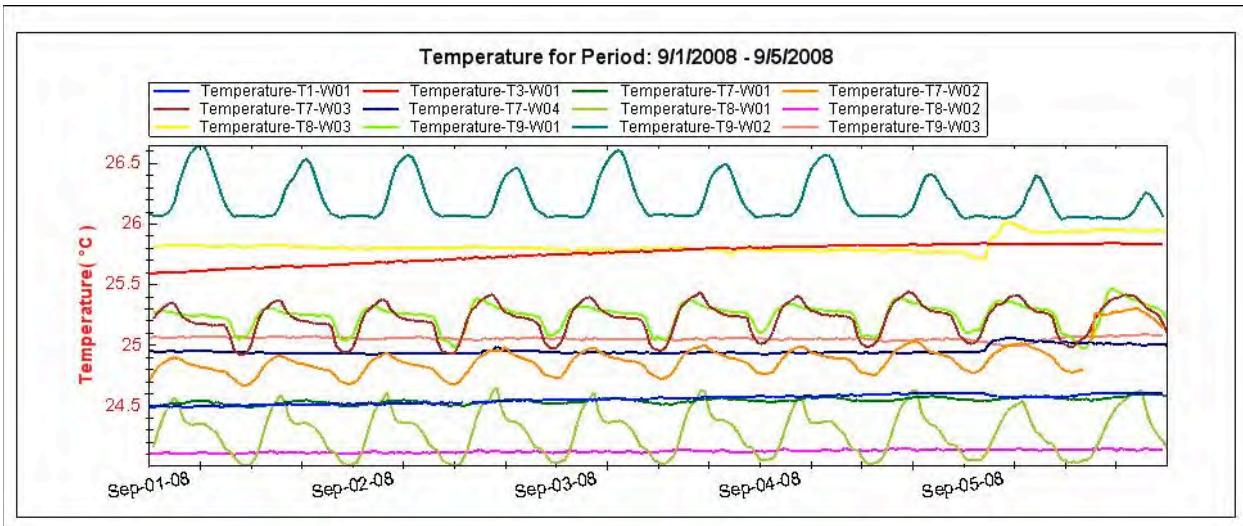
Figure 13. 30-minute groundwater temperature (degrees C) for all 12 wells in the project over a five-day period. Note diurnal variation in temperature.

REFERENCES

South Florida Water Management District (SFWMD). 2006. Evaluation of Restoration
    Alternatives for the Norwest Fork of the Loxahatchee River. Palm Beach, Florida.

Muñoz-Carpena, R., D. Kaplan and F.J. Gonzalez. 2008. Groundwater Data Processing and
    Analysis for the Loxahatchee River Basin. Final Project Report to the South Florida
    Water Management District-Coastal Ecosystems Division. University of Florida,
    Gainesville

LIST OF APPENDICES

Appendix I. Data set in electronic format (CD, enclosed)

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Appendix IV. Global, Annual, Monthly, and Wet/Dry Season Statistics Tables

Appendix IV-A – Global Statistics

Appendix IV-B – Annual Statistics

Appendix IV-C – Wet/Dry Season Statistics

Appendix IV-D – Monthly Statistics

Appendix V. Field sheet detailing the protocol for data collection

APPENDIX I: Electronic Data on CD

The enclosed CD has four subdirectories: Raw Data; Final Data; Modified Data Reports; and Final Report. The files in these subdirectories are described below:

- **Raw Data** – as per the scope of work, UF converted all raw binary files into .csv format. This converted data is referred to as "raw data" with the following data columns: Site – Test Name; Site – Unit Name; Time – Time Stamp; Level/Depth (ft); Level/Depth (cm); Temperature (F); Temperature (C); Barometric Pressure (in Hg); Conductivity (mS/cm actual); Conductivity (Spec Cond - mS); Clark DO (ug/L); Battery (volts); and Time – Elapsed (Seconds).

  Raw (converted) data is delivered in this subdirectory, with exactly the same file structure and naming conventions as the SFWMD ftp server. The only modification to the delivered data structure and naming is the addition of 17 data files emailed by Rob Rossmanith after data processing began, which were added to a new subdirectory called "Data_Not_On_Ftp_Server". Data files are classified in subdirectory called by the first date of downloaded data in the file. This structure and naming is summarized in the "Raw Data File Summary.xls" data file on the data CD and in table 1 below.

- **Final Data –** Final data are presented in 12 comma separated value (.csv) files, one for each well in the project. Data in these files have the following format: date/time, Water Table Elevation NGVD29_m, Water Table Elevation NGVD29_ft, Water Table Elevation NAVD88_m, Water Table Elevation NAVD88_ft, Water Table Depth_m, Water Table Depth_ft, groundwater temperature (°C), groundwater electrical conductivity (S/m).

- **Modified Data Reports** - Missing, deleted, and modified data may be flagged as deemed appropriate by the SFWMD. The files in this subdirectory detail these data in several files:

  1. Gaps in all delivered data that were replaced with nulls (summarized in electronic Excel file "Nulls_From_Missing_Data_08.xls" on data CD). Flag as missing.

  2. Gaps in delivered conductivity data that were replaced with nulls (summarized in electronic Excel file "Nulls__EC_From_Missing_Data_08.xls" on data CD). Flag as missing.

  3. Temperature modifications (in deg. Celcius). Summarized in electronic Excel file "Temperature_Modifications_08.xls" on data CD. Flag as modified

  4. Modifications (in S/m actual EC). Summarized in electronic Excel file "EC_Modifications_08.xls" on data CD. Flag as modified.

- **Final Report** – An electronic copy of this report and appendices

Table 1. Raw data file summary

Directory	File	Transec	Time start	Time end
ftp://ftp.sfwmd.gov/pub/fzheng/LOX_GW_DATA/WellData/				
NewdataFrom_Rob_Dec132007	SN33217 2007-12-13 150000 T1W01.bin.csv	T1W01	12/13/2007 15:00	3/13/2008 12:30
NewDataFrom_Rob_April212008	SN33217 2008-03-13 140000 T1W01.bin.csv	T1W01	3/13/2008 14:00	4/21/2008 14:29
NewDataFromRob_July72008	SN33217 2008-04-21 153000 T1W01.bin.csv	T1W01	4/21/2008 15:30	7/3/2008 13:30
Files sent by email NOT on FTP server	SN33217 2008-07-03 140000 T1W01.bin.csv	T1W01	7/3/2008 14:00	8/29/2008 13:59
NewDataFromRob_Sept082008	SN33217 2008-08-29 143000 T1W01.bin.csv	T1W01	8/29/2008 14:30	9/2/2008 13:00
NewDataFromRob_Oct082008	SN33217 2008-09-02 140000 T1W01.bin.csv	T1W01	9/2/2008 14:00	10/9/2008 14:00
Files sent by email NOT on FTP server	SN33217 2008-10-09 150000 T1W01.bin.csv	T1W01	10/9/2008 15:00	1/5/2009 16:59
NewdataFrom_Rob_Dec132007	SN33027 2007-12-13 133000 T3W01.bin.csv	T3W01	12/13/2007 13:30	3/13/2008 11:00
NewDataFrom_Rob_April212008	SN33027 2008-03-13 130000 T3W01.bin.csv	T3W01	3/13/2008 13:00	4/21/2008 15:30
NewDataFromRob_July72008	SN33027 2008-04-21 160000 T3W01.bin.csv	T3W01	4/21/2008 16:00	7/3/2008 12:30
NewDataFromRob_Oct082008	SN33027 2008-07-03 130000 T3W01.bin.csv	T3W01	7/3/2008 13:00	10/9/2008 13:00
Files sent by email NOT on FTP server	SN33027 2008-10-09 133000 T3W01.bin.csv	T3W01	10/9/2008 13:30	1/5/2009 16:00
NewdataFrom_Rob_Dec132007	SN33684 2007-12-13 123000 T7W01.bin.csv	T7W01	12/13/2007 12:30	3/13/2008 10:30
Files sent by email NOT on FTP server	SN33684 2008-03-13 120000 T7W01.bin.csv	T7W01	3/13/2008 12:00	4/17/2008 16:00
NewDataFromRob_July72008	SN33684 2008-04-17 163000 T7W01.bin.csv	T7W01	4/17/2008 16:30	7/3/2008 11:30
NewDataFromRob_Oct082008	SN33684 2008-07-03 120000 T7W01.bin.csv	T7W01	7/3/2008 12:00	10/9/2008 11:59
Files sent by email NOT on FTP server	SN33684 2008-10-09 123000 T7W01.bin.csv	T7W01	10/9/2008 12:30	1/5/2009 14:59
NewdataFrom_Rob_Dec132007	SN33751 2007-12-13 120000 T7W02.bin.csv	T7W02	12/13/2007 12:00	3/13/2008 9:59
Files sent by email NOT on FTP server	SN33751 2008-03-13 113000 T7W02.bin.csv	T7W02	3/13/2008 11:30	4/17/2008 15:30
NewDataFromRob_July72008	SN33751 2008-04-17 160000 T7W02.bin.csv	T7W02	4/17/2008 16:00	7/3/2008 11:00
NewDataFromRob_Sept082008	SN33751 2008-07-03 123000 T7W02.bin.csv	T7W02	7/3/2008 12:30	9/3/2008 15:30
NewDataFromRob_Sept082008	SN33751 2008-09-02 160000 T7W02.bin.csv	T7W02	9/2/2008 16:00	9/5/2008 14:00
NewDataFromRob_Oct082008	SN33743 2008-09-05 150000 T7W02.bin.csv	T7W02	9/5/2008 15:00	10/9/2008 11:30
Files sent by email NOT on FTP server	SN33743 2008-10-09 120000 T7W02.bin.csv	T7W02	10/9/2008 12:00	1/5/2009 14:30
NewdataFrom_Rob_Dec132007	SN31527 2007-12-13 120000 T7W03.bin.csv	T7W03	12/13/2007 12:00	3/13/2008 9:30
Files sent by email NOT on FTP server	SN31527 2008-03-13 113000 T7W03.bin.csv	T7W03	3/13/08 11:30	4/17/08 14:59
NewDataFromRob_July72008	SN31527 2008-04-17 160000 T7W03.bin.csv	T7W03	4/17/2008 16:00	7/3/2008 10:30
NewDataFromRob_Oct082008	SN31527 2008-07-03 110000 T7W03.bin.csv	T7W03	7/3/2008 11:00	9/17/2008 2:29
Files sent by email NOT on FTP server	SN31527 2008-10-09 120000 T7W03.bin.csv	T7W03	10/9/2008 12:00	1/5/2009 14:00
NewdataFrom_Rob_Dec132007	SN33037 2007-12-13 113000 T7W04.bin.csv	T7W04	12/13/2007 11:30	2/23/2008 12:30
Files sent by email NOT on FTP server	SN33037 2008-03-13 110000 T7W04.bin.csv	T7W04	3/13/2008 11:00	4/17/2008 14:30
NewDataFromRob_July72008	SN33037 2008-04-17 153000 T7W04.bin.csv	T7W04	4/17/2008 15:30	6/5/2008 5:59
NewDataFromRob_Sept082008	SN33037 2008-07-03 110000 T7W04.bin.csv	T7W04	7/3/2008 11:00	9/2/2008 15:00
NewDataFromRob_Oct082008	SN33037 2008-09-02 153000 T7W04.bin.csv	T7W04	9/2/2008 15:30	10/9/2008 10:59
Files sent by email NOT on FTP server	SN33037 2008-10-09 113000 T7W04.bin.csv	T7W04	10/9/2008 11:30	11/13/2008 13:30
Files sent by email NOT on FTP server	SN33037 2008-11-13 133000 T7W04.bin.csv	T7W04	11/13/2008 14:00	1/5/2009 12:59

Table 1 (continued).

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Table 1 (continued).

NewdataFrom_Rob_Dec132007	SN33118 2007-12-04 123000 T8W01.bin.csv	T8W01	12/4/2007 12:30	3/17/2008 11:00
NewDataFrom_Rob_April212008	SN33118 2008-03-17 130000 T8W01.bin.csv	T8W01	3/17/2008 13:00	4/21/2008 13:00
NewdataFromRob_July112008	SN33118 2008-04-21 140000 T8W01.bin.csv	T8W01	4/21/2008 14:00	7/8/2008 16:00
NewDataFromRob_Oct062008	SN33118 2008-07-08 163000 T8W01.bin.csv	T8W01	7/8/2008 16:30	10/6/2008 14:29
Files sent by email NOT on FTP server	SN33118 2008-10-06 153000 T8W01.bin.csv	T8W01	10/6/2008 15:30	1/5/2009 10:30
NewdataFrom_Rob_Dec132007	SN32130 2007-12-04 120000 T8W02.bin.csv	T8W02	12/4/2007 12:00	3/17/2008 10:30
NewDataFrom_Rob_April212008	SN32130 2008-03-17 123000 T8W02.bin.csv	T8W02	3/17/2008 12:30	4/21/2008 13:00
NewDataFromRob_Oct062008	SN32130 2008-07-08 163000 T8W02.bin.csv	T8W02	7/8/2008 16:30	10/6/2008 14:00
Files sent by email NOT on FTP server	SN32130 2008-10-06 150000 T8W02.bin.csv	T8W02	10/6/2008 15:00	1/5/2009 9:59
NewdataFrom_Rob_Dec132007	SN30987 2007-12-04 113000 T8W03.bin.csv	T8W03	12/4/2007 11:30	3/17/2008 10:30
NewDataFrom_Rob_April212008	SN30987 2008-03-17 120000 T8W03.bin.csv	T8W03	3/17/2008 12:00	4/21/2008 12:29
NewdataFromRob_July112008	SN30987 2008-04-21 133000 T8W03.bin.csv	T8W03	4/21/2008 13:30	6/26/2008 12:30
NewDataFromRob_Oct062008	SN30987 2008-07-08 160000 T8W03.bin.csv	T8W03	7/8/2008 16:00	10/6/2008 13:29
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NewdataFrom_Rob_Dec132007	SN33451 2007-12-14 173000 T9W01.bin.csv	T9W01	12/14/2007 17:30	3/17/2008 12:30
NewDataFrom_Rob_April212008	SN33451 2008-03-17 143000 T9W01.bin.csv	T9W01	3/17/2008 14:30	4/21/2008 11:59
NewdataFromRob_July112008	SN33451 2008-04-21 130000 T9W01.bin.csv	T9W01	4/21/2008 13:00	7/11/2008 11:30
NewDataFromRob_Oct062008	SN33451 2008-07-11 120000 T9W01.bin.csv	T9W01	7/11/2008 12:00	10/6/2008 15:59
NewdataFrom_Rob_Dec132007	SN33053 2007-12-14 173000 T9W02.bin.csv	T9W02	12/14/2007 17:30	3/17/2008 12:30
NewDataFrom_Rob_April212008	SN33053 2008-03-17 140000 T9W02.bin.csv	T9W02	3/17/2008 14:00	4/21/2008 12:00
NewdataFromRob_July112008	SN33053 2008-04-21 123000 T9W02.bin.csv	T9W02	4/21/2008 12:30	7/11/2008 11:00
NewDataFromRob_Oct062008	SN33053 2008-07-11 120000 T9W02.bin.csv	T9W02	7/11/2008 12:00	10/6/2008 15:30
Files sent by email NOT on FTP server	SN33053 2008-10-06 163000 T9W02.bin.csv	T9W02	10/6/2008 16:30	1/5/2009 11:29
NewdataFrom_Rob_Dec132007	SN33469 2007-12-14 170000 T9W03.bin.csv	T9W03	12/14/2007 17:00	3/17/2008 12:00
NewDataFrom_Rob_April212008	SN33469 2008-03-17 140000 T9W03.bin.csv	T9W03	3/17/2008 14:00	4/21/2008 11:29
NewdataFromRob_July112008	SN33469 2008-04-21 120000 T9W03.bin.csv	T9W03	4/21/2008 12:00	7/11/2008 11:00
NewDataFromRob_Oct062008	SN33469 2008-07-11 113000 T9W03.bin.csv	T9W03	7/11/2008 11:30	10/6/2008 15:30
Files sent by email NOT on FTP server	SN33469 2008-10-06 160000 T9W03.bin.csv	T9W03	10/6/2008 16:00	1/5/2009 11:00

APPENDIX II: Electronic Data in Hydrobase

1. Description

The final processed data has been stored and made available to the District at UF-HydroBase, a web-based information system for hydrological data storage, maintenance and mining. HydroBase is based on industry-standard Microsoft SQL server, .NET asp web services, and Java. The application contains powerful on-line web-based graphing, statistical analysis, and reporting capabilities as well as project maintenance and administration. Access to this system allows the District personnel quick analysis of the project data in the form of graphs and statistical tables.

The "project-based" logic model used by HydroBase closely matches research and environmental monitoring environments. Project team members on different roles (PI, collaborator, general public) can remotely assess and administer the on-line database through a complete web interface. Projects can be maintained private (for team members only) or public (open data sources). When users participate in different projects, they can work on specific projects or compare data across projects. A distributed remote Windows client allows project teams to quickly upload and maintain data independently using common Excel coma separated files.

The system, designed to make University of Florida's hydrological/WQ data accessible to specialists and expert stakeholders, provides an ideal platform as a repository for intensive hydrological and water quality monitoring projects.

2. Data types

The current classes of data accessible and downloadable by the user are:

- surface water (stream/canal stage and flow, and runoff)
- groundwater (well stage and temperature, unsaturated zone moisture salinity and temperature)
- weather (rain and detail weather station parameters including measured and estimated ET)
- water quality (flexible classification of analytes) .

Two of the data classes (weather and WQ) are dynamic so new measurement types can be added "on the fly".

3. User roles

The following user types are available in the database:

- General users: see only public projects
- Project users: in addition, they can see private projects they are assigned to
- Team members: in addition, they can upload new data to private projects they are assigned to
- Principal Investigators: in addition, they can create new projects and make their projects public or private
- Administrator: administer users and roles and oversees system operation over all projects

4. Access information

Access to the database is obtained through visiting the website http://carpena.ifas.ufl.edu and selecting website the "UF-HydroBase" menu item form the main page (horizontal tabs on the top frame of the page). Once clicked, the user information must be entered as follows:

Username: sfwmd1
Password: Loxahatchee

A series of options are then displayed. Data for the "Loxahatchee River" project (including that from our previous research efforts in cooperation with the District) are available at login. In particular, the data for this project (groundwater elevations, depth and temperature are stored under the "Ground Water" class and electrical-conductivity (salinity) under the "Water Quality" class.

Various temporal scales can be selected for a better analysis of data. The UF-HydroBase can perform a series of graphs for each option depicted in the last paragraph.

Appendix III. Daily Time Series Graphs

Timelines of average daily water table elevation, water table depth (below benchmark), temperature, and EC are given below. Figures 1 – 12 show average daily water table elevation (in ft, NAVD88); figures 13 – 24 show average daily water table depth below benchmark (in feet); figures 25 – 36 show average daily groundwater temperature (in degrees Celsius); and figures 37 – 48 show average daily EC (in S/m). **Note: scale on y-axis of individual daily time series graphs is variable.**

Appendix III-A – Daily time series of Water Table Elevation (ft, NAVD88)
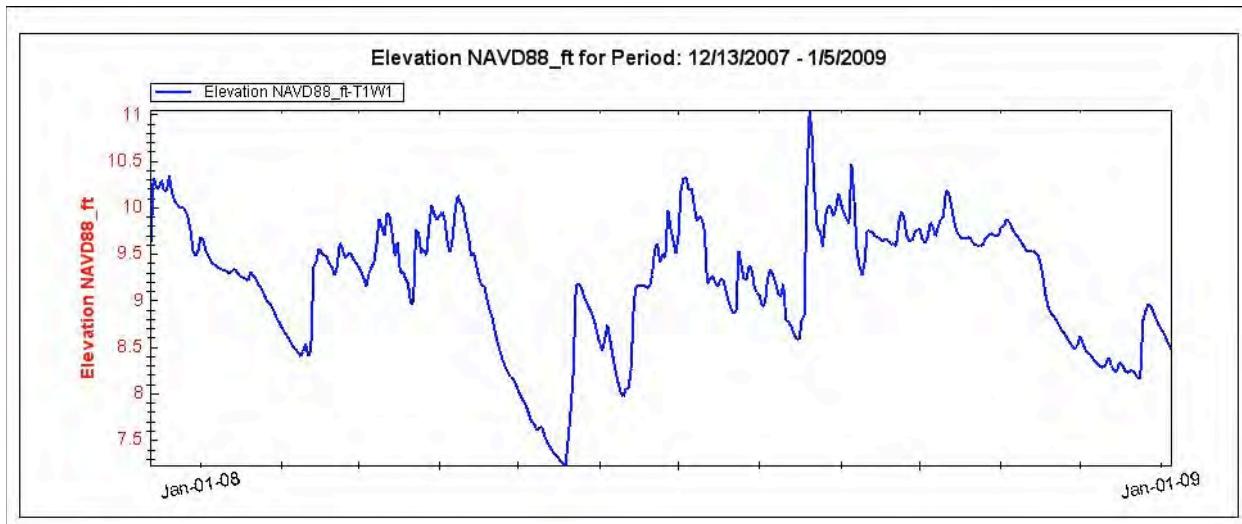
Figure 1. Average daily water table elevation at well 1 on Transect 1.
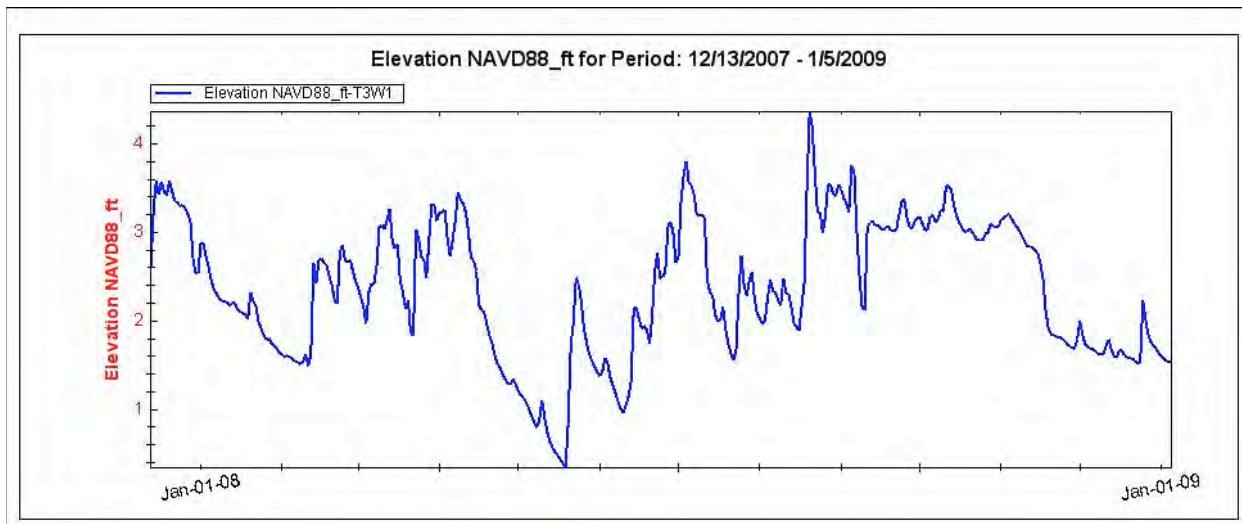
Figure 2. Average daily water table elevation at well 1 on Transect 3.
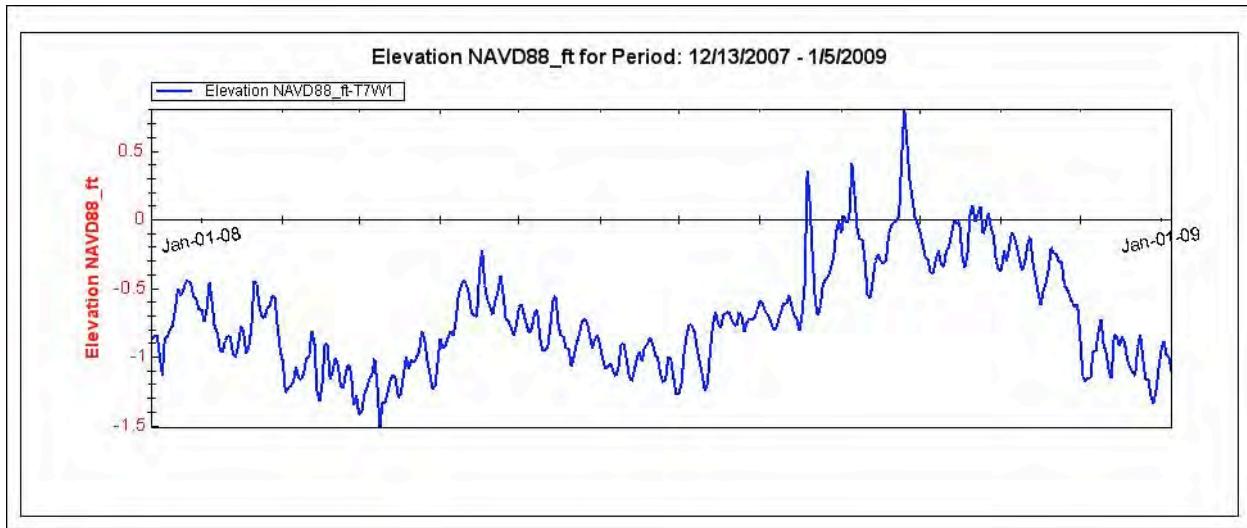
Figure 3. Average daily water table elevation at well 1 on Transect 7.
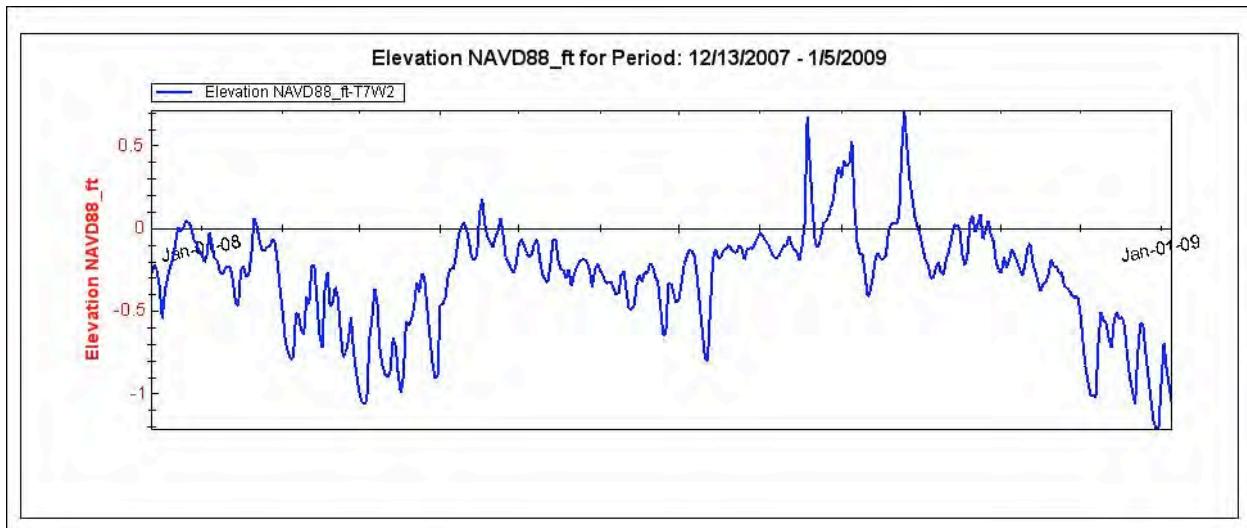
Figure 4. Average daily water table elevation at well 2 on Transect 7.
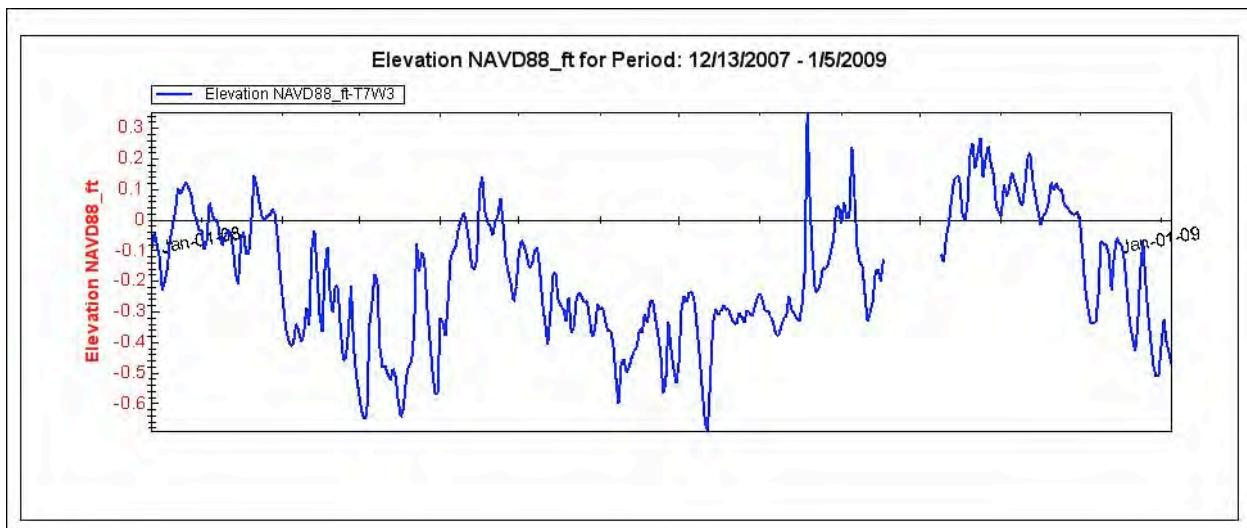
Figure 5. Average daily water table elevation at well 3 on Transect 7.
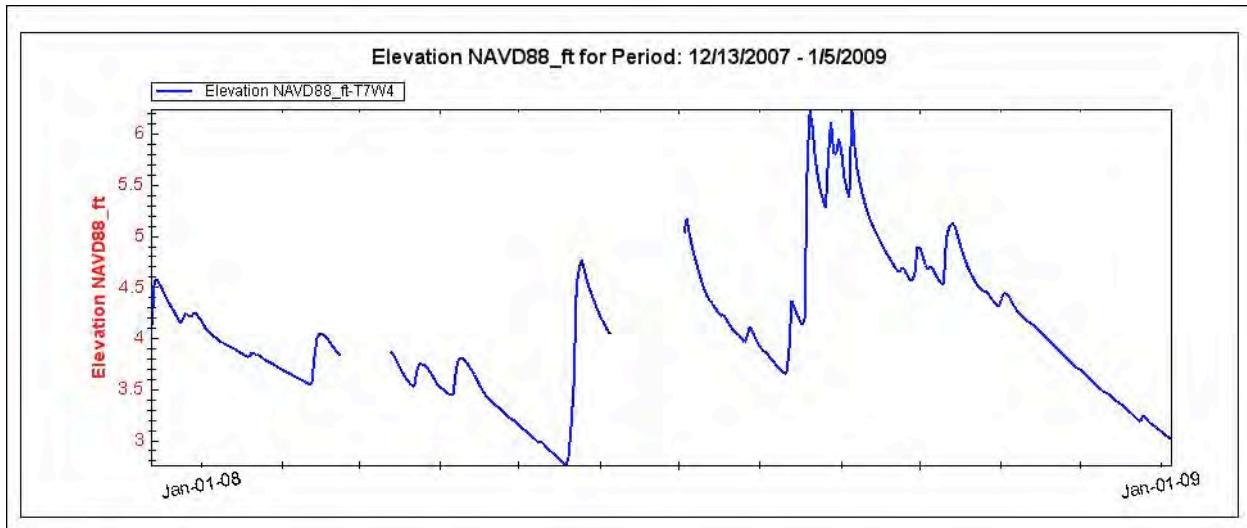
Figure 6. Average daily water table elevation at well 4 on Transect 7.
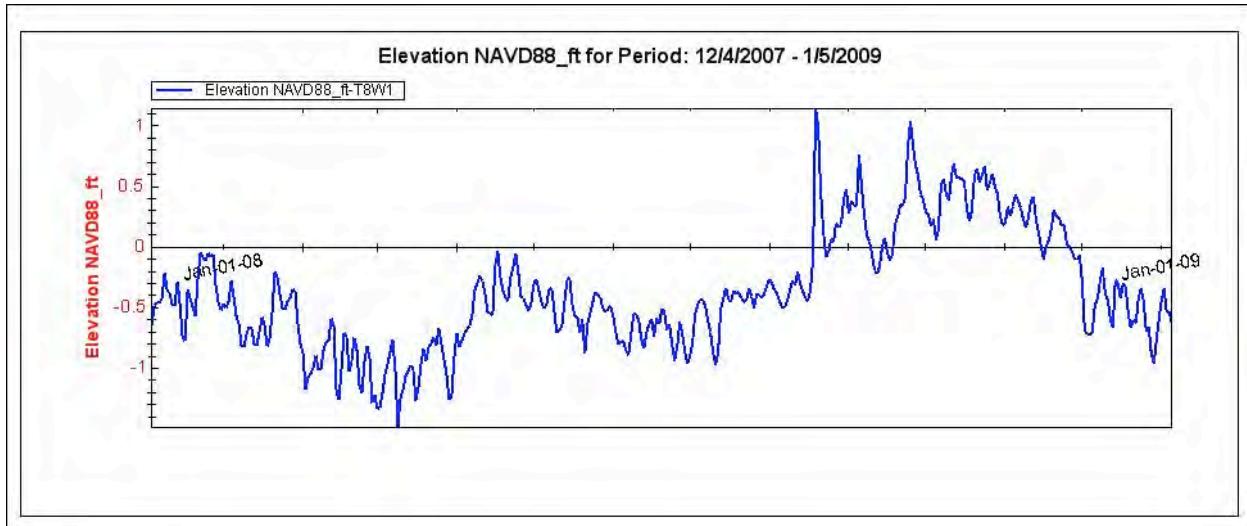
Figure 7. Average daily water table elevation at well 1 on Transect 8.
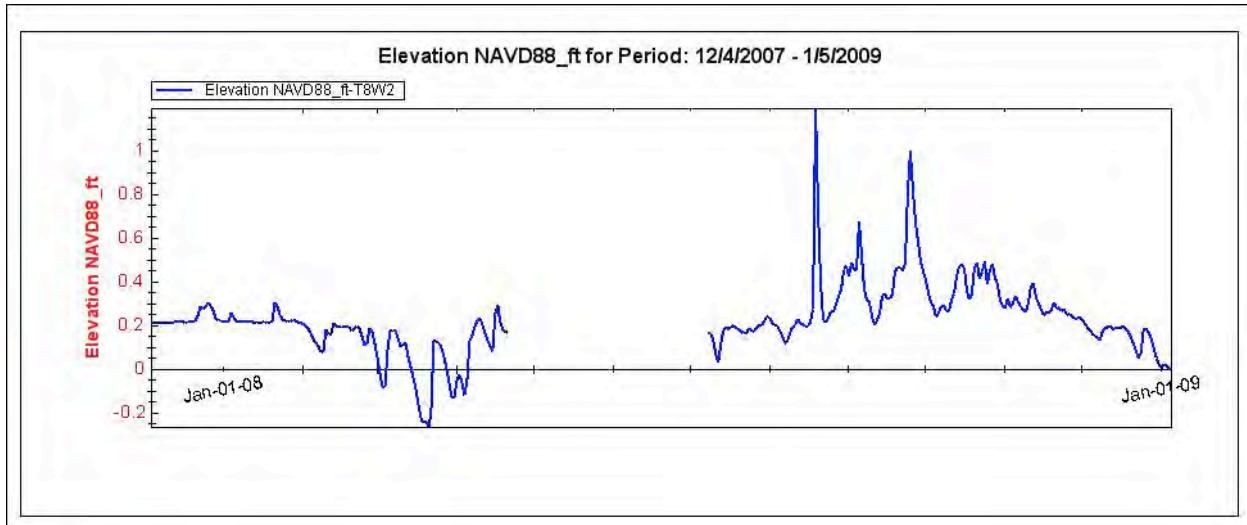
Figure 8. Average daily water table elevation at well 2 on Transect 8.
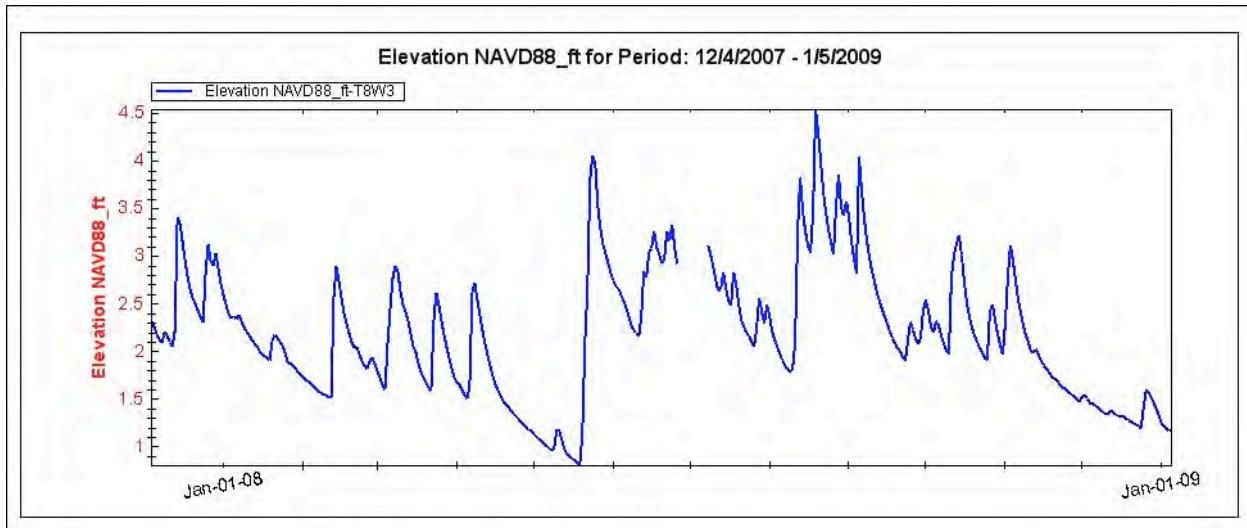
Figure 9. Average daily water table elevation at well 3 on Transect 8.
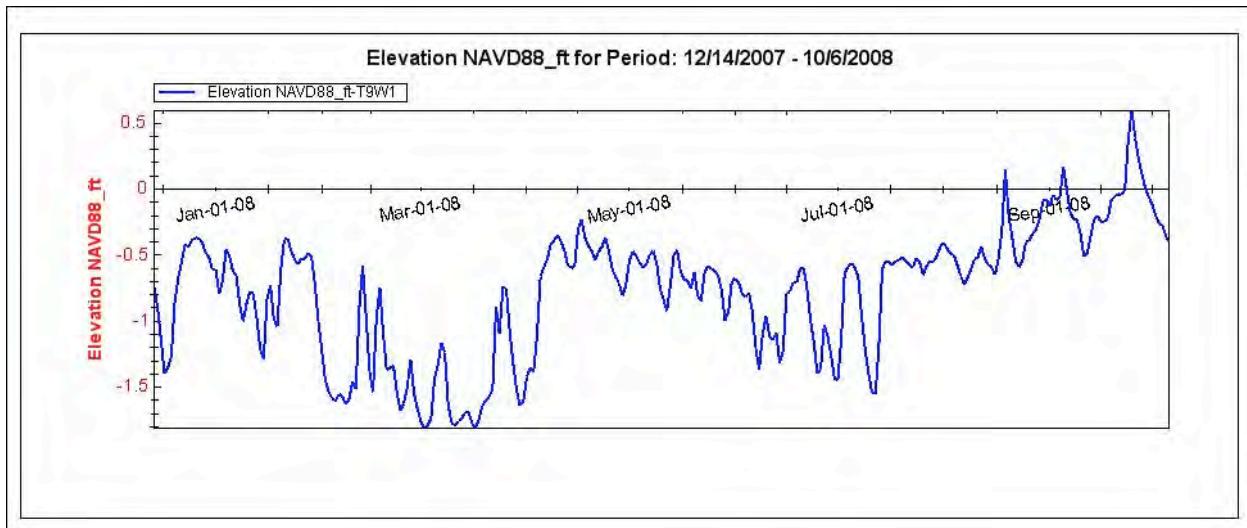
Figure 10. Average daily water table elevation at well 1 on Transect 9.
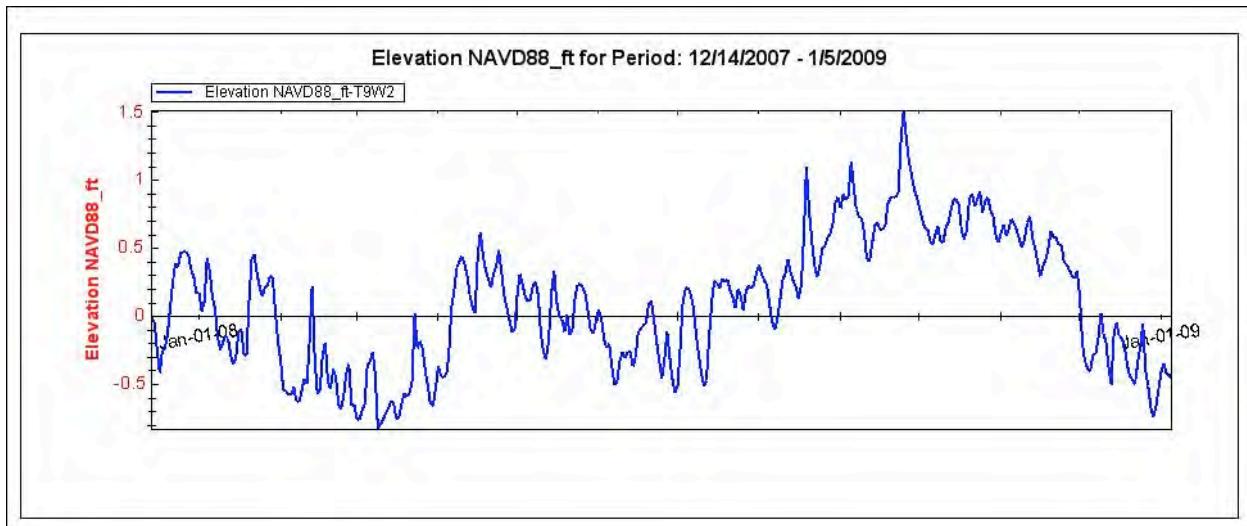
Figure 11. Average daily water table elevation at well 2 on Transect 9.
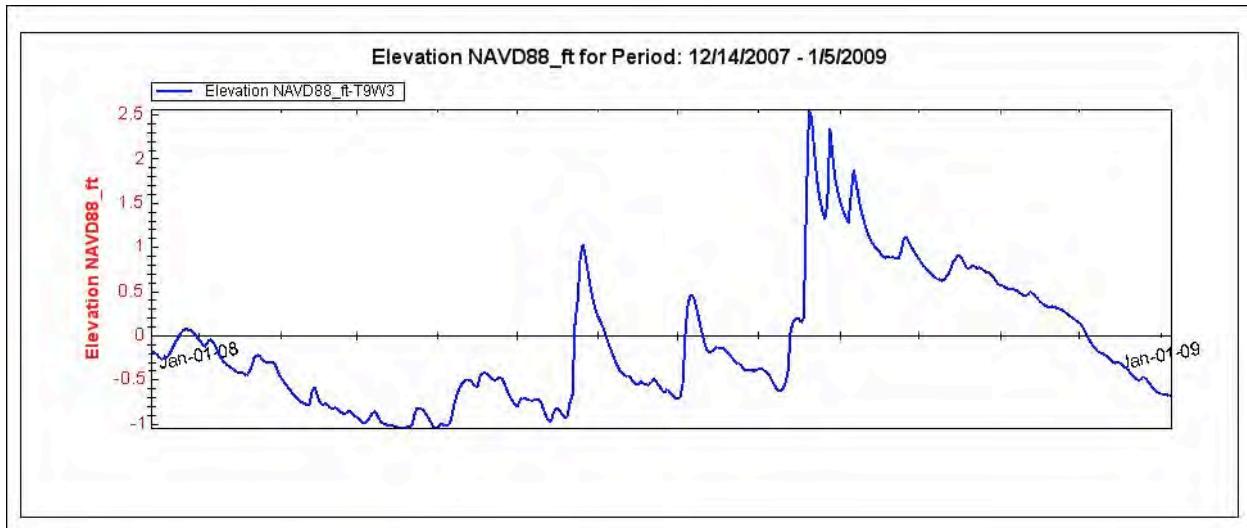
Figure 12. Average daily water table elevation at well 3 on Transect 9.

Appendix III-B – Daily time series of Water Table Depth (ft)
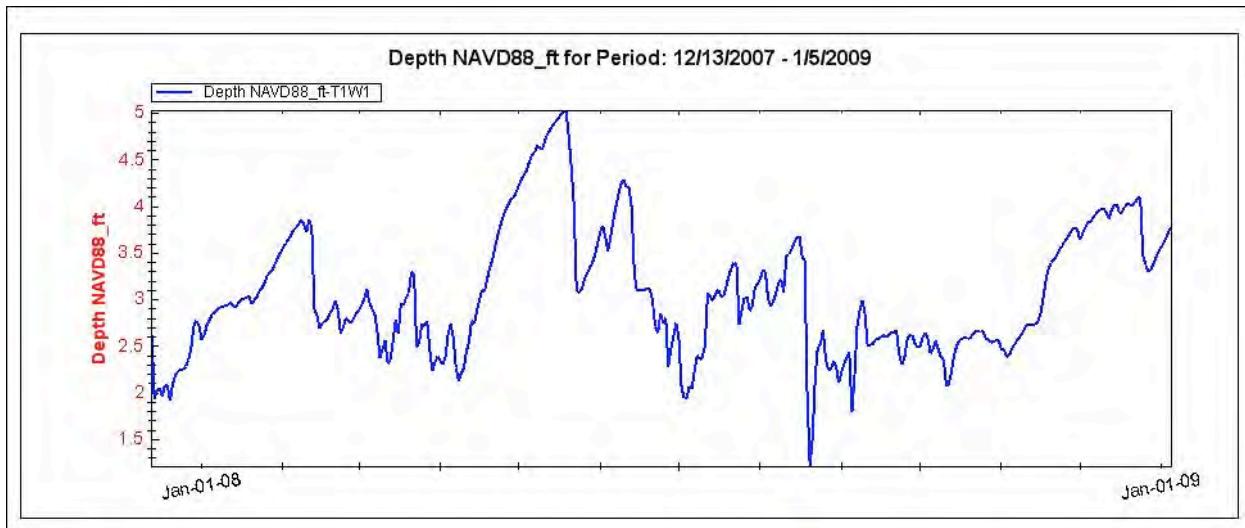
Figure 13. Average daily water table depth at well 1 on Transect 1.
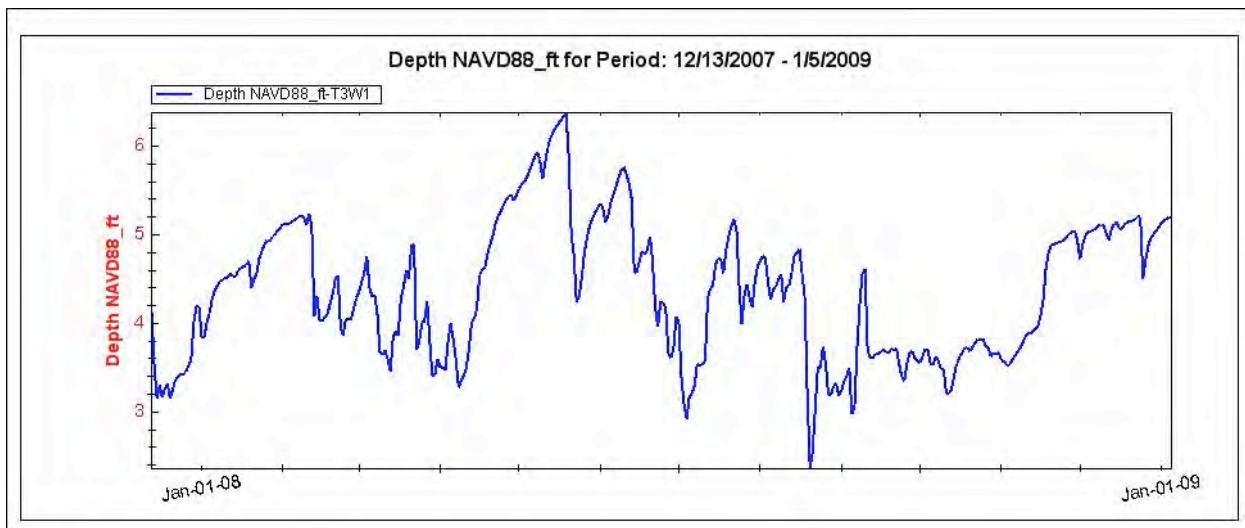
Figure 14. Average daily water table depth at well 1 on Transect 3.
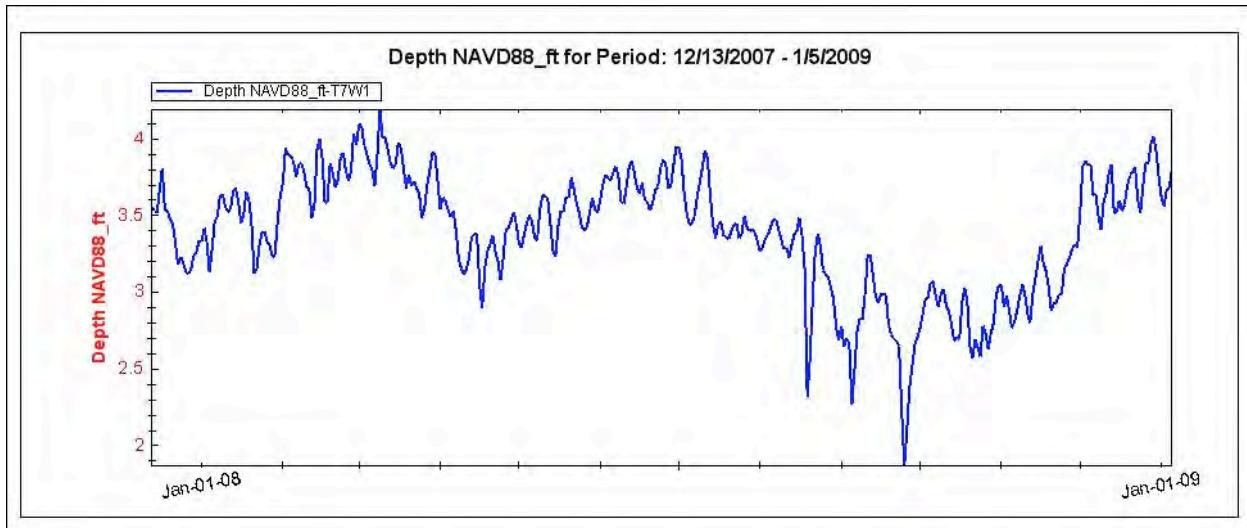
Figure 15. Average daily water table depth at well 1 on Transect 7.
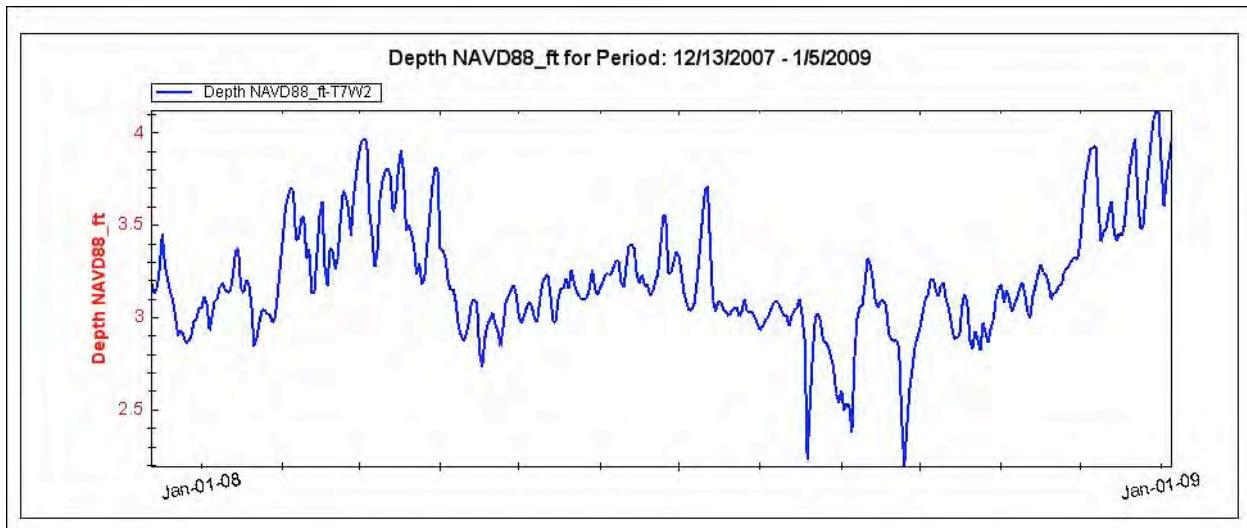
Figure 16. Average daily water table depth at well 2 on Transect 7.
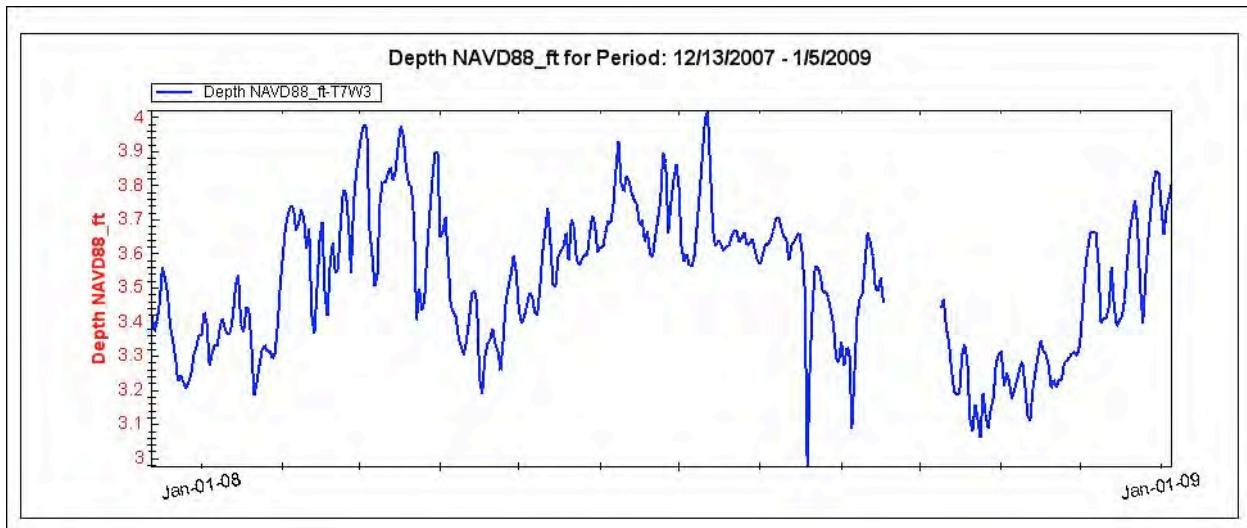
Figure 17. Average daily water table depth at well 3 on Transect 7.
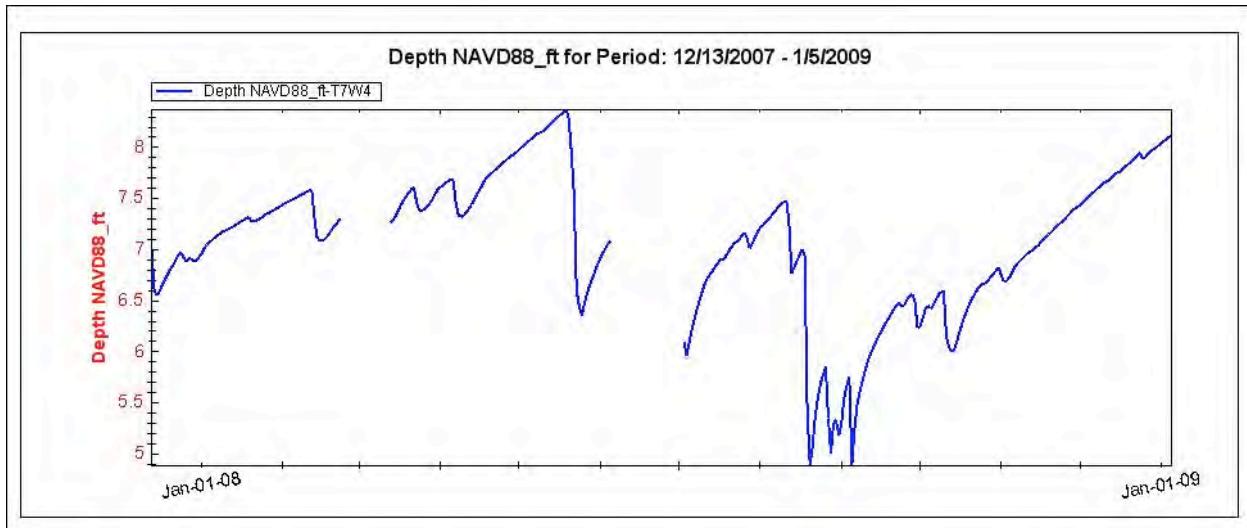
Figure 18. Average daily water table depth at well 4 on Transect 7.
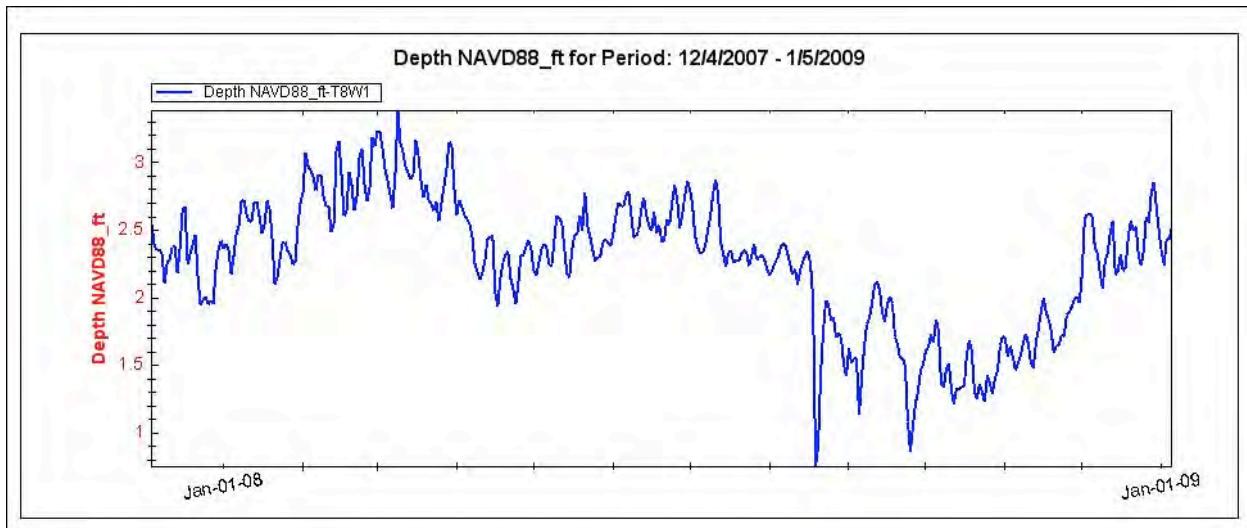
FFigure 19. Average daily water table depth at well 1 on Transect 8.
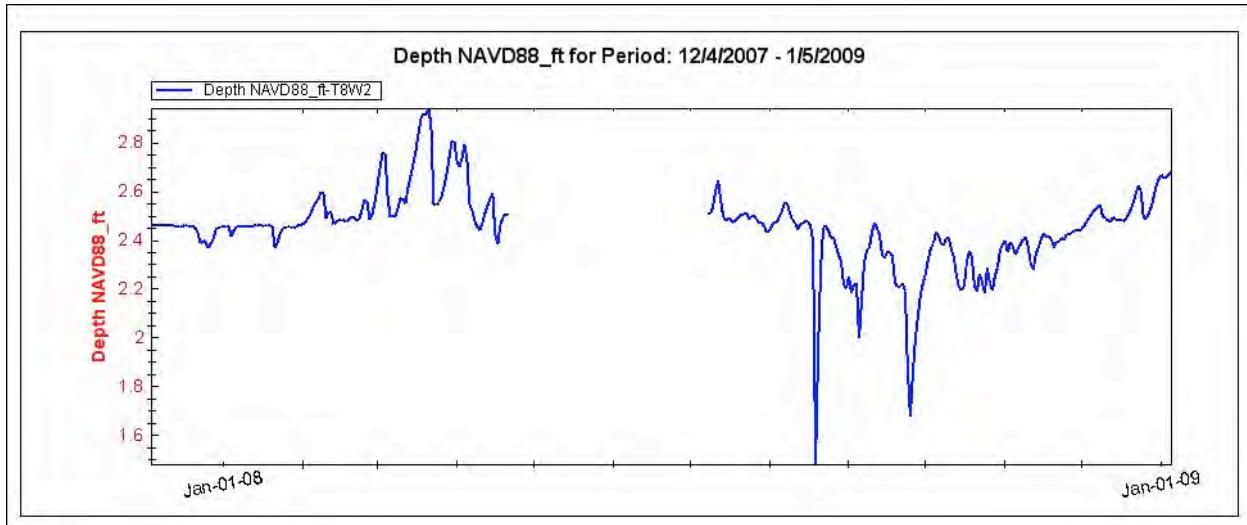
Figure 20. Average daily water table depth at well 2 on Transect 8.
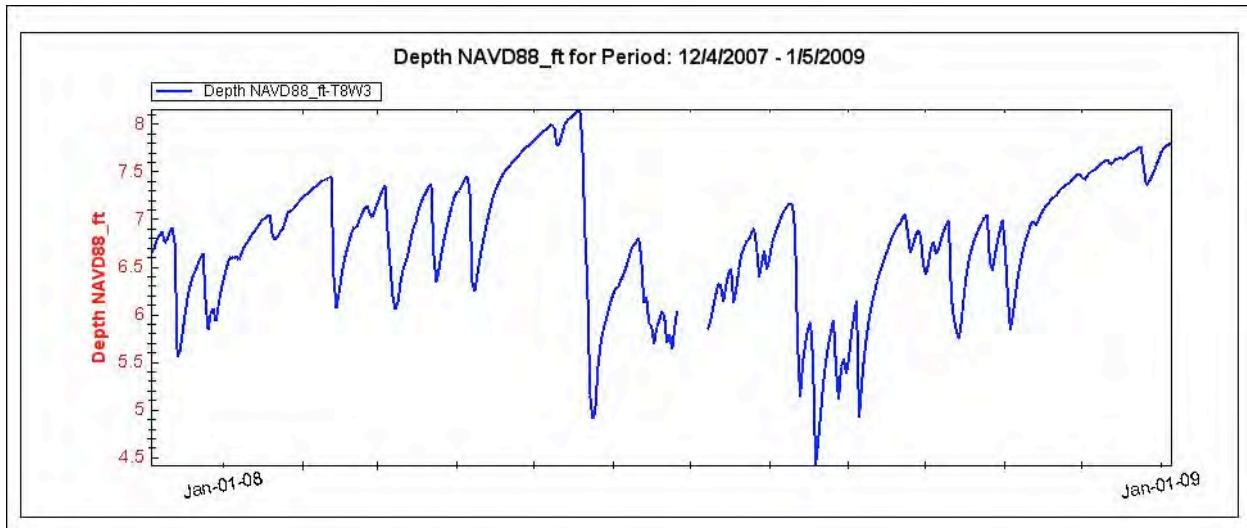
Figure 21. Average daily water table depth at well 3 on Transect 8.
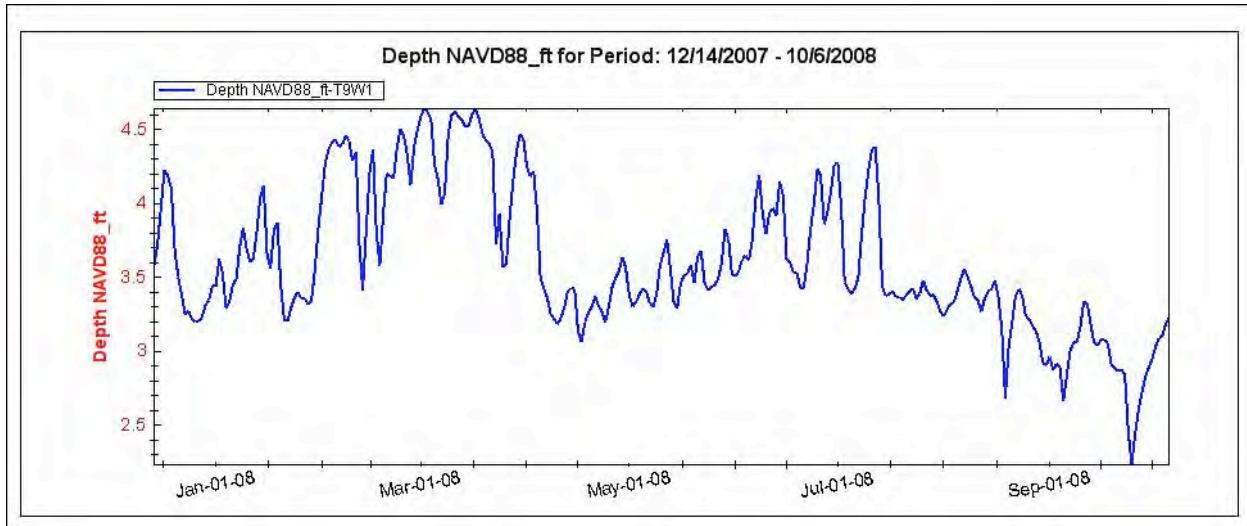
Figure 22. Average daily water table depth at well 1 on Transect 9.
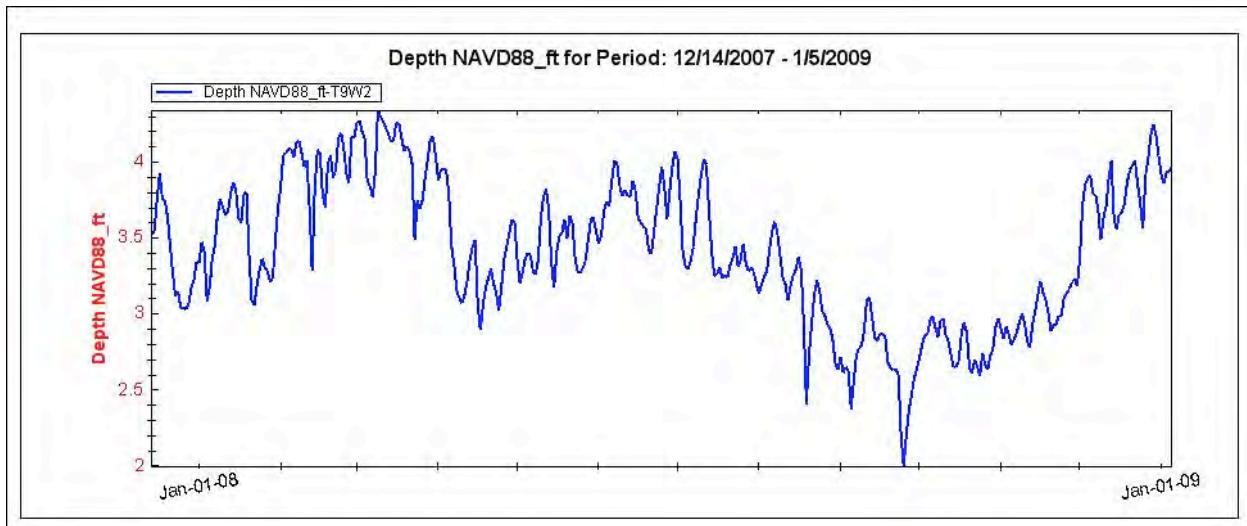
Figure 23. Average daily water table depth at well 2 on Transect 9.
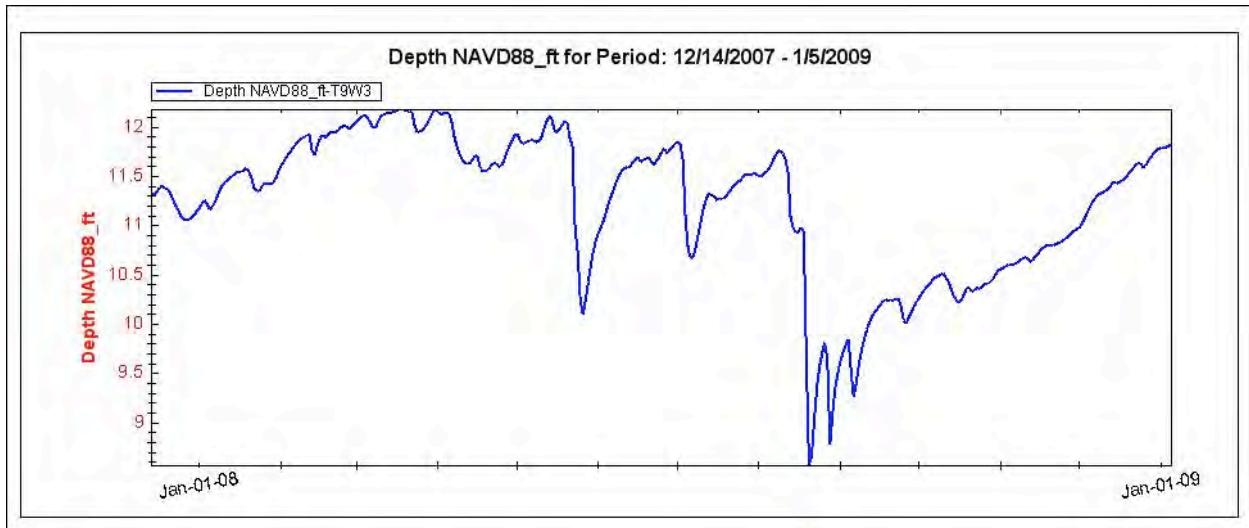
Figure 24. Average daily water table depth at well 3 on Transect 9.

Appendix III-C – Daily time series of groundwater temperature (C)
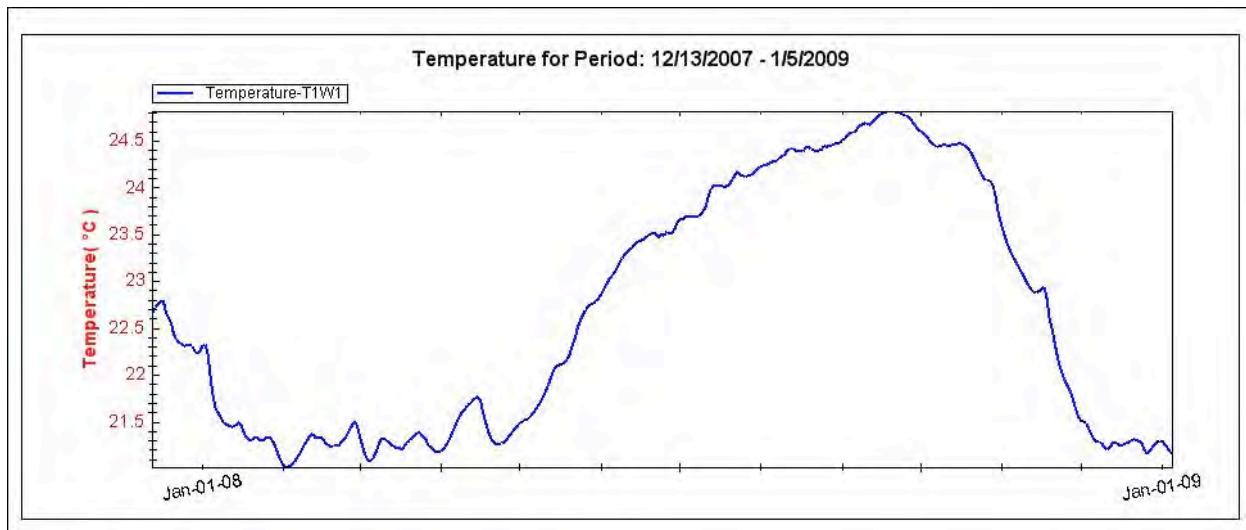
Figure 25. Average daily groundwater temperature at well 1 on Transect 1.
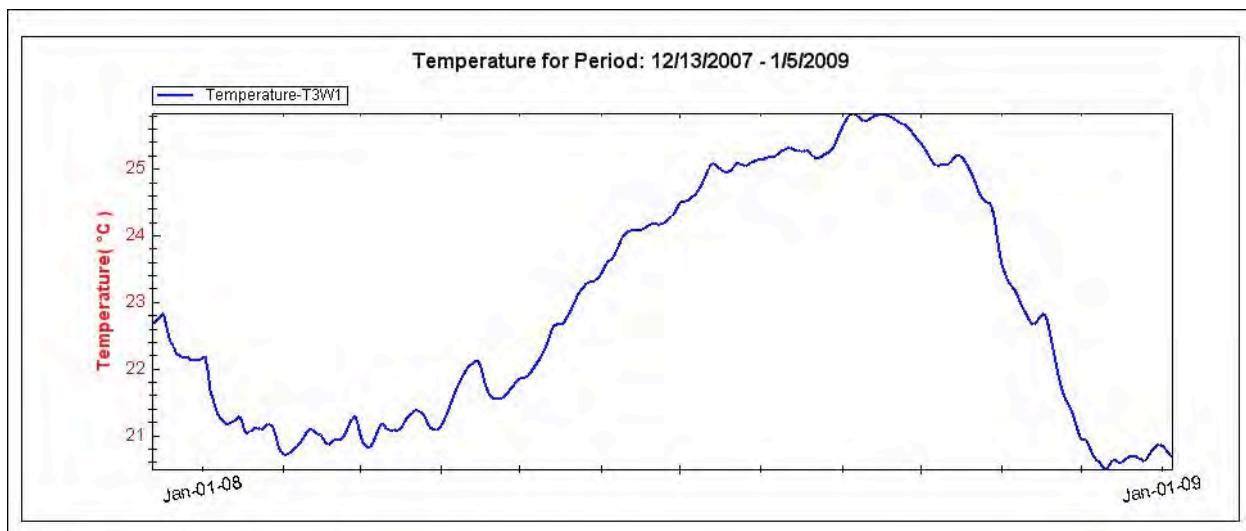
Figure 26. Average daily groundwater temperature at well 1 on Transect 3.
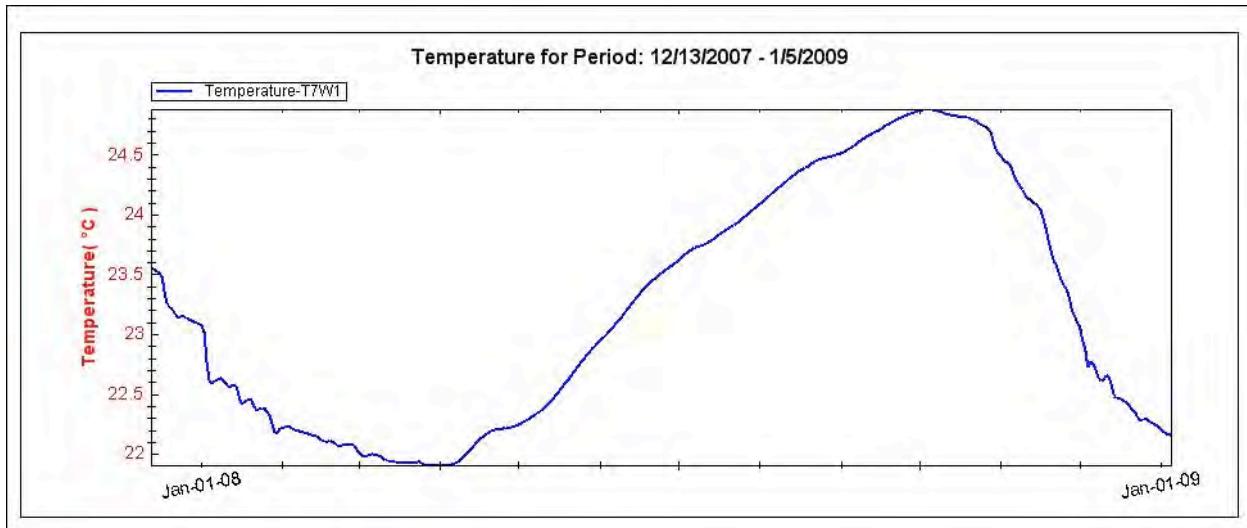
Figure 27. Average daily groundwater temperature at well 1 on Transect 7.
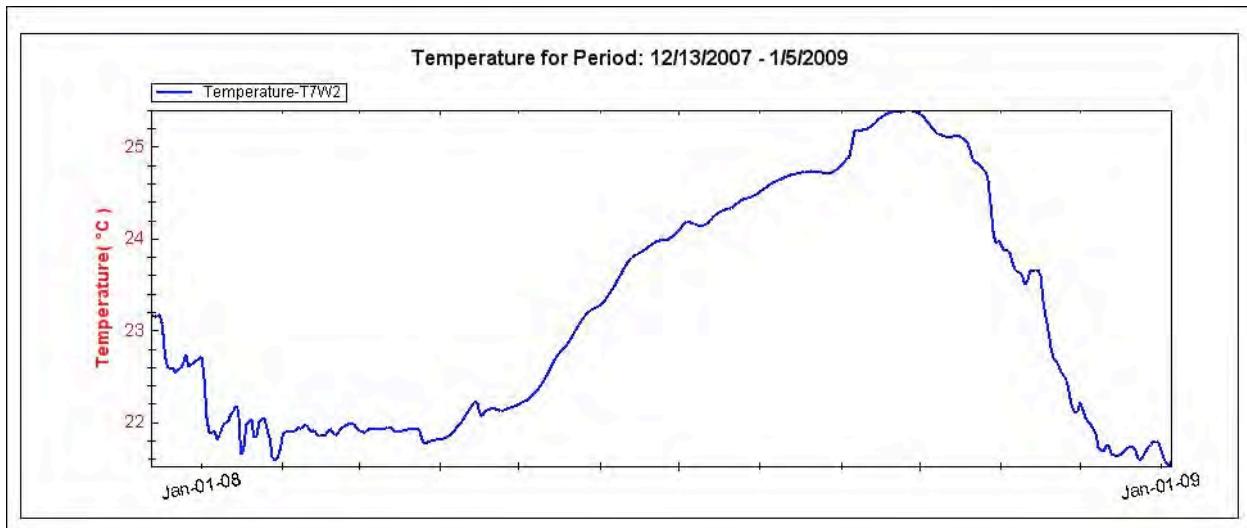
Figure 28. Average daily groundwater temperature at well 2 on Transect 7.
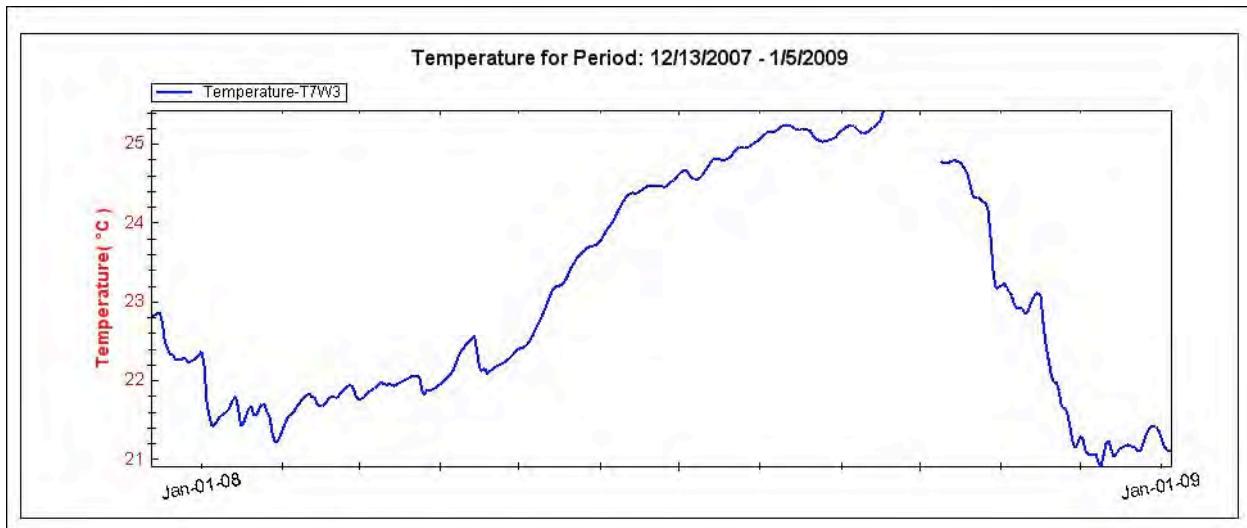
Figure 29. Average daily groundwater temperature at well 3 on Transect 7.
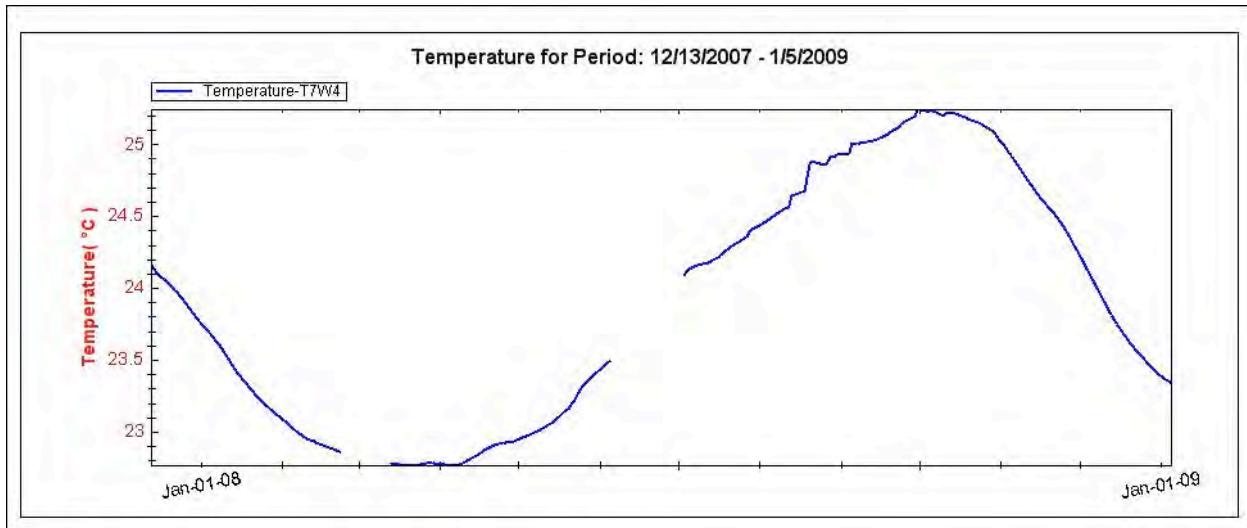
Figure 30. Average daily groundwater temperature at well 4 on Transect 7.
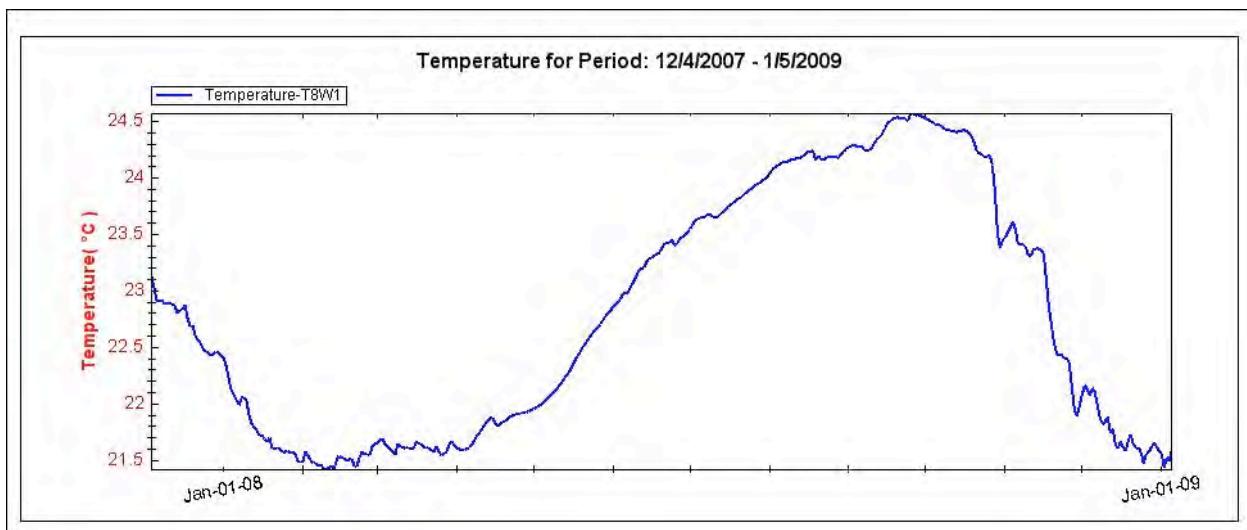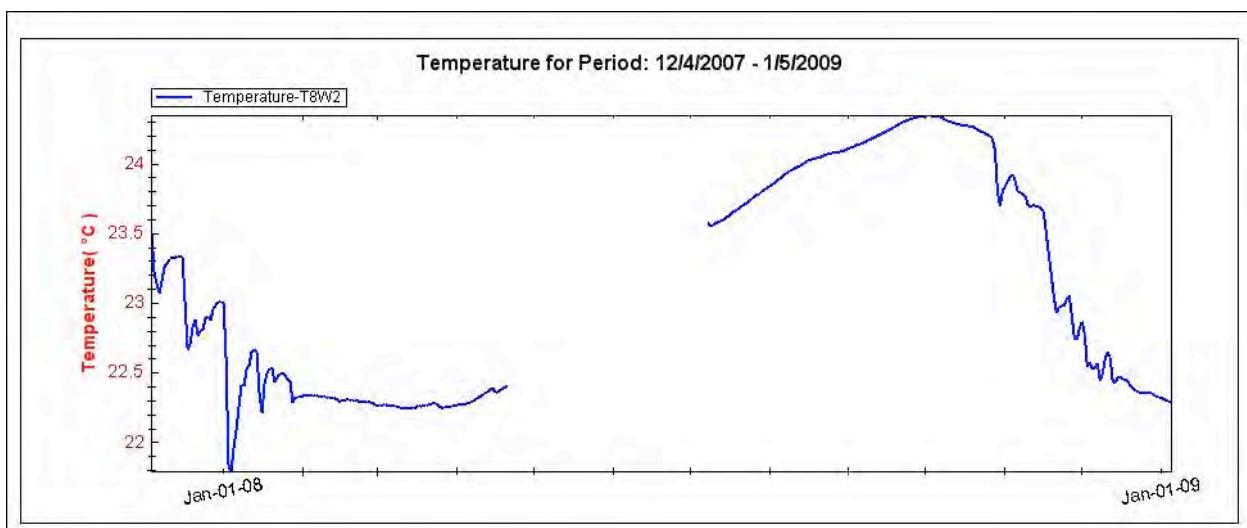
Figure 31. Average daily groundwater temperature at well 1 on Transect 8.
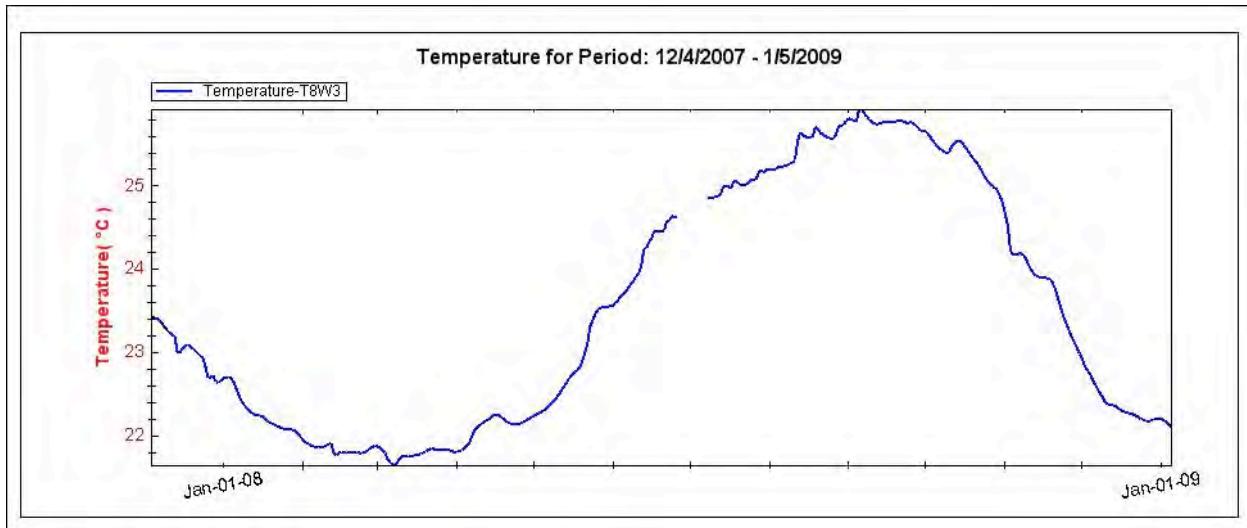
Figure 33. Average daily groundwater temperature at well 3 on Transect 8.
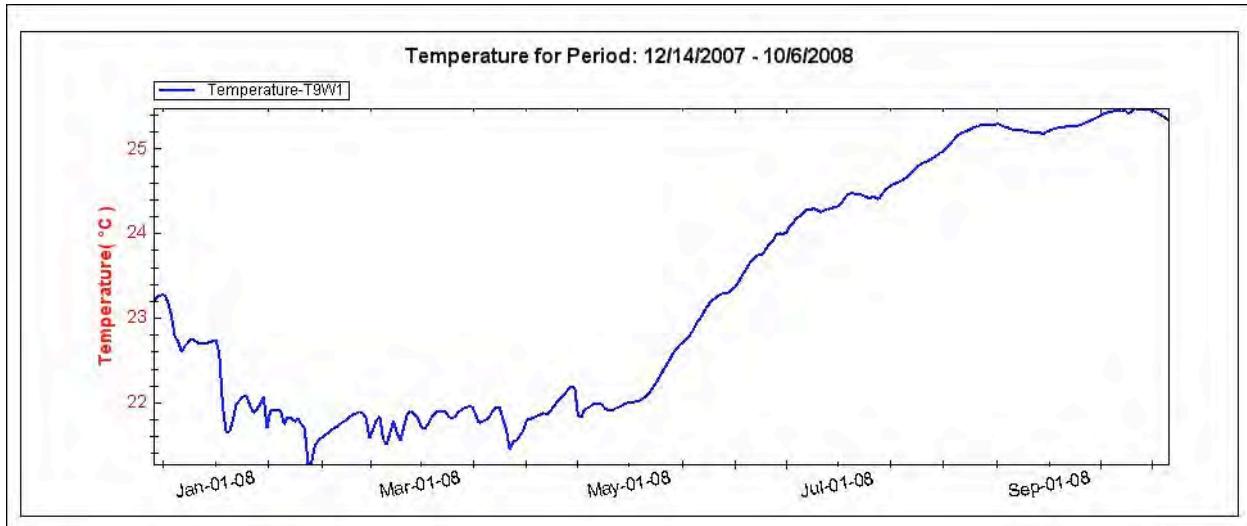
Figure 34. Average daily groundwater temperature at well 1 on Transect 9.
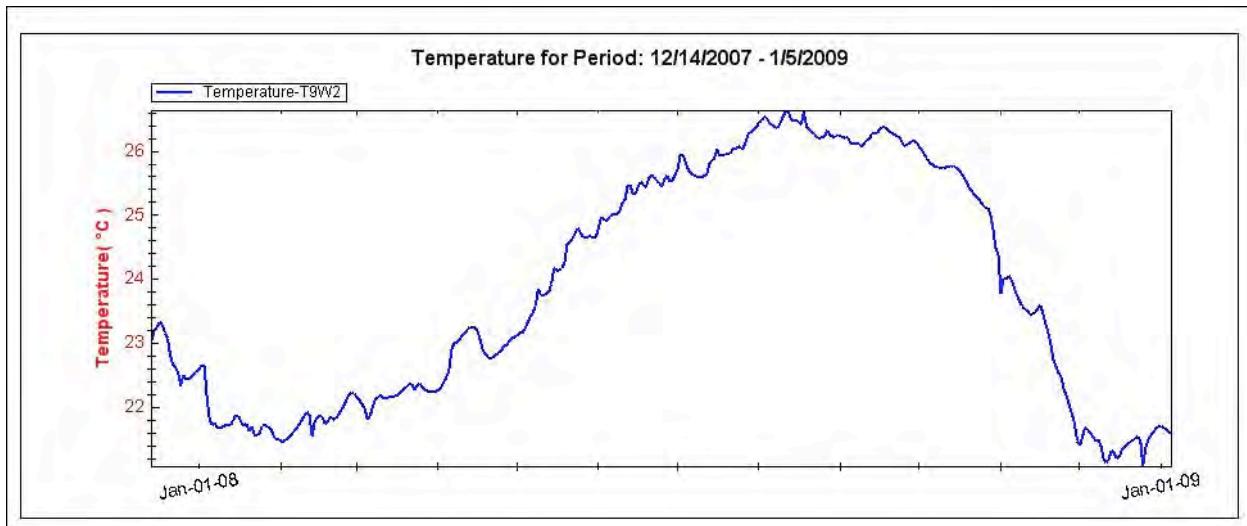
Figure 35. Average daily groundwater temperature at well 2 on Transect 9.
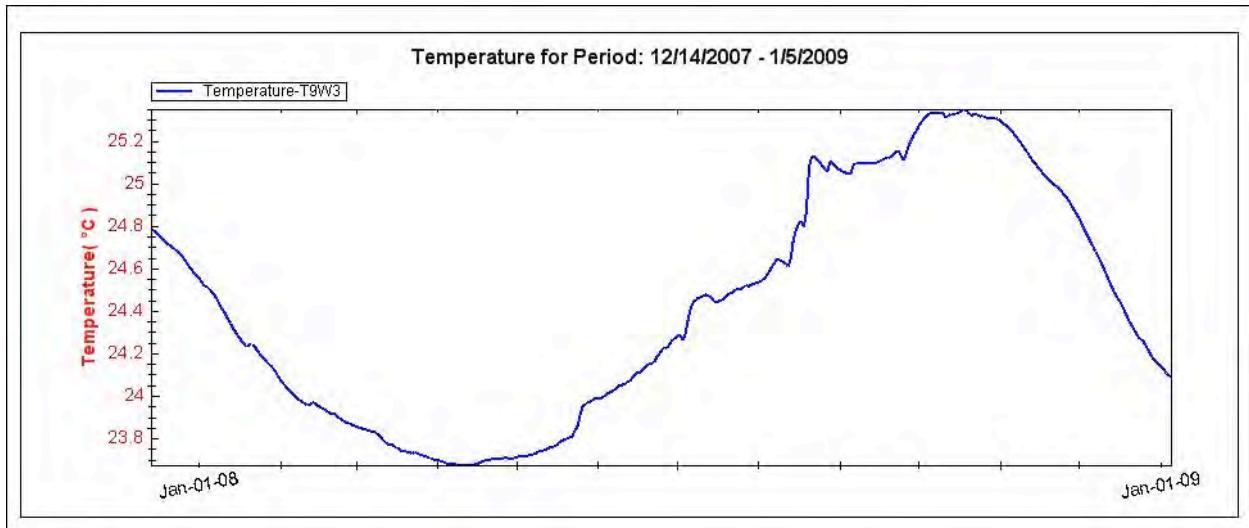
Figure 36. Average daily groundwater temperature at well 3 on Transect 9.

Appendix III-D – Daily time series of groundwater EC (S/m)
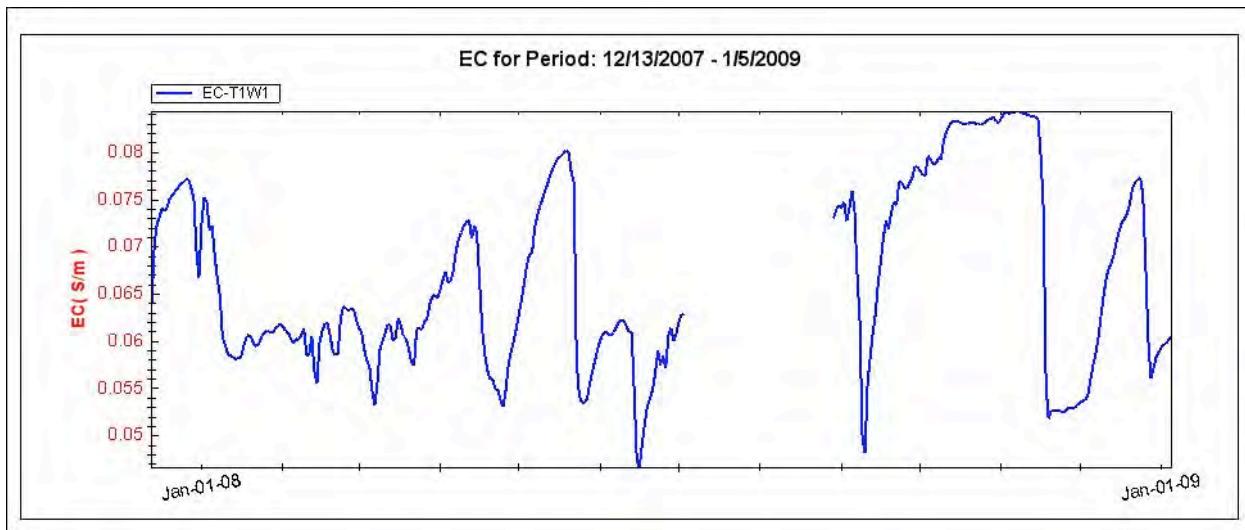
Figure 37. Average daily groundwater EC at well 1 on Transect 1.
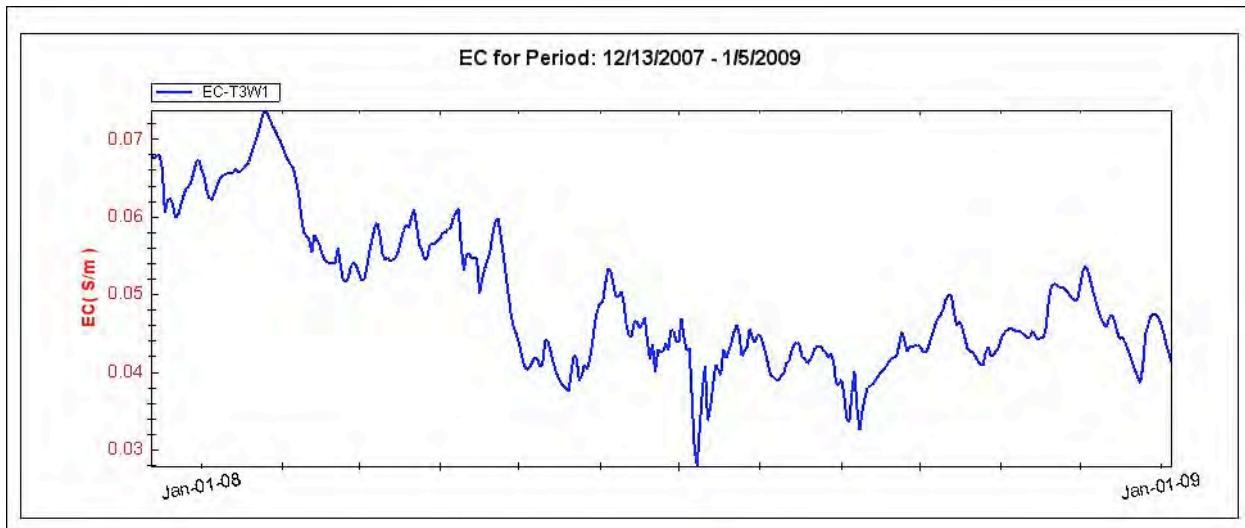
Figure 38. Average daily groundwater EC at well 1 on Transect 3.
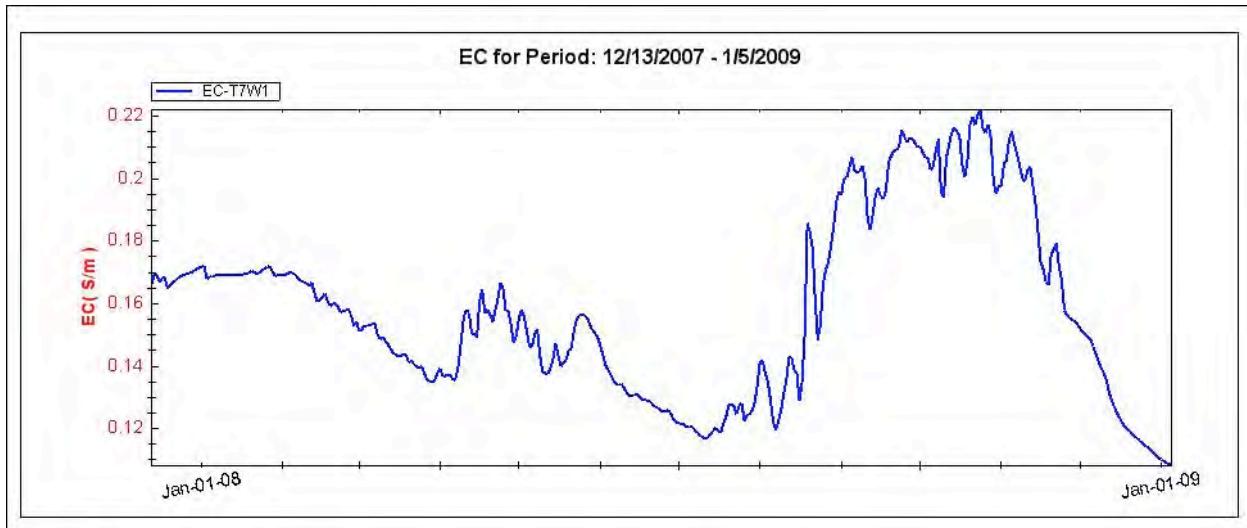
Figure 39. Average daily groundwater EC at well 1 on Transect 7.
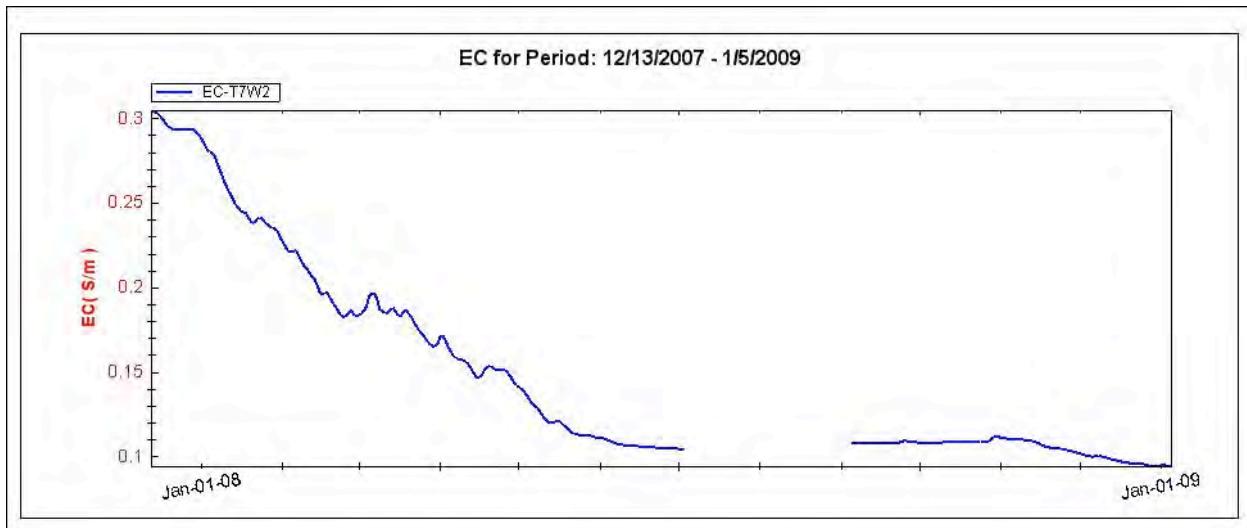
Figure 40. Average daily groundwater EC at well 2 on Transect 7.
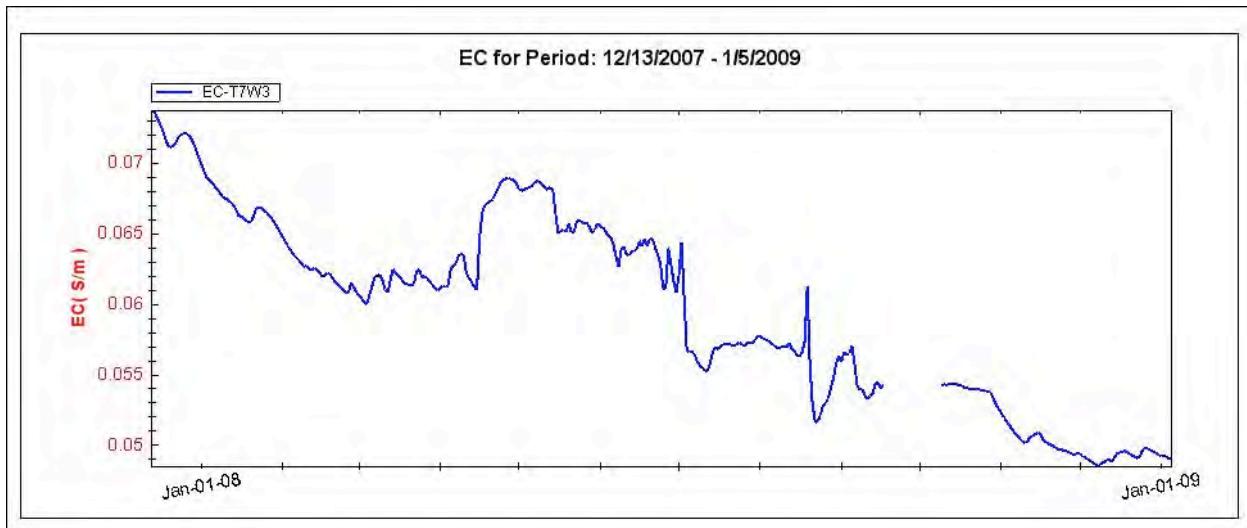
Figure 41. Average daily groundwater EC at well 3 on Transect 7.
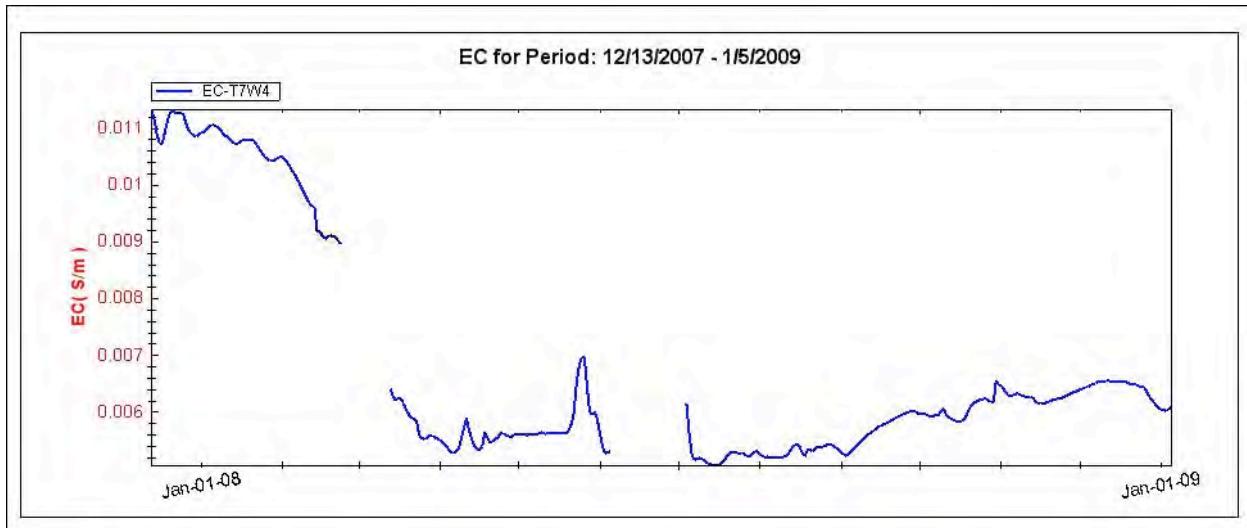
Figure 42. Average daily groundwater EC at well 4 on Transect 7.
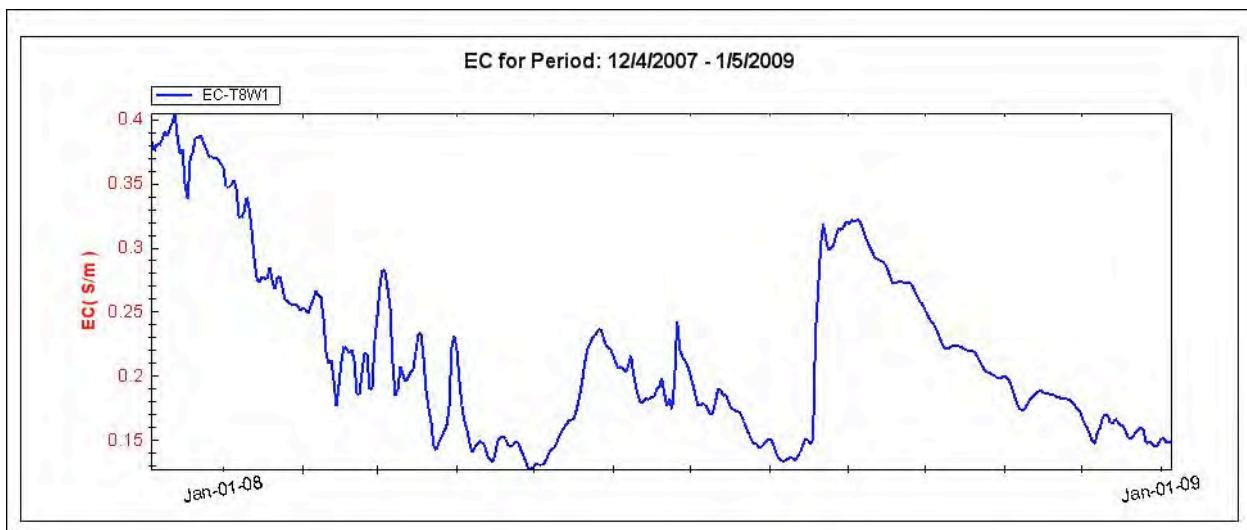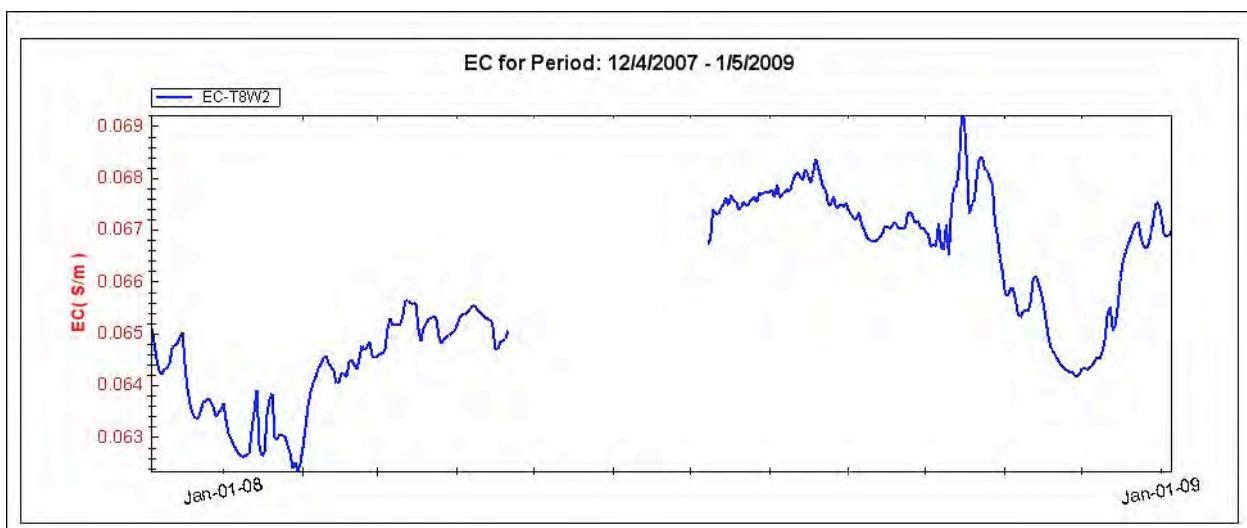
Figure 43. Average daily groundwater EC at well 1 on Transect 8.
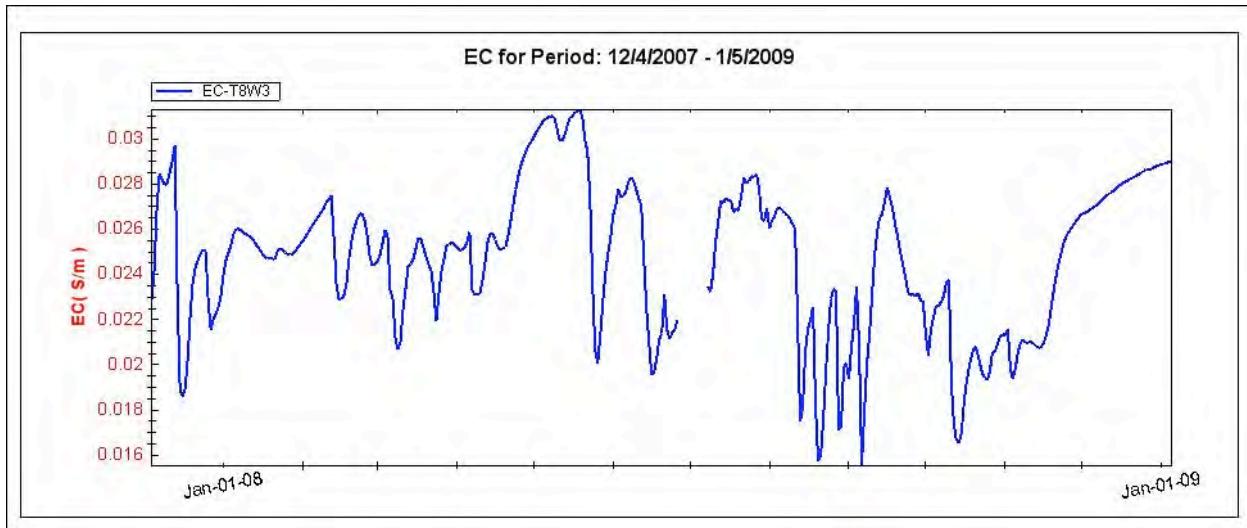
Figure 45. Average daily groundwater EC at well 3 on Transect 8.
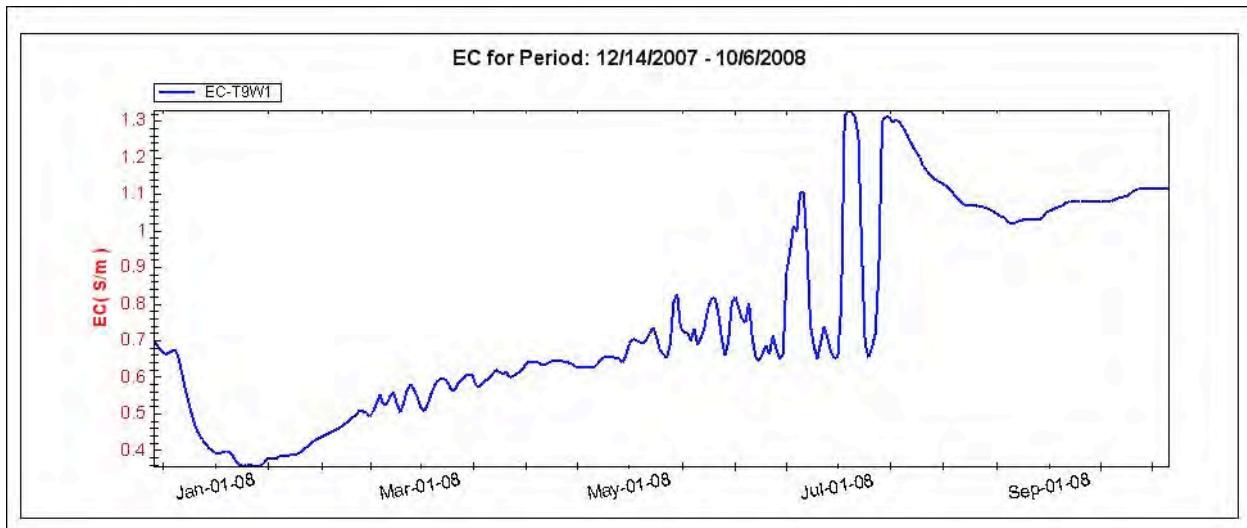
Figure 46. Average daily groundwater EC at well 1 on Transect 9.
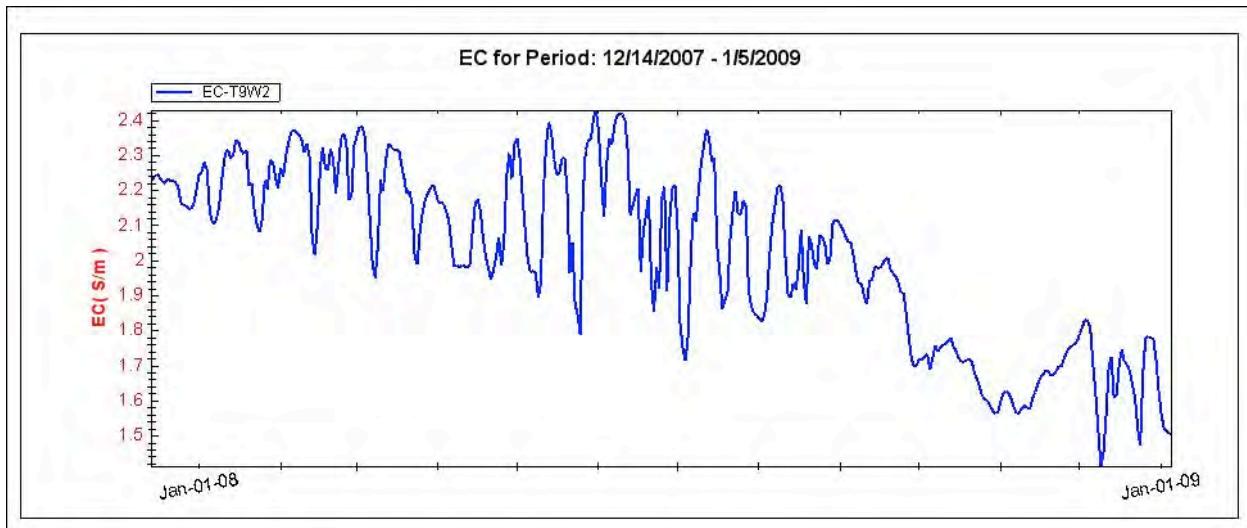
Figure 47. Average daily groundwater EC at well 2 on Transect 9.
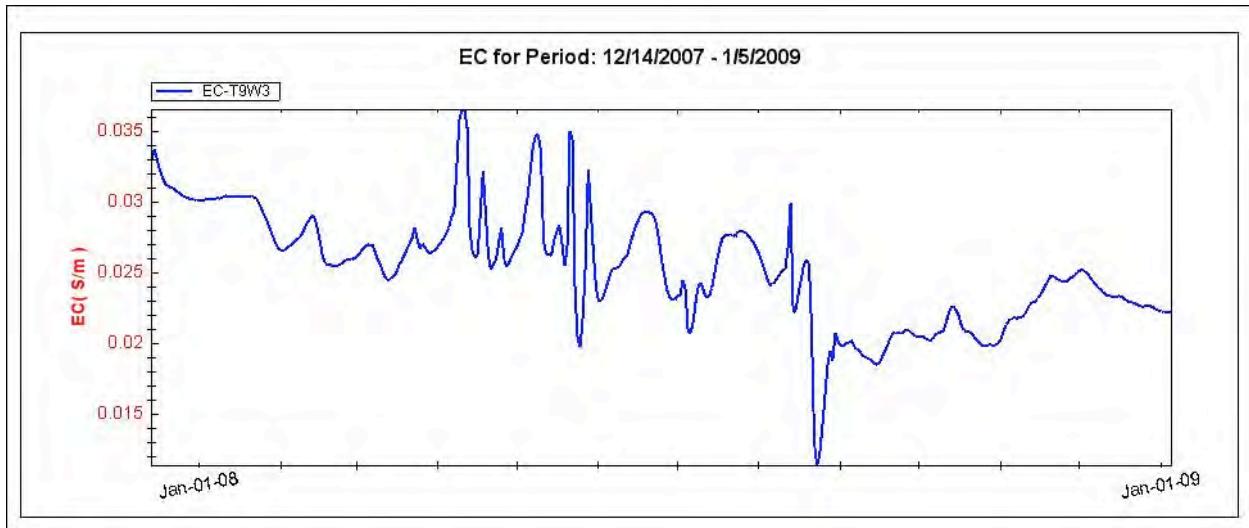
Figure 48. Average daily groundwater EC at well 3 on Transect 9.

Appendix IV. Global, Annual, Monthly, and Wet/Dry Season Statistics Tables

Summary statistics, including global, annual, and wet/dry season means, minima, maxima, variances, and standard deviations are given in tables 2 – 10. Wet and dry season statistics were calculated for 2008 wet and dry seasons from monthly data.

Appendix IV-A – Global Statistics

Table 2. Global statistics by station over period of record.

T1W01	Measurement	Min	Max	Mean	Variance	Std
	Elevation NAVD88_ft	7.126	11.291	9.206	0.477	0.691
	Depth NAVD88_ft	0.976	5.141	3.061	0.477	0.691
	Temperature_°C	21	24.83	22.665	1.739	1.319
	EC_S/m	0.045	0.085	0.067	0	0.01
T3W01						
	Elevation NAVD88_ft	0.302	4.44	2.374	0.604	0.777
	Depth NAVD88_ft	2.291	6.429	4.357	0.604	0.777
	Temperature_°C	20.48	25.85	22.924	3.221	1.795
	EC_S/m	0.027	0.074	0.049	0	0.009
T7W01						
	Elevation NAVD88_ft	-1.831	1.481	-0.706	0.244	0.494
	Depth NAVD88_ft	1.2	4.512	3.387	0.244	0.494
	Temperature_°C	21.84	24.91	23.212	1.016	1.008
	EC_S/m	0.107	0.232	0.159	0.001	0.031
T7W02						
	Elevation NAVD88_ft	-1.831	1.481	-0.706	0.244	0.494
	Depth NAVD88_ft	1.2	4.512	3.387	0.244	0.494
	Temperature_°C	21.84	24.91	23.212	1.016	1.008
	EC_S/m	0.094	0.306	0.152	0.004	0.061
T7W03						
	Elevation NAVD88_ft	-0.827	1.377	-0.189	0.072	0.267
	Depth NAVD88_ft	1.954	4.158	3.52	0.072	0.267
	Temperature_°C	20.82	25.5	23.011	2.022	1.422
	EC_S/m	0.048	0.074	0.06	0	0.007
T7W04						
	Elevation NAVD88_ft	2.732	6.963	4.068	0.49	0.7
	Depth NAVD88_ft	4.171	8.402	7.066	0.49	0.7
	Temperature_°C	22.76	25.26	23.936	0.711	0.843
	EC_S/m	0.005	0.011	0.007	0	0.002
T8W01						
	Elevation NAVD88_ft	-1.932	2.214	-0.366	0.397	0.63
	Depth NAVD88_ft	-0.313	3.833	2.267	0.397	0.63
	Temperature_°C	20.91	24.98	22.788	1.175	1.084
	EC_S/m	0.117	0.437	0.218	0.005	0.07

Table 3. (continued) Global statistics by station over period of record.

T8W02						
	Elevation NAVD88_ft	-0.319	2.438	0.226	0.051	0.226
	Depth NAVD88_ft	0.239	2.996	2.451	0.051	0.226
	Temperature_°C	21.45	24.38	23.132	0.644	0.803
	EC_S/m	0.062	0.07	0.066	0	0.002
T8W03						
	Elevation NAVD88_ft	0.785	4.97	2.195	0.493	0.702
	Depth NAVD88_ft	3.997	8.182	6.772	0.493	0.702
	Temperature_°C	21.62	26.02	23.484	2.115	1.454
	EC_S/m	0.015	0.032	0.025	0	0.003
T9W01						
	Elevation NAVD88_ft	-1.956	1.667	-0.777	0.284	0.533
	Depth NAVD88_ft	1.167	4.79	3.611	0.284	0.533
	Temperature_°C	21.06	25.73	23.269	2.098	1.449
	EC_S/m	0.355	1.45	0.761	0.076	0.275
T9W02						
	Elevation NAVD88_ft	-1.254	2.634	0.1	0.298	0.545
	Depth NAVD88_ft	0.88	4.768	3.414	0.298	0.545
	Temperature_°C	20.06	27.09	23.825	3.386	1.84
	EC_S/m	1.341	2.542	2.017	0.07	0.264
T9W03						
	Elevation NAVD88_ft	-1.064	2.749	-0.088	0.54	0.735
	Depth NAVD88_ft	8.385	12.198	11.222	0.54	0.735
	Temperature_°C	23.67	25.36	24.421	0.297	0.545
	EC_S/m	0.011	0.037	0.025	0	0.004

Appendix IV-B – Yearly Statistics

Table 4. Water table elevation 2008 statistics (ft, NAVD88).

T1W01	Year	Min	Max	Mean	Variance	Std
	2008	7.126	11.291	9.174	0.465	0.682
T3W01						
	2008	0.302	4.44	2.341	0.588	0.767
T7W01						
	2008	-1.831	1.481	-0.703	0.251	0.501
T7W02						
	2008	-1.342	1.826	-0.288	0.158	0.397
T7W03						
	2008	-0.827	1.377	-0.195	0.072	0.269
T7W04						
	2008	2.732	6.963	4.068	0.506	0.712
T8W01						
	2008	-1.932	2.214	-0.364	0.418	0.647
T8W02						
	2008	-0.319	2.438	0.229	0.055	0.235
T8W03						
	2008	0.785	4.97	2.175	0.498	0.706
T9W01						
	2008	-1.956	1.667	-0.781	0.29	0.539
T9W02						
	2008	-1.254	2.634	0.104	0.304	0.552
T9W03						
	2008	-1.064	2.749	-0.081	0.567	0.753

Table 5. Water table depth 2008 statistics (ft below benchmark).

T1W01	Year	Min	Max	Mean	Variance	Std
	2008	0.976	5.141	3.093	0.465	0.682
T3W01						
	2008	2.291	6.429	4.39	0.588	0.767
T7W01						
	2008	1.2	4.512	3.384	0.251	0.501
T7W02						
	2008	1.085	4.253	3.199	0.158	0.397
T7W03						
	2008	1.954	4.158	3.526	0.072	0.269
T7W04						
	2008	4.171	8.402	7.066	0.506	0.712
T8W01						
	2008	-0.313	3.833	2.265	0.418	0.647

Table 6. (continued) Water table depth 2008 statistics (ft below benchmark).

T8W02						
	2008	0.239	2.996	2.448	0.055	0.235
T8W03						
	2008	3.997	8.182	6.792	0.498	0.706
T9W01						
	2008	1.167	4.79	3.615	0.29	0.539
T9W02						
	2008	0.88	4.768	3.41	0.304	0.552
T9W03						
	2008	8.385	12.198	11.215	0.567	0.753

Table 7. Groundwater temperature 2008 statistics (degrees Celsius).

T1W01	Year	Min	Max	Mean	Variance	Std
	2008	21	24.83	22.693	1.817	1.348
T3W01						
	2008	20.48	25.85	22.979	3.343	1.828
T7W01						
	2008	21.84	24.91	23.223	1.065	1.032
T7W02						
	2008	21.39	25.54	23.207	1.683	1.297
T7W03						
	2008	20.82	25.5	23.067	2.088	1.445
T7W04						
	2008	22.76	25.26	23.942	0.757	0.87
T8W01						
	2008	20.91	24.98	22.809	1.252	1.119
T8W02						
	2008	21.45	24.38	23.152	0.699	0.836
T8W03						
	2008	21.62	26.02	23.535	2.261	1.504
T9W01						
	2008	21.06	25.73	23.294	2.213	1.488
T9W02						
	2008	20.06	27.09	23.9	3.465	1.861
T9W03						
	2008	23.67	25.36	24.412	0.31	0.556

Table 7. Groundwater EC 2008 statistics (S/m).

T1W01	Year	Min	Max	Mean	Variance	Std
	2008	21	24.83	22.693	1.817	1.348
T3W01						
	2008	20.48	25.85	22.979	3.343	1.828

Table 7. (continued) Groundwater EC 2008 statistics (S/m).

T7W01						
	2008	21.84	24.91	23.223	1.065	1.032
T7W02						
	2008	21.39	25.54	23.207	1.683	1.297
T7W03						
	2008	20.82	25.5	23.067	2.088	1.445
T7W04						
	2008	22.76	25.26	23.942	0.757	0.87
T8W01						
	2008	20.91	24.98	22.809	1.252	1.119
T8W02						
	2008	21.45	24.38	23.152	0.699	0.836
T8W03						
	2008	21.62	26.02	23.535	2.261	1.504
T9W01						
	2008	21.06	25.73	23.294	2.213	1.488
T9W02						
	2008	20.06	27.09	23.9	3.465	1.861
T9W03						
	2008	23.67	25.36	24.412	0.31	0.556

Appendix IV-C – Wet/Dry Season Statistics

Table 8. Water table elevation (ft, NAVD88) wet/dry season statistics.

T1W01

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	8.846683	10.04933	9.465188	0.14489	0.325231
Wet 2008	May 2008 - October 2008	8.515667	10.38183	9.225667	0.259167	0.466167
Dry 2008-2009	November 2008 - January 2009	8.348667	9.257333	8.757667	0.102667	0.273

T3W01

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	1.856105	3.329712	2.573129	0.216613	0.410648
Wet 2008	May 2008 - October 2008	1.566667	3.7945	2.436833	0.3295	0.536
Dry 2008-2009	November 2008 - January 2009	1.553333	2.576667	1.906333	0.125	0.262333

T7W01

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	-1.48948	0.121298	-0.81409	0.127401	0.341185
Wet 2008	May 2008 - October 2008	-1.37517	0.563	-0.565	0.151667	0.3815
Dry 2008-2009	November 2008 - January 2009	-1.426	-0.015	-0.78467	0.083667	0.282333

T7W02

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	-0.79161	0.653204	-0.28342	0.080667	0.268556
Wet 2008	May 2008 - October 2008	-0.6815	1.089333	-0.139	0.119667	0.325
Dry 2008-2009	November 2008 - January 2009	-1.07833	0.176667	-0.64233	0.060333	0.244333

T7W03

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	-0.36948	0.666514	-0.11191	0.038935	0.179184
Wet 2008	May 2008 - October 2008	-0.55383	0.8455	-0.1995	0.067167	0.241167
Dry 2008-2009	November 2008 - January 2009	-0.391	0.440667	-0.186	0.024667	0.148333

T7W04

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	3.760233	4.320033	3.990067	0.031858	0.154092
Wet 2008	May 2008 - October 2008	3.856333	5.534333	4.399	0.303833	0.462333
Dry 2008-2009	November 2008 - January 2009	3.268667	3.758	3.503	0.026667	0.140667

T8W01

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	-1.39007	0.70843	-0.53043	0.200449	0.43304
Wet 2008	May 2008 - October 2008	-1.2635	1.362667	-0.17717	0.2655	0.506333
Dry 2008-2009	November 2008 - January 2009	-1.119	0.884333	-0.279	0.144667	0.375

Table 7 (continued). Water table elevation (ft, NAVD88) wet/dry season statistics.

T8W02						
Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.029	0.71107	0.179124	0.022344	0.11971
Wet 2008	May 2008 - October 2008	0.10775	1.69325	0.3235	0.076	0.2515
Dry 2008-2009	November 2008 - January 2009	2.143	2.604667	2.526667	0.006667	0.064667

T8W03						
Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	1.765683	3.068524	2.208739	0.13	0.329524
Wet 2008	May 2008 - October 2008	1.724167	4.036167	2.502333	0.4425	0.592
Dry 2008-2009	November 2008 - January 2009	1.243333	2.032667	1.531	0.073	0.199333

T9W01						
Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	-1.51081	0.139352	-0.91198	0.108549	0.315889
Wet 2008	May 2008 - October 2008	-1.125	0.716833	-0.53083	0.116167	0.332

T9W02						
Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	-0.77185	1.052978	-0.05696	0.120669	0.337263
Wet 2008	May 2008 - October 2008	-0.49583	1.6275	0.3085	0.136833	0.365
Dry 2008-2009	November 2008 - January 2009	-0.70633	0.710667	-0.065	0.070667	0.261333

T9W03						
Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	-0.60035	-0.05381	-0.36501	0.041508	0.158062
Wet 2008	May 2008 - October 2008	-0.28333	1.235333	0.255333	0.321167	0.447833
Dry 2008-2009	November 2008 - January 2009	-0.39567	0.038	-0.19367	0.019333	0.114

Table 9. Water table depth below benchmark (ft) wet/dry season statistics.

T1W1						
Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	2.1035	3.49	2.7595	0.157167	0.364333
Wet 2008	May 2008 - October 2008	1.978	3.506833	2.9335	0.1835	0.363333
Dry 2008-2009	November 2008 - January 2009	3.009667	3.918333	3.509333	0.102667	0.273

T3W1						
Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	3.275167	5.018333	4.095333	0.235167	0.459
Wet 2008	May 2008 - October 2008	3.238	4.990667	4.253333	0.266	0.442667
Dry 2008-2009	November 2008 - January 2009	4.154333	5.177667	4.824667	0.125	0.262333

T7W1						
Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	2.444833	4.208	3.4745	0.135833	0.356
Wet 2008	May 2008 - October 2008	2.188667	4.011667	3.250667	0.149667	0.378333
Dry 2008-2009	November 2008 - January 2009	2.696	4.107	3.465667	0.083667	0.282333

Table 10. (continued) Water table depth below benchmark (ft) wet/dry season statistics.

T7W2

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	2.1225	3.7445	3.181333	0.0875	0.286667
Wet 2008	May 2008 - October 2008	1.899667	3.567167	3.051333	0.118333	0.322167
Dry 2008-2009	November 2008 - January 2009	2.734333	3.989333	3.553333	0.060333	0.244333

T7W3

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	2.5785	3.737833	3.448833	0.043167	0.195667
Wet 2008	May 2008 - October 2008	2.580667	3.864667	3.536167	0.064833	0.232833
Dry 2008-2009	November 2008 - January 2009	2.890333	3.722	3.517	0.024667	0.148333

T7W4

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	6.773167	7.418667	7.144833	0.035	0.173167
Wet 2008	May 2008 - October 2008	5.685833	7.025	6.594667	0.2165	0.346333
Dry 2008-2009	November 2008 - January 2009	7.376	7.865333	7.631	0.026667	0.140667

T8W1

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	1.072833	3.3405	2.429667	0.207667	0.4445
Wet 2008	May 2008 - October 2008	0.609	3.088333	2.077	0.266667	0.507667
Dry 2008-2009	November 2008 - January 2009	1.016667	3.02	2.18	0.144667	0.375

T8W2

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	1.866833	2.648833	2.497333	0.0225	0.126833
Wet 2008	May 2008 - October 2008	0.98375	2.56925	2.3535	0.076	0.2515
Dry 2008-2009	November 2008 - January 2009	2.143	2.604667	2.526667	0.006667	0.064667

T8W3

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	5.767667	7.2855	6.757167	0.157667	0.388833
Wet 2008	May 2008 - October 2008	5.223	6.913833	6.290667	0.229167	0.411667
Dry 2008-2009	November 2008 - January 2009	6.934333	7.723667	7.436	0.073	0.199333

T9W1

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	2.521667	4.422333	3.7195	0.1315	0.358333
Wet 2008	May 2008 - October 2008	2.221667	3.923167	3.370167	0.113333	0.325167

T9W2

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	2.298	4.335167	3.543667	0.136667	0.364167
Wet 2008	May 2008 - October 2008	2.020667	3.982	3.2205	0.133833	0.359667
Dry 2008-2009	November 2008 - January 2009	2.803333	4.220333	3.579	0.070667	0.261333

T9W3

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	11.1545	11.754	11.4915	0.044333	0.177333
Wet 2008	May 2008 - October 2008	10.02517	11.21567	10.76717	0.249667	0.344833
Dry 2008-2009	November 2008 - January 2009	11.096	11.52967	11.32767	0.019333	0.114

Table 11. Groundwater temperature (°C) wet/dry season statistics.

T1W1						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	21.56	22.419	21.92467	0.096167	0.253833
Wet 2008	May 2008 - October 2008	23.37833	24.11667	23.80567	0.057833	0.2075
Dry 2008-2009	November 2008 - January 2009	21.27	22.15333	21.73167	0.12	0.242333

T3W1						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	21.38533	22.58533	21.87567	0.186333	0.343667
Wet 2008	May 2008 - October 2008	23.98167	24.98333	24.57283	0.092167	0.2625
Dry 2008-2009	November 2008 - January 2009	20.70333	21.82667	21.31267	0.18	0.302667

T7W1						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	22.44333	23.01783	22.71083	0.033333	0.155167
Wet 2008	May 2008 - October 2008	23.605	24.17167	23.9235	0.024	0.148167
Dry 2008-2009	November 2008 - January 2009	22.42333	23.33	22.86567	0.081	0.232333

T7W2						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	22.02933	22.87617	22.418	0.072333	0.209667
Wet 2008	May 2008 - October 2008	23.70833	24.64167	24.27367	0.0655	0.230833
Dry 2008-2009	November 2008 - January 2009	21.61667	22.69667	22.18633	0.135	0.282667

T7W3						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	21.87967	22.78933	22.2425	0.080167	0.236167
Wet 2008	May 2008 - October 2008	23.88333	24.91	24.4905	0.095333	0.260333
Dry 2008-2009	November 2008 - January 2009	20.97	22.01667	21.59933	0.168667	0.299

T7W4						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	23.27	23.66783	23.4625	0.019333	0.114
Wet 2008	May 2008 - October 2008	24.12667	24.475	24.30033	0.011833	0.096333
Dry 2008-2009	November 2008 - January 2009	23.65333	24.22667	23.92667	0.037	0.162

T8W1						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	21.625	22.66117	22.1785	0.059167	0.218333
Wet 2008	May 2008 - October 2008	23.09167	24.195	23.70417	0.054	0.223167
Dry 2008-2009	November 2008 - January 2009	21.27	22.67667	22.07533	0.142667	0.332667

Table 12. (Continued) Groundwater temperature (°C) wet/dry season statistics.

T8W2						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	22.38367	22.98367	22.71283	0.029	0.1325
Wet 2008	May 2008 - October 2008	23.7325	24.1725	24.0365	0.0115	0.101
Dry 2008-2009	November 2008 - January 2009	22.39667	23.05667	22.735	0.061667	0.184667

T8W3						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	22.13267	22.892	22.52333	0.074167	0.212333
Wet 2008	May 2008 - October 2008	24.355	25.16167	24.76533	0.0785	0.240167
Dry 2008-2009	November 2008 - January 2009	22.4	23.30667	22.79133	0.075333	0.224333

T9W1						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	21.802	22.91783	22.35617	0.112833	0.272833
Wet 2008	May 2008 - October 2008	24.06667	24.905	24.5395	0.060833	0.203667

T9W2						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	21.64383	23.38117	22.63	0.2225	0.402833
Wet 2008	May 2008 - October 2008	24.79833	26.425	25.571	0.1455	0.358333
Dry 2008-2009	November 2008 - January 2009	20.58333	22.86667	22.082	0.264667	0.420667

T9W3						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	24.13333	24.41967	24.279	0.009	0.080667
Wet 2008	May 2008 - October 2008	24.44667	24.77333	24.608	0.012667	0.091667
Dry 2008-2009	November 2008 - January 2009	24.35333	24.77	24.554	0.020333	0.119333

Table 13. Groundwater EC (S/m) wet/dry season statistics.

T1W1						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	0.05683333	0.074833	0.066833	0	0.004167
Wet 2008	May 2008 - October 2008	0.05833333	0.074333	0.069333	0	0.0045
Dry 2008-2009	November 2008 - January 2009	0.05366667	0.074667	0.065	0	0.007667

T3W1						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	0.054	0.069833	0.062167	0	0.004
Wet 2008	May 2008 - October 2008	0.035	0.048667	0.0425	0	0.003167
Dry 2008-2009	November 2008 - January 2009	0.04066667	0.051	0.045667	0	0.003

T7W1						
Season	**Period**	**Min**	**Max**	**Mean**	**Variance**	**Std**
Dry 2007-2008	November 2007 - April 2008	0.14866667	0.1755	0.159833	0	0.006833
Wet 2008	May 2008 - October 2008	0.12833333	0.195333	0.160833	0.000167	0.016

| Dry 2008-2009 | November 2008 - January 2009 | 0.12333333 | 0.165333 | 0.140333 | 0.000333 | 0.014 |

Table 14. (continued) Groundwater EC (S/m) wet/dry season statistics.

T7W2

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.19833333	0.2555	0.226167	0.0005	0.017833
Wet 2008	May 2008 - October 2008	0.1072	0.1168	0.1102	0	0.0026
Dry 2008-2009	November 2008 - January 2009	0.097	0.103	0.100333	0	0.001667

T7W3

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.06566667	0.073167	0.068833	0	0.002167
Wet 2008	May 2008 - October 2008	0.05516667	0.065167	0.058833	0	0.002
Dry 2008-2009	November 2008 - January 2009	0.04866667	0.050333	0.049333	0	0.000333

T7W4

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.0085	0.009667	0.009167	0	0.000167
Wet 2008	May 2008 - October 2008	0.00533333	0.006333	0.0055	0	0
Dry 2008-2009	November 2008 - January 2009	0.006	0.006667	0.006	0	0

T8W1

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.20583333	0.344667	0.266	0.001	0.032667
Wet 2008	May 2008 - October 2008	0.162	0.285833	0.210833	0.0015	0.033
Dry 2008-2009	November 2008 - January 2009	0.152	0.178	0.163667	0	0.005667

T8W2

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.06333333	0.0655	0.064333	0	0.000333
Wet 2008	May 2008 - October 2008	0.06675	0.06875	0.06725	0	0.00025
Dry 2008-2009	November 2008 - January 2009	0.065	0.067	0.066	0	0.000667

T8W3

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.02066667	0.0285	0.025	0	0.001667
Wet 2008	May 2008 - October 2008	0.01783333	0.028333	0.024167	0	0.002833
Dry 2008-2009	November 2008 - January 2009	0.025	0.028333	0.026667	0	0.001

T9W1

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.49166667	0.706833	0.576333	0.0035	0.049333
Wet 2008	May 2008 - October 2008	0.84966667	1.269667	0.980333	0.016667	0.094667

T9W2

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	1.98566667	2.440167	2.214	0.0125	0.105667
Wet 2008	May 2008 - October 2008	1.682	2.299167	2.008833	0.030667	0.165333
Dry 2008-2009	November 2008 - January 2009	1.46033333	1.763	1.618667	0.006667	0.072667

T9W3

Season	Period	Min	Max	Mean	Variance	Std
Dry 2007-2008	November 2007 - April 2008	0.02566667	0.032333	0.028833	0	0.001833
Wet 2008	May 2008 - October 2008	0.01816667	0.0285	0.023667	0	0.0025

Appendix IV-D – Monthly Statistics

Table 11. Monthly water table elevation (ft, NAVD88) statistics.

T1W01	Month	Min	Max	Mean	Variance	Std
	12(2007)	9.261	10.501	10.011	0.078	0.279
	1(2008)	8.736	9.701	9.25	0.047	0.217
	2(2008)	8.358	9.726	9.073	0.222	0.471
	3(2008)	8.856	10.153	9.534	0.095	0.308
	4(2008)	8.048	10.323	9.204	0.44	0.664
	5(2008)	7.126	9.291	8.018	0.458	0.677
	6(2008)	7.889	10.146	8.927	0.363	0.603
	7(2008)	8.786	10.577	9.485	0.207	0.455
	8(2008)	8.487	11.291	9.433	0.446	0.668
	9(2008)	9.238	10.714	9.738	0.057	0.239
	10(2008)	9.568	10.272	9.753	0.024	0.155
	11(2008)	8.453	9.953	9.231	0.237	0.486
	12(2008)	8.15	9.097	8.448	0.064	0.252
	1(2009)	8.443	8.722	8.594	0.007	0.081
T3W01						
	12(2007)	1.905	3.717	3.238	0.122	0.349
	1(2008)	1.613	2.947	2.162	0.102	0.32
	2(2008)	1.437	3.277	2.16	0.27	0.52
	3(2008)	1.709	3.377	2.648	0.205	0.453
	4(2008)	1.18	3.508	2.343	0.596	0.772
	5(2008)	0.302	3.316	1.183	0.385	0.621
	6(2008)	0.91	3.421	1.897	0.465	0.682
	7(2008)	1.489	3.962	2.572	0.439	0.663
	8(2008)	1.803	4.44	2.754	0.538	0.734
	9(2008)	2.021	4.026	3.095	0.123	0.351
	10(2008)	2.875	3.602	3.12	0.027	0.165
	11(2008)	1.656	3.306	2.455	0.346	0.588
	12(2008)	1.5	2.801	1.703	0.028	0.168
	1(2009)	1.504	1.623	1.561	0.001	0.031
T7W01						
	12(2007)	-1.455	0.334	-0.695	0.127	0.357
	1(2008)	-1.459	0.274	-0.756	0.099	0.314
	2(2008)	-1.772	-0.39	-1.115	0.075	0.274
	3(2008)	-1.831	-0.396	-1.154	0.078	0.279
	4(2008)	-1.298	0.409	-0.646	0.128	0.357
	5(2008)	-1.591	0.146	-0.809	0.106	0.325
	6(2008)	-1.772	-0.321	-1.038	0.078	0.279
	7(2008)	-1.719	0.091	-0.843	0.11	0.332
	8(2008)	-1.247	1.142	-0.51	0.179	0.424
	9(2008)	-0.976	1.481	-0.033	0.262	0.511
	10(2008)	-0.946	0.839	-0.157	0.175	0.418
	11(2008)	-1.18	0.669	-0.355	0.131	0.362

	12(2008)	-1.686	-0.208	-1.024	0.077	0.277
	1(2009)	-1.412	-0.506	-0.975	0.043	0.208

Table 11. (continued) Monthly water table elevation (ft, NAVD88) statistics.

T7W02						
	12(2007)	-0.706	0.963	-0.156	0.078	0.279
	1(2008)	-0.646	0.877	-0.189	0.045	0.212
	2(2008)	-1.051	0.135	-0.559	0.05	0.223
	3(2008)	-1.204	0.088	-0.698	0.076	0.276
	4(2008)	-1.025	0.92	-0.132	0.088	0.296
	5(2008)	-0.616	0.777	-0.202	0.048	0.218
	6(2008)	-0.882	0.31	-0.358	0.035	0.187
	7(2008)	-1.015	0.796	-0.236	0.073	0.27
	8(2008)	-0.418	1.732	0.006	0.116	0.341
	9(2008)	-0.604	1.826	0.065	0.289	0.538
	10(2008)	-0.554	1.095	-0.109	0.157	0.396
	11(2008)	-0.595	0.924	-0.263	0.074	0.272
	12(2008)	-1.342	0.013	-0.781	0.065	0.256
	1(2009)	-1.298	-0.407	-0.883	0.042	0.205
T7W03						
	12(2007)	-0.267	0.945	-0.016	0.033	0.182
	1(2008)	-0.247	0.882	-0.033	0.016	0.125
	2(2008)	-0.55	0.113	-0.306	0.017	0.132
	3(2008)	-0.708	0.112	-0.43	0.034	0.184
	4(2008)	-0.575	0.838	-0.095	0.048	0.218
	5(2008)	-0.554	0.68	-0.24	0.027	0.165
	6(2008)	-0.683	0.122	-0.408	0.016	0.127
	7(2008)	-0.827	0.497	-0.347	0.026	0.162
	8(2008)	-0.551	1.377	-0.205	0.073	0.271
	9(2008)	-0.425	1.165	-0.104	0.126	0.355
	10(2008)	-0.283	1.232	0.107	0.135	0.367
	11(2008)	-0.097	1.181	0.08	0.044	0.209
	12(2008)	-0.536	0.344	-0.235	0.024	0.156
	1(2009)	-0.54	-0.203	-0.403	0.006	0.08
T7W04						
	12(2007)	4.016	4.601	4.314	0.02	0.14
	1(2008)	3.699	4.187	3.894	0.014	0.118
	2(2008)	3.543	4.055	3.774	0.033	0.181
	3(2008)	3.518	3.892	3.677	0.01	0.099
	4(2008)	3.165	3.827	3.482	0.036	0.19
	5(2008)	2.732	4.834	3.439	0.525	0.724
	6(2008)	4.037	4.253	4.14	0.004	0.063
	7(2008)	3.917	5.289	4.34	0.121	0.348
	8(2008)	3.61	6.963	4.703	0.918	0.958
	9(2008)	4.549	6.684	5.094	0.2	0.447
	10(2008)	4.293	5.183	4.678	0.055	0.234
	11(2008)	3.701	4.458	4.074	0.049	0.222
	12(2008)	3.099	3.711	3.38	0.03	0.173
	1(2009)	3.006	3.105	3.055	0.001	0.027

Table 11. (continued) Monthly water table elevation (ft, NAVD88) statistics.

T8W01						
	12(2007)	-1.158	1.053	-0.368	0.169	0.411
	1(2008)	-1.504	0.805	-0.565	0.153	0.391
	2(2008)	-1.797	0.136	-0.955	0.136	0.369
	3(2008)	-1.932	0.109	-1.023	0.143	0.378
	4(2008)	-1.276	0.923	-0.423	0.211	0.459
	5(2008)	-1.62	0.856	-0.492	0.183	0.428
	6(2008)	-1.77	0.444	-0.712	0.154	0.392
	7(2008)	-1.635	0.852	-0.51	0.185	0.431
	8(2008)	-1.087	2.214	-0.07	0.372	0.61
	9(2008)	-1.016	2.085	0.286	0.415	0.644
	10(2008)	-0.453	1.725	0.435	0.284	0.533
	11(2008)	-0.782	1.561	0.17	0.204	0.452
	12(2008)	-1.436	0.719	-0.527	0.142	0.377
	1(2009)	-1.139	0.373	-0.48	0.088	0.296
T8W02						
	12(2007)	0.207	0.957	0.234	0.006	0.08
	1(2008)	0.208	0.878	0.226	0.003	0.055
	2(2008)	0.051	0.23	0.165	0.002	0.041
	3(2008)	-0.319	0.208	-0.005	0.02	0.143
	4(2008)	-0.182	0.901	0.123	0.028	0.166
	7(2008)	-0.013	0.808	0.172	0.005	0.073
	8(2008)	0.058	2.438	0.29	0.082	0.287
	9(2008)	0.181	2.12	0.459	0.151	0.389
	10(2008)	0.205	1.407	0.373	0.066	0.257
	11(2008)	0.223	1.223	0.285	0.017	0.13
	12(2008)	0.004	0.348	0.155	0.003	0.053
	1(2009)	-0.01	0.031	0.011	0	0.011
T8W03						
	12(2007)	2.003	3.474	2.6	0.178	0.422
	1(2008)	1.737	2.635	2.116	0.046	0.215
	2(2008)	1.493	2.952	1.948	0.15	0.388
	3(2008)	1.531	2.999	2.121	0.165	0.406
	4(2008)	1.149	2.797	1.682	0.192	0.438
	5(2008)	0.785	4.67	1.791	1.283	1.133
	6(2008)	2.12	3.445	2.775	0.136	0.368
	7(2008)	1.961	3.155	2.519	0.08	0.283
	8(2008)	1.752	4.97	2.995	0.705	0.839
	9(2008)	1.844	4.613	2.578	0.317	0.563
	10(2008)	1.883	3.364	2.356	0.134	0.366
	11(2008)	1.434	3.179	2.005	0.206	0.454
	12(2008)	1.166	1.639	1.385	0.012	0.109
	1(2009)	1.13	1.28	1.203	0.001	0.035

Table 11. (continued) Monthly water table elevation (ft, NAVD88) statistics.

T9W01					
	12(2007)	-1.557	0.506	-0.715	0.17	0.412
	1(2008)	-1.436	0.444	-0.723	0.08	0.282
	2(2008)	-1.826	-0.366	-1.372	0.098	0.313
	3(2008)	-1.956	-0.493	-1.503	0.11	0.332
	4(2008)	-1.657	0.516	-0.614	0.138	0.371
	5(2008)	-1.167	0.42	-0.66	0.055	0.235
	6(2008)	-1.61	-0.194	-0.995	0.087	0.295
	7(2008)	-1.707	0.411	-0.756	0.148	0.385
	8(2008)	-0.953	1.198	-0.441	0.095	0.309
	9(2008)	-0.743	1.667	-0.073	0.227	0.477
	10(2008)	-0.57	0.799	-0.26	0.085	0.291
T9W02					
	12(2007)	-0.685	1.396	0.142	0.154	0.392
	1(2008)	-0.77	1.336	0.041	0.105	0.324
	2(2008)	-1.07	0.666	-0.464	0.085	0.292
	3(2008)	-1.254	0.348	-0.545	0.094	0.306
	4(2008)	-0.813	1.368	0.143	0.158	0.397
	5(2008)	-0.639	1.288	0.061	0.096	0.31
	6(2008)	-1.048	0.522	-0.227	0.087	0.295
	7(2008)	-0.992	1.281	0.055	0.124	0.352
	8(2008)	-0.429	2.117	0.39	0.151	0.388
	9(2008)	0.034	2.634	0.853	0.231	0.481
	10(2008)	0.099	1.923	0.719	0.132	0.364
	11(2008)	-0.16	1.73	0.52	0.086	0.293
	12(2008)	-1.097	0.469	-0.309	0.089	0.298
	1(2009)	-0.862	-0.067	-0.406	0.037	0.193
T9W03					
	12(2007)	-0.274	0.084	-0.091	0.017	0.129
	1(2008)	-0.461	-0.021	-0.27	0.016	0.125
	2(2008)	-0.914	-0.438	-0.739	0.014	0.118
	3(2008)	-1.064	-0.802	-0.961	0.005	0.073
	4(2008)	-1.043	-0.39	-0.64	0.042	0.204
	5(2008)	-0.992	1.079	-0.399	0.431	0.657
	6(2008)	-0.715	0.235	-0.414	0.058	0.242
	7(2008)	-0.735	0.491	-0.168	0.088	0.296
	8(2008)	-0.654	2.749	0.616	1.264	1.124
	9(2008)	0.831	1.914	1.152	0.079	0.282
	10(2008)	0.565	0.944	0.745	0.007	0.086
	11(2008)	0.159	0.595	0.394	0.014	0.12
	12(2008)	-0.657	0.166	-0.307	0.044	0.21
	1(2009)	-0.689	-0.647	-0.668	0	0.012

Table 12. Monthly water table depth (ft below benchmark) statistics.

T1W01	Month	Min	Max	Mean	Variance	Std
	12(2007)	1.766	3.006	2.256	0.078	0.279
	1(2008)	2.566	3.531	3.017	0.047	0.217
	2(2008)	2.541	3.909	3.194	0.222	0.471
	3(2008)	2.114	3.411	2.733	0.095	0.308
	4(2008)	1.944	4.219	3.063	0.44	0.664
	5(2008)	2.976	5.141	4.249	0.458	0.677
	6(2008)	2.121	4.378	3.34	0.363	0.603
	7(2008)	1.69	3.481	2.782	0.207	0.455
	8(2008)	0.976	3.78	2.834	0.446	0.668
	9(2008)	1.553	3.029	2.529	0.057	0.239
	10(2008)	1.995	2.699	2.514	0.024	0.155
	11(2008)	2.314	3.814	3.036	0.237	0.486
	12(2008)	3.17	4.117	3.819	0.064	0.252
	1(2009)	3.545	3.824	3.673	0.007	0.081
T3W01						
	12(2007)	3.014	4.826	3.493	0.122	0.349
	1(2008)	3.784	5.118	4.569	0.102	0.32
	2(2008)	3.454	5.294	4.571	0.27	0.52
	3(2008)	3.354	5.022	4.083	0.205	0.453
	4(2008)	3.223	5.551	4.388	0.596	0.772
	5(2008)	3.415	6.429	5.548	0.385	0.621
	6(2008)	3.31	5.821	4.834	0.465	0.682
	7(2008)	2.769	5.242	4.159	0.439	0.663
	8(2008)	2.291	4.928	3.977	0.538	0.734
	9(2008)	2.705	4.71	3.636	0.123	0.351
	10(2008)	3.129	3.856	3.611	0.027	0.165
	11(2008)	3.425	5.075	4.276	0.346	0.588
	12(2008)	3.93	5.231	5.028	0.028	0.168
	1(2009)	5.108	5.227	5.17	0.001	0.031
T7W01						
	12(2007)	2.347	4.136	3.376	0.127	0.357
	1(2008)	2.407	4.14	3.437	0.099	0.314
	2(2008)	3.071	4.453	3.796	0.075	0.274
	3(2008)	3.077	4.512	3.835	0.078	0.279
	4(2008)	2.272	3.979	3.327	0.128	0.357
	5(2008)	2.535	4.272	3.49	0.106	0.325
	6(2008)	3.002	4.453	3.719	0.078	0.279
	7(2008)	2.59	4.4	3.524	0.11	0.332
	8(2008)	1.539	3.928	3.191	0.179	0.424
	9(2008)	1.2	3.657	2.714	0.262	0.511
	10(2008)	1.842	3.627	2.838	0.175	0.418
	11(2008)	2.012	3.861	3.036	0.131	0.362
	12(2008)	2.889	4.367	3.705	0.077	0.277

| | 1(2009) | 3.187 | 4.093 | 3.656 | 0.043 | 0.208 |

Table 12. (continued) Monthly water table depth (ft below benchmark) statistics.

T7W02						
	12(2007)	1.948	3.617	3.067	0.078	0.279
	1(2008)	2.034	3.557	3.1	0.045	0.212
	2(2008)	2.776	3.962	3.47	0.05	0.223
	3(2008)	2.823	4.115	3.609	0.076	0.276
	4(2008)	1.991	3.936	3.043	0.088	0.296
	5(2008)	2.134	3.527	3.113	0.048	0.218
	6(2008)	2.601	3.793	3.269	0.035	0.187
	7(2008)	2.115	3.926	3.147	0.073	0.27
	8(2008)	1.179	3.329	2.905	0.116	0.341
	9(2008)	1.085	3.515	2.846	0.289	0.538
	10(2008)	1.816	3.465	3.02	0.157	0.396
	11(2008)	1.987	3.506	3.174	0.074	0.272
	12(2008)	2.898	4.253	3.692	0.065	0.256
	1(2009)	3.318	4.209	3.794	0.042	0.205
T7W03						
	12(2007)	2.386	3.598	3.347	0.033	0.182
	1(2008)	2.449	3.578	3.364	0.016	0.125
	2(2008)	3.218	3.881	3.637	0.017	0.132
	3(2008)	3.219	4.039	3.761	0.034	0.184
	4(2008)	2.493	3.906	3.426	0.048	0.218
	5(2008)	2.651	3.885	3.571	0.027	0.165
	6(2008)	3.209	4.014	3.739	0.016	0.127
	7(2008)	2.834	4.158	3.678	0.026	0.162
	8(2008)	1.954	3.882	3.536	0.073	0.271
	9(2008)	2.166	3.756	3.435	0.126	0.355
	10(2008)	2.099	3.614	3.224	0.135	0.367
	11(2008)	2.15	3.428	3.251	0.044	0.209
	12(2008)	2.987	3.867	3.566	0.024	0.156
	1(2009)	3.534	3.871	3.734	0.006	0.08
T7W04						
	12(2007)	6.533	7.118	6.82	0.02	0.14
	1(2008)	6.947	7.435	7.24	0.014	0.118
	2(2008)	7.079	7.591	7.36	0.033	0.181
	3(2008)	7.242	7.616	7.457	0.01	0.099
	4(2008)	7.307	7.969	7.652	0.036	0.19
	5(2008)	6.3	8.402	7.695	0.525	0.724
	6(2008)	6.881	7.097	6.994	0.004	0.063
	7(2008)	5.845	7.217	6.794	0.121	0.348
	8(2008)	4.171	7.524	6.431	0.918	0.958
	9(2008)	4.45	6.585	6.04	0.2	0.447
	10(2008)	5.951	6.841	6.456	0.055	0.234
	11(2008)	6.676	7.433	7.06	0.049	0.222
	12(2008)	7.423	8.035	7.754	0.03	0.173

	1(2009)	8.029	8.128	8.079	0.001	0.027

Table 12. (continued) Monthly water table depth (ft below benchmark) statistics.

T8W01						
	12(2007)	0.848	3.059	2.269	0.169	0.411
	1(2008)	1.096	3.405	2.466	0.153	0.391
	2(2008)	1.765	3.698	2.856	0.136	0.369
	3(2008)	1.792	3.833	2.924	0.143	0.378
	4(2008)	0.978	3.177	2.324	0.211	0.459
	5(2008)	1.045	3.521	2.393	0.183	0.428
	6(2008)	1.457	3.671	2.613	0.154	0.392
	7(2008)	1.049	3.536	2.411	0.185	0.431
	8(2008)	-0.313	2.988	1.971	0.372	0.61
	9(2008)	-0.184	2.917	1.615	0.415	0.644
	10(2008)	0.176	2.354	1.466	0.284	0.533
	11(2008)	0.34	2.683	1.731	0.204	0.452
	12(2008)	1.182	3.337	2.428	0.142	0.377
	1(2009)	1.528	3.04	2.381	0.088	0.296
T8W02						
	12(2007)	1.72	2.47	2.443	0.006	0.08
	1(2008)	1.799	2.469	2.451	0.003	0.055
	2(2008)	2.447	2.626	2.512	0.002	0.041
	3(2008)	2.469	2.996	2.682	0.02	0.143
	4(2008)	1.776	2.859	2.554	0.028	0.166
	7(2008)	1.869	2.69	2.505	0.005	0.073
	8(2008)	0.239	2.619	2.387	0.082	0.287
	9(2008)	0.557	2.496	2.218	0.151	0.389
	10(2008)	1.27	2.472	2.304	0.066	0.257
	11(2008)	1.454	2.454	2.392	0.017	0.13
	12(2008)	2.329	2.673	2.522	0.003	0.053
	1(2009)	2.646	2.687	2.666	0	0.011
T8W03						
	12(2007)	5.493	6.964	6.367	0.178	0.422
	1(2008)	6.332	7.23	6.851	0.046	0.215
	2(2008)	6.015	7.474	7.019	0.15	0.388
	3(2008)	5.968	7.436	6.846	0.165	0.406
	4(2008)	6.17	7.818	7.285	0.192	0.438
	5(2008)	4.297	8.182	7.176	1.283	1.133
	6(2008)	5.522	6.847	6.192	0.136	0.368
	7(2008)	5.812	7.006	6.448	0.08	0.283
	8(2008)	3.997	7.215	5.972	0.705	0.839
	9(2008)	4.354	7.123	6.389	0.317	0.563
	10(2008)	5.603	7.084	6.611	0.134	0.366
	11(2008)	5.788	7.533	6.962	0.206	0.454
	12(2008)	7.328	7.801	7.582	0.012	0.109

Table 12. (continued) Monthly water table depth (ft below benchmark) statistics.

T9W01						
	12(2007)	2.328	4.391	3.549	0.17	0.412
	1(2008)	2.39	4.27	3.557	0.08	0.282
	2(2008)	3.2	4.66	4.206	0.098	0.313
	3(2008)	3.327	4.79	4.337	0.11	0.332
	4(2008)	2.318	4.491	3.448	0.138	0.371
	5(2008)	2.414	4.001	3.494	0.055	0.235
	6(2008)	3.028	4.444	3.829	0.087	0.295
	7(2008)	2.423	4.541	3.59	0.148	0.385
	8(2008)	1.636	3.787	3.275	0.095	0.309
	9(2008)	1.167	3.577	2.907	0.227	0.477
	10(2008)	2.035	3.404	3.094	0.085	0.291
T9W02						
	12(2007)	2.118	4.199	3.372	0.154	0.392
	1(2008)	2.178	4.284	3.473	0.105	0.324
	2(2008)	2.848	4.584	3.978	0.085	0.292
	3(2008)	3.166	4.768	4.059	0.094	0.306
	4(2008)	2.146	4.327	3.371	0.158	0.397
	5(2008)	2.226	4.153	3.453	0.096	0.31
	6(2008)	2.992	4.562	3.741	0.087	0.295
	7(2008)	2.233	4.506	3.459	0.124	0.352
	8(2008)	1.397	3.943	3.124	0.151	0.388
	9(2008)	0.88	3.48	2.661	0.231	0.481
	10(2008)	1.591	3.415	2.795	0.132	0.364
	11(2008)	1.784	3.674	2.994	0.086	0.293
	12(2008)	3.045	4.611	3.823	0.089	0.298
	1(2009)	3.581	4.376	3.92	0.037	0.193
T9W03						
	12(2007)	11.05	11.408	11.225	0.017	0.129
	1(2008)	11.155	11.595	11.404	0.016	0.125
	2(2008)	11.572	12.048	11.873	0.014	0.118
	3(2008)	11.936	12.198	12.095	0.005	0.073
	4(2008)	11.524	12.177	11.774	0.042	0.204
	5(2008)	10.055	12.126	11.533	0.431	0.657
	6(2008)	10.899	11.849	11.548	0.058	0.242
	7(2008)	10.643	11.869	11.302	0.088	0.296
	8(2008)	8.385	11.788	10.519	1.264	1.124
	9(2008)	9.22	10.303	9.982	0.079	0.282
	10(2008)	10.19	10.569	10.389	0.007	0.086
	11(2008)	10.539	10.975	10.74	0.014	0.12
	12(2008)	10.968	11.791	11.441	0.044	0.21
	1(2009)	11.781	11.823	11.802	0	0.012

Table 13. Monthly groundwater temperature (C) statistics.

T1W01	Month	Min	Max	Mean	Variance	Std
	12(2007)	22.22	22.81	22.473	0.04	0.199
	1(2008)	21.04	22.34	21.5	0.097	0.311
	2(2008)	21	21.52	21.264	0.018	0.133
	3(2008)	21.07	21.41	21.255	0.007	0.083
	4(2008)	21.18	21.79	21.454	0.032	0.178
	5(2008)	21.47	22.85	22.121	0.199	0.446
	6(2008)	22.84	23.67	23.344	0.044	0.209
	7(2008)	23.63	24.23	23.952	0.037	0.193
	8(2008)	24.22	24.5	24.382	0.006	0.075
	9(2008)	24.49	24.83	24.707	0.009	0.093
	10(2008)	23.62	24.62	24.328	0.052	0.229
	11(2008)	21.51	23.63	22.671	0.35	0.592
	12(2008)	21.15	21.52	21.295	0.007	0.085
	1(2009)	21.15	21.31	21.229	0.003	0.05
T3W01						
	12(2007)	22.1	22.85	22.377	0.067	0.26
	1(2008)	20.72	22.2	21.262	0.108	0.329
	2(2008)	20.7	21.31	20.972	0.023	0.151
	3(2008)	20.8	21.39	21.124	0.024	0.156
	4(2008)	21.12	22.14	21.712	0.065	0.255
	5(2008)	21.84	23.4	22.639	0.266	0.515
	6(2008)	23.39	24.47	24.022	0.064	0.254
	7(2008)	24.47	25.18	24.904	0.047	0.218
	8(2008)	25.14	25.59	25.257	0.008	0.087
	9(2008)	25.41	25.85	25.724	0.011	0.105
	10(2008)	23.64	25.41	24.891	0.157	0.396
	11(2008)	20.97	23.64	22.477	0.521	0.722
	12(2008)	20.48	20.97	20.696	0.015	0.123
	1(2009)	20.66	20.87	20.765	0.004	0.063
T7W01						
	12(2007)	23.03	23.58	23.252	0.028	0.168
	1(2008)	22.09	23.11	22.504	0.044	0.209
	2(2008)	21.97	22.28	22.141	0.004	0.062
	3(2008)	21.84	22.07	21.951	0.001	0.038
	4(2008)	21.88	22.25	22.085	0.016	0.126
	5(2008)	22.24	22.95	22.548	0.047	0.216
	6(2008)	22.93	23.63	23.304	0.042	0.206
	7(2008)	23.6	24.11	23.841	0.017	0.129
	8(2008)	24.07	24.54	24.343	0.017	0.131
	9(2008)	24.49	24.89	24.708	0.012	0.11

	10(2008)	24.3	24.91	24.797	0.009	0.097
	11(2008)	23	24.55	23.901	0.189	0.435
	12(2008)	22.19	23.2	22.515	0.053	0.229
	1(2009)	22.08	22.24	22.181	0.001	0.033

Table 13. (continued) Monthly groundwater temperature (C) statistics.

T7W02						
	12(2007)	22.36	23.25	22.76	0.054	0.232
	1(2008)	21.39	22.74	21.955	0.063	0.251
	2(2008)	21.75	22.01	21.921	0.002	0.046
	3(2008)	21.71	21.98	21.898	0.003	0.056
	4(2008)	21.81	22.26	22.07	0.017	0.13
	5(2008)	22.18	23.3	22.724	0.129	0.36
	6(2008)	23.22	24.09	23.766	0.058	0.241
	7(2008)	24.06	24.58	24.286	0.016	0.126
	8(2008)	24.4	24.89	24.686	0.006	0.079
	9(2008)	24.67	25.54	25.244	0.039	0.198
	10(2008)	23.72	25.45	24.936	0.145	0.381
	11(2008)	21.93	23.99	23.186	0.373	0.611
	12(2008)	21.45	22.3	21.779	0.026	0.162
	1(2009)	21.47	21.8	21.594	0.006	0.075
T7W03						
	12(2007)	22.17	22.89	22.432	0.055	0.234
	1(2008)	21.14	22.4	21.599	0.055	0.235
	2(2008)	21.36	21.97	21.744	0.018	0.133
	3(2008)	21.74	22.08	21.931	0.007	0.085
	4(2008)	21.94	22.59	22.238	0.027	0.165
	5(2008)	22.4	23.81	23.137	0.207	0.454
	6(2008)	23.65	24.61	24.309	0.054	0.232
	7(2008)	24.48	25.19	24.791	0.025	0.157
	8(2008)	24.85	25.35	25.146	0.008	0.091
	9(2008)	24.92	25.5	25.209	0.012	0.112
	10(2008)	23	25	24.351	0.266	0.516
	11(2008)	21.01	23.28	22.463	0.484	0.696
	12(2008)	20.82	21.44	21.173	0.017	0.132
	1(2009)	21.08	21.33	21.162	0.005	0.069
T7W04						
	12(2007)	23.76	24.22	23.97	0.013	0.112
	1(2008)	23.09	23.77	23.406	0.042	0.204
	2(2008)	22.85	23.1	22.957	0.004	0.066
	3(2008)	22.76	22.8	22.778	0	0.007
	4(2008)	22.76	22.95	22.85	0.004	0.064
	5(2008)	22.94	23.43	23.142	0.022	0.15
	6(2008)	23.42	23.5	23.464	0	0.021
	7(2008)	24.02	24.44	24.254	0.009	0.096
	8(2008)	24.43	24.97	24.695	0.03	0.174
	9(2008)	24.92	25.26	25.065	0.007	0.082

	10(2008)	25.03	25.25	25.182	0.003	0.055
	11(2008)	24.24	25.03	24.65	0.048	0.219
	12(2008)	23.39	24.25	23.763	0.063	0.25
	1(2009)	23.33	23.4	23.367	0	0.017

Table 13. (continued) Monthly groundwater temperature (C) statistics.

T8W01						
	12(2007)	21.97	23.22	22.711	0.058	0.241
	1(2008)	20.91	22.57	21.805	0.103	0.32
	2(2008)	21.16	21.82	21.506	0.02	0.14
	3(2008)	21.34	21.83	21.617	0.009	0.093
	4(2008)	21.47	22.01	21.796	0.017	0.131
	5(2008)	21.91	22.96	22.357	0.082	0.287
	6(2008)	22.7	23.66	23.237	0.053	0.231
	7(2008)	23.35	24.19	23.77	0.028	0.169
	8(2008)	23.8	24.6	24.173	0.016	0.125
	9(2008)	24.01	24.98	24.42	0.043	0.208
	10(2008)	22.78	24.78	24.268	0.102	0.319
	11(2008)	21.46	23.78	22.95	0.334	0.578
	12(2008)	21.19	22.45	21.764	0.068	0.26
	1(2009)	21.16	21.8	21.512	0.026	0.16
T8W02						
	12(2007)	22.52	23.51	23.054	0.053	0.231
	1(2008)	21.45	23.02	22.405	0.065	0.254
	2(2008)	22.26	22.36	22.315	0	0.02
	3(2008)	22.24	22.32	22.263	0	0.012
	4(2008)	22.26	22.42	22.335	0.002	0.047
	7(2008)	23.54	23.84	23.683	0.007	0.085
	8(2008)	23.83	24.11	24	0.006	0.079
	9(2008)	24.1	24.36	24.234	0.006	0.076
	10(2008)	23.46	24.38	24.229	0.027	0.164
	11(2008)	22.58	23.94	23.422	0.168	0.41
	12(2008)	22.32	22.9	22.475	0.017	0.132
	1(2009)	22.29	22.33	22.308	0	0.012
T8W03						
	12(2007)	22.6	23.42	23.041	0.061	0.246
	1(2008)	21.95	22.72	22.28	0.049	0.222
	2(2008)	21.72	21.98	21.842	0.003	0.051
	3(2008)	21.62	21.89	21.784	0.004	0.06
	4(2008)	21.8	22.27	22.105	0.019	0.139
	5(2008)	22.23	23.58	22.833	0.224	0.473
	6(2008)	23.55	24.66	24.139	0.138	0.371
	7(2008)	24.81	25.22	25.022	0.01	0.102
	8(2008)	25.15	25.82	25.496	0.04	0.2
	9(2008)	25.65	26.02	25.777	0.003	0.059
	10(2008)	24.74	25.67	25.385	0.056	0.236

	11(2008)	22.95	24.74	23.825	0.179	0.423
	12(2008)	22.16	22.97	22.389	0.046	0.214
	1(2009)	22.09	22.21	22.16	0.001	0.036

Table 13. (continued) Monthly groundwater temperature (C) statistics.

T9W01						
	12(2007)	22.32	23.29	22.863	0.062	0.249
	1(2008)	21.06	22.78	21.867	0.095	0.308
	2(2008)	21.45	21.95	21.742	0.019	0.137
	3(2008)	21.35	21.98	21.804	0.022	0.148
	4(2008)	21.46	22.24	21.953	0.013	0.113
	5(2008)	22	23.37	22.67	0.217	0.466
	6(2008)	23.23	24.35	23.985	0.085	0.292
	7(2008)	24.14	25.04	24.599	0.035	0.188
	8(2008)	24.79	25.41	25.211	0.008	0.089
	9(2008)	24.98	25.73	25.368	0.017	0.129
	10(2008)	25.26	25.53	25.404	0.003	0.058
T9W02						
	12(2007)	21.76	23.43	22.787	0.168	0.41
	1(2008)	20.64	22.8	21.804	0.165	0.406
	2(2008)	20.97	22.28	21.816	0.059	0.242
	3(2008)	21.59	22.45	22.191	0.023	0.153
	4(2008)	22.17	23.56	22.908	0.086	0.293
	5(2008)	23.08	25.4	24.074	0.356	0.597
	6(2008)	24.55	26.15	25.329	0.123	0.351
	7(2008)	25.44	26.83	25.92	0.1	0.316
	8(2008)	26.03	27.09	26.396	0.063	0.251
	9(2008)	25.96	26.83	26.207	0.038	0.196
	10(2008)	23.73	26.25	25.5	0.193	0.439
	11(2008)	20.06	24.72	23.144	0.693	0.833
	12(2008)	20.44	22.02	21.44	0.08	0.283
	1(2009)	21.25	21.86	21.662	0.021	0.146
T9W03						
	12(2007)	24.56	24.79	24.683	0.004	0.063
	1(2008)	24.08	24.57	24.315	0.019	0.139
	2(2008)	23.85	24.09	23.953	0.003	0.058
	3(2008)	23.69	23.87	23.772	0.003	0.051
	4(2008)	23.67	23.72	23.693	0	0.014
	5(2008)	23.7	24	23.808	0.009	0.093
	6(2008)	23.98	24.29	24.114	0.007	0.086
	7(2008)	24.24	24.55	24.452	0.006	0.075
	8(2008)	24.51	25.15	24.832	0.051	0.225
	9(2008)	25	25.29	25.119	0.003	0.053
	10(2008)	25.25	25.36	25.323	0	0.018

	11(2008)	24.84	25.31	25.083	0.017	0.131
	12(2008)	24.14	24.85	24.464	0.044	0.209
	1(2009)	24.08	24.15	24.115	0	0.018

Table 14. Monthly groundwater EC (S/m) statistics.

T1W01	Month	Min	Max	Mean	Variance	Std
	12(2007)	0.062	0.077	0.074	0	0.003
	1(2008)	0.057	0.076	0.063	0	0.005
	2(2008)	0.054	0.064	0.061	0	0.002
	3(2008)	0.053	0.065	0.06	0	0.003
	4(2008)	0.052	0.075	0.064	0	0.007
	5(2008)	0.053	0.081	0.069	0	0.01
	6(2008)	0.046	0.063	0.058	0	0.005
	7(2008)	0.059	0.063	0.063	0	0.001
	8(2008)	0.072	0.075	0.074	0	0.001
	9(2008)	0.045	0.08	0.07	0	0.008
	10(2008)	0.075	0.084	0.082	0	0.002
	11(2008)	0.049	0.085	0.07	0	0.015
	12(2008)	0.053	0.078	0.065	0	0.008
	1(2009)	0.059	0.061	0.06	0	0
T3W01						
	12(2007)	0.059	0.069	0.064	0	0.003
	1(2008)	0.062	0.074	0.067	0	0.003
	2(2008)	0.052	0.07	0.058	0	0.005
	3(2008)	0.052	0.061	0.056	0	0.002
	4(2008)	0.044	0.061	0.055	0	0.004
	5(2008)	0.036	0.049	0.041	0	0.002
	6(2008)	0.037	0.054	0.046	0	0.004
	7(2008)	0.027	0.049	0.041	0	0.005
	8(2008)	0.038	0.045	0.042	0	0.002
	9(2008)	0.031	0.045	0.04	0	0.003
	10(2008)	0.041	0.05	0.045	0	0.003
	11(2008)	0.043	0.052	0.047	0	0.003
	12(2008)	0.038	0.054	0.046	0	0.004
	1(2009)	0.041	0.047	0.044	0	0.002
T7W01						
	12(2007)	0.161	0.179	0.169	0	0.004
	1(2008)	0.165	0.178	0.17	0	0.002
	2(2008)	0.148	0.178	0.163	0	0.007
	3(2008)	0.132	0.163	0.145	0	0.008
	4(2008)	0.13	0.178	0.151	0	0.016
	5(2008)	0.132	0.179	0.148	0	0.011
	6(2008)	0.12	0.153	0.131	0	0.006

	7(2008)	0.111	0.176	0.123	0	0.011
	8(2008)	0.11	0.208	0.151	0.001	0.031
	9(2008)	0.151	0.225	0.203	0	0.017
	10(2008)	0.146	0.231	0.209	0	0.02
	11(2008)	0.153	0.232	0.184	0.001	0.027
	12(2008)	0.11	0.153	0.128	0	0.014
	1(2009)	0.107	0.111	0.109	0	0.001

Table 14. Monthly groundwater EC (S/m) statistics.

T7W02						
	12(2007)	0.289	0.306	0.296	0	0.004
	1(2008)	0.228	0.289	0.253	0	0.018
	2(2008)	0.182	0.228	0.202	0	0.015
	3(2008)	0.165	0.198	0.182	0	0.009
	4(2008)	0.141	0.173	0.155	0	0.007
	5(2008)	0.111	0.142	0.122	0	0.009
	6(2008)	0.105	0.112	0.107	0	0.002
	7(2008)	0.104	0.105	0.105	0	0
	9(2008)	0.108	0.113	0.108	0	0.001
	10(2008)	0.108	0.112	0.109	0	0.001
	11(2008)	0.102	0.112	0.108	0	0.003
	12(2008)	0.094	0.102	0.098	0	0.002
	1(2009)	0.095	0.095	0.095	0	0
T7W03						
	12(2007)	0.07	0.074	0.072	0	0.001
	1(2008)	0.065	0.07	0.067	0	0.001
	2(2008)	0.061	0.065	0.062	0	0.001
	3(2008)	0.06	0.063	0.061	0	0.001
	4(2008)	0.06	0.069	0.065	0	0.003
	5(2008)	0.064	0.07	0.067	0	0.002
	6(2008)	0.057	0.069	0.064	0	0.002
	7(2008)	0.055	0.066	0.057	0	0.002
	8(2008)	0.051	0.068	0.056	0	0.003
	9(2008)	0.052	0.063	0.055	0	0.003
	10(2008)	0.052	0.055	0.054	0	0
	11(2008)	0.049	0.052	0.05	0	0.001
	12(2008)	0.048	0.05	0.049	0	0
	1(2009)	0.049	0.049	0.049	0	0
T7W04						
	12(2007)	0.011	0.011	0.011	0	0
	1(2008)	0.01	0.011	0.011	0	0
	2(2008)	0.009	0.011	0.01	0	0.001
	3(2008)	0.006	0.007	0.006	0	0
	4(2008)	0.005	0.006	0.006	0	0
	5(2008)	0.006	0.007	0.006	0	0
	6(2008)	0.005	0.006	0.005	0	0
	7(2008)	0.005	0.006	0.005	0	0

	8(2008)	0.005	0.006	0.005	0	0
	9(2008)	0.005	0.006	0.006	0	0
	10(2008)	0.006	0.007	0.006	0	0
	11(2008)	0.006	0.007	0.006	0	0
	12(2008)	0.006	0.007	0.006	0	0
	1(2009)	0.006	0.006	0.006	0	0

Table 14. (continued) Monthly groundwater EC (S/m) statistics.

T8W01						
	12(2007)	0.321	0.437	0.378	0	0.018
	1(2008)	0.238	0.369	0.296	0.001	0.037
	2(2008)	0.158	0.283	0.222	0.001	0.029
	3(2008)	0.126	0.303	0.205	0.002	0.043
	4(2008)	0.117	0.255	0.15	0	0.021
	5(2008)	0.117	0.244	0.179	0.002	0.039
	6(2008)	0.164	0.291	0.198	0	0.021
	7(2008)	0.125	0.234	0.171	0	0.018
	8(2008)	0.118	0.351	0.209	0.007	0.083
	9(2008)	0.251	0.338	0.288	0	0.022
	10(2008)	0.197	0.257	0.22	0	0.015
	11(2008)	0.17	0.202	0.184	0	0.007
	12(2008)	0.142	0.176	0.157	0	0.008
	1(2009)	0.144	0.156	0.15	0	0.002
T8W02						
	12(2007)	0.063	0.065	0.064	0	0.001
	1(2008)	0.062	0.064	0.063	0	0
	2(2008)	0.063	0.065	0.064	0	0
	3(2008)	0.064	0.066	0.065	0	0
	4(2008)	0.064	0.066	0.065	0	0
	7(2008)	0.067	0.068	0.067	0	0
	8(2008)	0.067	0.069	0.068	0	0
	9(2008)	0.067	0.068	0.067	0	0
	10(2008)	0.066	0.07	0.067	0	0.001
	11(2008)	0.064	0.066	0.065	0	0.001
	12(2008)	0.064	0.068	0.066	0	0.001
	1(2009)	0.067	0.067	0.067	0	0
T8W03						
	12(2007)	0.018	0.031	0.024	0	0.003
	1(2008)	0.024	0.026	0.025	0	0
	2(2008)	0.022	0.028	0.026	0	0.001
	3(2008)	0.02	0.027	0.024	0	0.001
	4(2008)	0.022	0.03	0.026	0	0.002
	5(2008)	0.02	0.032	0.029	0	0.004

	6(2008)	0.019	0.029	0.024	0	0.003
	7(2008)	0.022	0.03	0.027	0	0.001
	8(2008)	0.015	0.027	0.022	0	0.004
	9(2008)	0.015	0.028	0.023	0	0.003
	10(2008)	0.016	0.024	0.02	0	0.002
	11(2008)	0.019	0.027	0.023	0	0.002
	12(2008)	0.027	0.029	0.028	0	0.001
	1(2009)	0.029	0.029	0.029	0	0

Table 14. (continued) Monthly groundwater EC (S/m) statistics.

T9W01						
	12(2007)	0.398	0.702	0.56	0.012	0.11
	1(2008)	0.355	0.435	0.385	0	0.021
	2(2008)	0.435	0.584	0.506	0.002	0.043
	3(2008)	0.501	0.636	0.588	0.001	0.034
	4(2008)	0.621	0.74	0.642	0	0.013
	5(2008)	0.638	1.413	0.726	0.012	0.109
	6(2008)	0.643	1.45	0.773	0.029	0.171
	7(2008)	0.646	1.389	1.122	0.058	0.242
	8(2008)	1.004	1.13	1.057	0.001	0.029
	9(2008)	1.053	1.118	1.087	0	0.016
	10(2008)	1.114	1.118	1.117	0	0.001
T9W02						
	12(2007)	2.118	2.298	2.203	0.002	0.04
	1(2008)	2.015	2.421	2.23	0.01	0.1
	2(2008)	1.935	2.48	2.276	0.016	0.125
	3(2008)	1.85	2.48	2.207	0.02	0.142
	4(2008)	1.862	2.467	2.082	0.018	0.134
	5(2008)	1.722	2.542	2.163	0.049	0.22
	6(2008)	1.778	2.498	2.188	0.043	0.208
	7(2008)	1.663	2.45	2.054	0.052	0.227
	8(2008)	1.766	2.293	2.014	0.019	0.136
	9(2008)	1.621	2.121	1.94	0.015	0.123
	10(2008)	1.542	1.891	1.694	0.006	0.078
	11(2008)	1.543	1.801	1.655	0.004	0.066
	12(2008)	1.341	1.861	1.676	0.015	0.124
	1(2009)	1.497	1.627	1.525	0.001	0.028
T9W03						
	12(2007)	0.03	0.034	0.031	0	0.001
	1(2008)	0.027	0.031	0.03	0	0.001
	2(2008)	0.025	0.029	0.027	0	0.001
	3(2008)	0.024	0.028	0.026	0	0.001
	4(2008)	0.024	0.037	0.029	0	0.003
	5(2008)	0.018	0.035	0.028	0	0.004
	6(2008)	0.023	0.029	0.026	0	0.002

7(2008)	0.02	0.029	0.025	0	0.002
8(2008)	0.011	0.033	0.022	0	0.005
9(2008)	0.018	0.022	0.02	0	0.001
10(2008)	0.019	0.023	0.021	0	0.001
11(2008)	0.02	0.025	0.023	0	0.001
12(2008)	0.022	0.025	0.023	0	0.001
1(2009)	0.022	0.022	0.022	0	0

Appendix V – Field sheet detailing the protocol for data collection

Table 15. Field sheet detailing the protocol for data collection for future downloads

Data taken by:_____

Date	Time	Well	"Spot" Reading (units)	Tapedown (unit in water) (ft)	Battery Change?	EC Cal?	Tapedown (unit replaced) (ft)	Notes (dead batteries, connection problems, cable length if measured, etc.)
For example: 5/6/08	17:32	T7-W2	0.752 psi	4.67	yes	no	4.67	Switched old troll SN 33751 w/ new SN 33743 b/c of bad cond. Sensor; cable length 15.3 ft;