2011 ANNUAL GROUNDWATER REPORT

PERFLUOROCHEMICAL (PFC) GROUNDWATER ASSESSMENT AND HYDRAULIC CAPTURE ZONE EVALUATION

3M WOODBURY, MN

NOVEMBER 2011

by

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West Chester, Pennsylvania 19380

02181.222.018.0001

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1. INTRODUCTION

This report has been prepared by Weston Solutions, Inc. (WESTON®) for 3M Company and is the annual report that includes an assessment of the groundwater at the former 3M Woodbury disposal site, in Woodbury, MN (the site). This report covers the October 2010 through November 2011 time-frame.

1.1 REMEDIAL DESIGN/REMEDIAL ACTION (RD/RA) PROGRAM

3M entered into a Settlement Agreement and Consent Order (the Agreement) in May 2007 with one purpose being the conducting of remedial investigations and response actions to address perfluorochemicals (PFCs) at the site (see Figure 1-1 for the location). In accordance with the Agreement between 3M and the MPCA, 3M has been conducting remedial investigations and response actions to address PFCs present at the site. As required by the Agreement, 3M submitted to the MPCA a Remedial Design/Response Action (RD/RA) Plan for addressing the PFCs at the site in April 2009. MPCA provided technical comments to 3M on the Woodbury RD/RA Plan and a response to comments letter was submitted by 3M to the MPCA in May 2009. The MPCA approved the RD/RA Plan in their letter to 3M dated June 1, 2009. The RD/RA Plan specifies a long-term groundwater monitoring network for the site to be implemented after response actions at the site have been completed.

The excavation and removal of soils containing PFCs in the former Main Disposal Area was completed in Fall 2009 and the excavation and removal of soils containing PFCs in the former Northeast Disposal Area was completed in Winter 2010 (final grading and seeding was completed in May 2011).

A letter to the MPCA from 3M requesting approval to reduce pumping from the Barrier Wells at the Woodbury site was submitted to the MPCA on March 16, 2010. This request for reduced pumping also included a groundwater monitoring plan to document that groundwater capture would still be achieved while pumping from the Barrier Wells is reduced. MPCA comments to the March 16, 2010 letter request were sent to 3M in a

June 30, 2011 letter and it included requirements for expanding the groundwater monitoring network proposed in 3M's letter request. Following the completion of several infrastructure changes to implement the Barrier Well reduction program, 3M sent a response to these MPCA requests in a letter dated January 12, 2011. The MPCA requirements, in conjunction with the groundwater monitoring network for the site presented in the RD/RA Plan, were used to develop a Groundwater Sampling Plan for the Woodbury site. The Groundwater Sampling Plan, (WESTON, June 2011) was submitted to the MPCA on June 16, 2011. Approval of the Sampling Plan with comments was provided by MPCA in letter to 3M dated August 23, 2011.

The MPCA approved RD/RA Plan indicates that the three components that will be addressed by the RA long-term monitoring plan for groundwater as follows:

- Verification that the extraction system maintains hydraulic capture of site groundwater.
- Documentation of groundwater quality as required by the Minnesota Decision Document (MDD).
- Documentation that treated groundwater is discharged in accordance with state requirements.

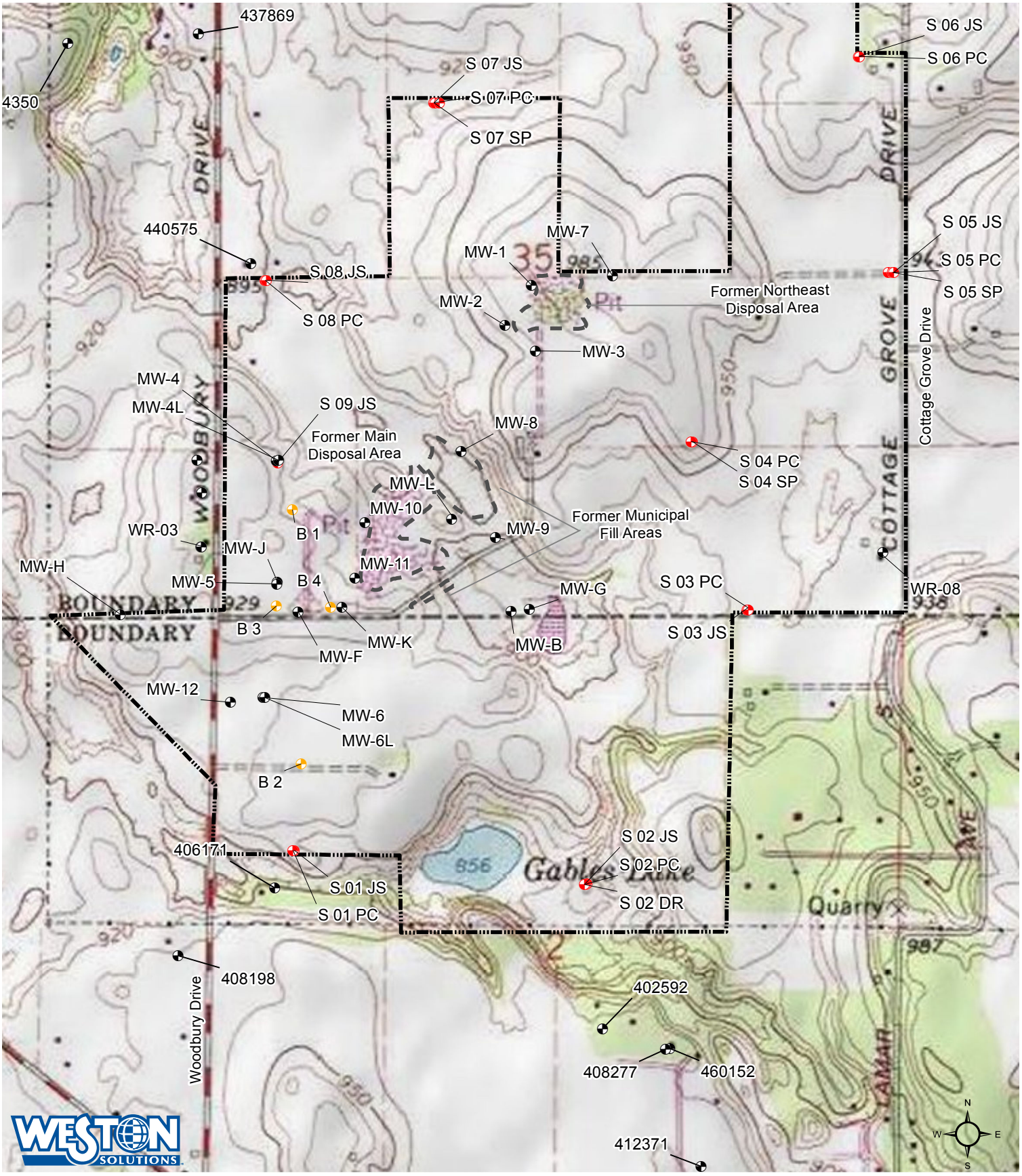
1.2 CHRONOLOGY OF RECENT ACTIVITIES

As part of the long term groundwater monitoring at the site, numerous wells were identified to be sampled and analyzed for PFCs. The number of wells and the frequency of sampling were established in the MPCA approved Groundwater Sampling Plan. The Groundwater Sampling Plan includes wells identified to be sampled as presented in the RD/RA and additional wells as a result of the pumping reduction request. In order to establish baseline groundwater quality data prior to the pumping reduction, the quarterly groundwater sampling program was initiated in October 2010. Subsequent quarterly sampling events were performed in February, May and August 2011.

On March 11, 2011 the initial pumping reduction plan was implemented. The results of the May 2011 quarterly groundwater sampling indicated for the first time, concentrations of certain PFCs in several sentinel wells at the southern property boundary. As a result of these detections, and as agreed to with MPCA, 3M returned Barrier Well B-2 to service and increased the pumping rate at Barrier Well B-3 to its pre-reduction pumping rate on September 14, 2011. Additionally, 3M increased the frequency of sampling and the number of wells to be sampled to collect additional data to evaluate trends. The following summarizes the timeline of events that occurred and additional sampling that was performed associated with the pumping reduction program:

- October, 2010: 1st annual sampling event.
- February, 2011: 1st quarterly groundwater sampling.
- March 2011: Implemented the first step of the reduction in pumping by shutting down Barrier Well B-2 and reducing pumping at B-3 to reduce the overall extracted groundwater flow rate by approximately 175 gallons per minute (GPM) (approximately a 5.8% reduction).
- April 22, 2011: Monitoring well MW-6L was reconstructed (as MW-6LR) due to blockage in the well and concerns of an improper grout seal. The borehole geophysics program was also completed at this time.
- May 19, 2011: 2nd quarterly groundwater sampling performed.
- May 30, 2011: Annual Memorial Day weekend Barrier Well shutdown for maintenance.
- August 22-23, 2011: 3rd quarterly groundwater sampling performed.
- August 23, 2011: May quarterly groundwater sampling results issued by the laboratory.
- September 12, 2011: WESTON provided an evaluation of the data to 3M.
- September 14, 2011: 3M initially notified MPCA of the laboratory results.

- September 14, 2011: 3M returned Barrier Well B-2 to service and increased pumping of B-3.
- September 14, 2011: Initiated weekly sampling of Barrier Wells B-2 and B-4 and bi-weekly sampling of select sentinel wells and monitor wells.
- September 28, 2011: 3M and WESTON met with MPCA to review quarterly sampling data.
- September 30, 2011: 3M met with the City of Cottage Grove, MDH and MPCA.
- September 30, 2011: MPCA initiated a residential well sampling event. 3M collected split samples with MPCA.
- October 12, 2011: 3M and WESTON met with MPCA to present information on activities completed and data collected to date.
- October 17, 2011: Planned transects for seismic survey submitted by 3M to the MPCA.
- October 20, 2011: A 3M plan to conduct an Electrical Resistivity (ER) geophysical survey was submitted to MPCA.
- October 21, 2011: 3M received MPCA concurrence on the geophysical surveys.
- October 24-28, 2011: ER geophysical survey was performed and 2nd annual groundwater sampling was performed. Groundwater samples were split with MPCA's contractor, West Central Environmental Consultants.
- November 3, 2011: 3M and WESTON met with MPCA to review weekly/bi-weekly PFC sampling data.



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Approximate Woodbury Site Boundary

Figure 1-1

WOODBURY WELL LOCATION AND TOPOGRAPHIC MAP

3M WOODBURY SITE
WOODBURY, MN

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2. SAMPLING PROGRAM

2.1 GROUNDWATER SAMPLING PLAN

As identified in the Groundwater Sampling Plan and based on subsequent MPCA comments, the groundwater monitoring network at the Woodbury site Figure 2-1 consists of 42 monitor and sentinel wells, and four Barrier Wells. As shown in Table 2-1, 19 monitor, sentinel and Barrier Wells are sampled for PFCs at the Woodbury site on a quarterly basis until response actions are complete. These wells include the MPCA requested monitoring network associated with 3M's request for reduction in pumping and Barrier Wells B-1, B-2, B-3 and B-4. Depth-to-groundwater measurements are recorded monthly at the wells indicated in Table 2-1. Annual long-term groundwater sampling is conducted at the 24 wells identified in the RD/RA Plan (i.e. identified by "RD/RA" in Table 2-1). Also, an annual PFC sample (identified as CMW) is collected from the conveyance line at a point where flow from the Barrier Wells has been combined. The groundwater monitoring well network at the Woodbury site is shown in Figure 2-1. (The conveyance line sample point (CMW) is located at the Cottage Grove Facility and is not shown on Figure 2-1).

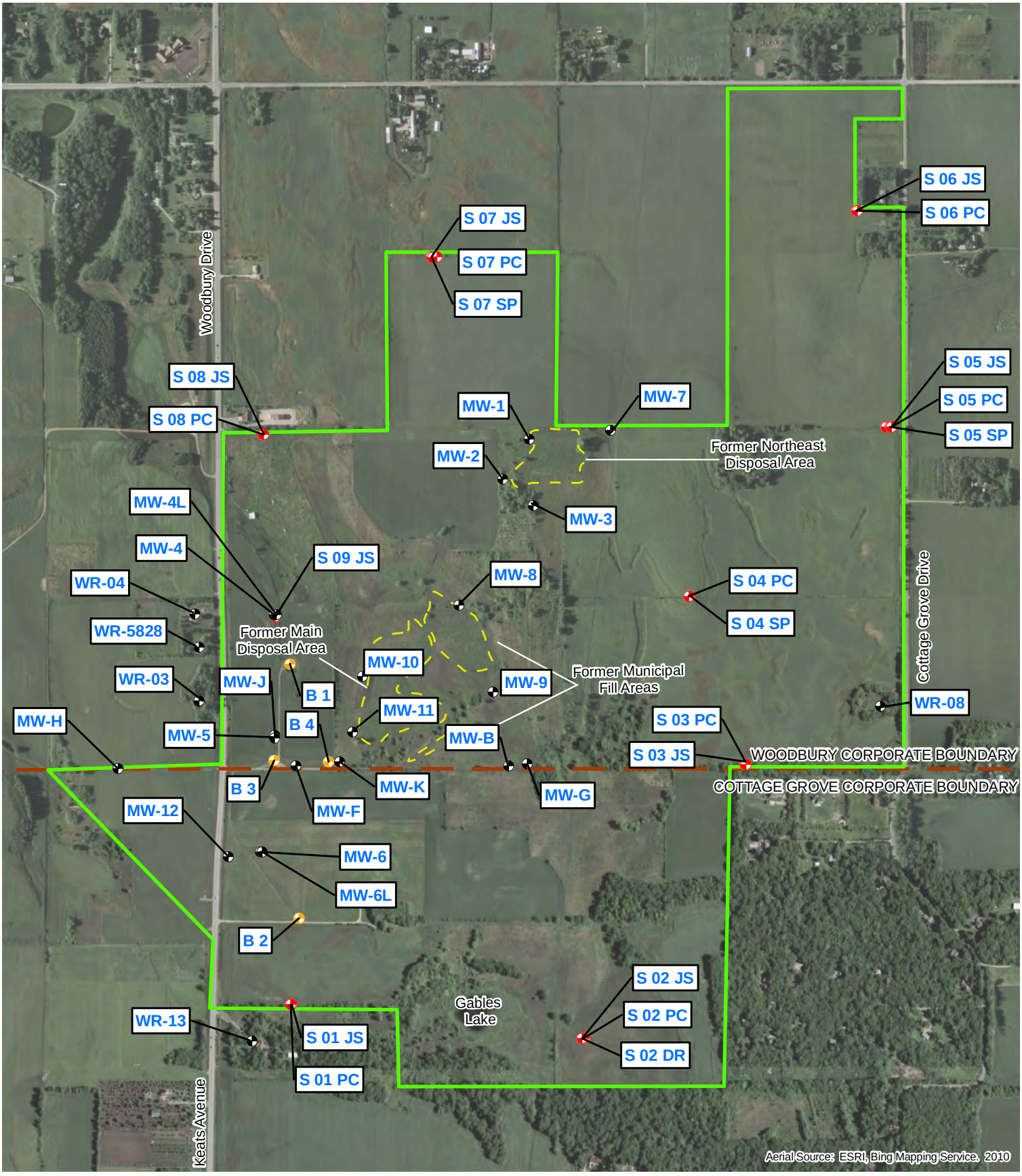
2.2 GROUNDWATER SAMPLING EVENTS

Prior to reduction in the Barrier Well pumping rates, the first annual groundwater sampling round was performed in October 2010 and a quarterly sampling round was performed in February 2011. The next two quarterly groundwater sampling rounds were performed in May 2011 and August 2011 after Barrier Well pumping rates were reduced (Table 2-2). For the October 2010 annual sampling event, groundwater samples were collected from 13 sentinel wells, 8 monitor wells, one former residential well, and four Barrier Wells. In the February, May and August 2011 quarterly sampling events, groundwater samples were collected from 6 sentinel wells, 7 monitor wells, and one former residential well. Groundwater samples were collected at all four Barrier Wells in October 2010 and February 2011, and the three operating Barrier Wells (B-1, B-3, and B-4) in May and August 2011.

Groundwater samples were collected for analyses of three PFC compounds perfluorobutanoic acid (PFBA), perfluorooctane sulfonate (PFOS), and perfluorooctanoic acid (PFOA) during the October 2010 and February 2011 sampling rounds. Per MPCA request, perfluorohexanoic acid (PFHS) was added to the list of PFC compounds during the May 2011, sampling round and perfluorobutane sulfonate (PFBS) was added per MPCA's request for the August 2011 sampling round and subsequent sampling rounds.

Following the August 2011 sampling, additional groundwater sampling was performed at select wells after PFOA and PFOS were detected during the May and/or August 2011 sampling rounds in southern sentinel wells S01JS, S01PC, S02DR, S02JS and S02PC. On September 14, 2011, 3M notified MPCA of the aforementioned analytical results, returned barrier well B-2 to service and increased the pumping rate at B-3. Weekly sampling of B-2 and B-4 was initiated by 3M on September 14 and bi-weekly sampling was initiated on September 20-21, 2011 at wells S01PC/JS, S02DR/PC/JS, MW-6LR and MW-12. The September 20-21, 2011 results confirmed the detections and MPCA requested that the following six wells be sampled in addition to the seven wells previously sampled: S03PC/JS, SO4SP/PC, MW-10 and MW-G. These wells were sampled on October 4, 2011 and again as part of the October 24 – 28, 2011 annual sampling round (except MW-10 was only sampled during the October 4, 2011 sampling round) per MPCA staff request.

The sampling locations and dates are presented in Table 2-2.



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Approximate Disposal Area Boundaries
- Site Boundary

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FIGURE 2-1

GROUNDWATER MONITORING NETWORK

3M WOODBURY SITE
WOODBURY, MN

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Table 2-1
Woodbury Site Groundwater Monitoring Plan
Woodbury, MN

Well ID	Depth-to-Groundwater Measurement	PFC Sample	Rationale for Sampling	Well ID	Depth-to-Groundwater Measurement	PFC Sample	Rationale for Sampling
B-1	X[1]	Q, A	RD/RA RAP	MW-H	X	Q, A	BWPRP[3] RD/RA
B-2	X[1]	Q, A	RD/RA RAP	MW-J	X		
B-3	X[1]	Q, A	RD/RA RAP	MW-K	X		
B-4	X[1]	Q, A	RD/RA RAP	S01JS	X	Q, A	BWPRP[3] RD/RA
MW-1				S01PC	X	Q, A	BWPRP[3] RD/RA
MW-2	X	Q, A	BWPRP[3] RD/RA RAP	S02DR	X	Q, A	BWPRP[3] RD/RA
MW-3	X		RAP	S02JS	X	Q, A	BWPRP[3] RD/RA
MW-4L	X	Q, A	BWPRP[3] RD/RA	S02PC	X	Q, A	BWPRP[3] RD/RA
MW-4	X	Q	BWPRP[3]	S03JS	X	Q	Per MPCA Request
MW-5	X		RAP	S03PC	X	Q	Per MPCA Request
MW-6	X	Q	BWPRP[3]	S04PC	X	A	RD/RA
MW-6LR	X	Q	BWPRP[3]	S04SP	X	A	RD/RA
MW-7	X		RAP	S05JS	X	A	RD/RA
MW-8	X		RAP	S05PC	X	A	RD/RA
MW-9	X			S05SP	X	A	RD/RA
MW-10	X			S06JS	X		
MW-11	X		RAP	S06PC	X	Q	
MW-12	X	Q	BWPRP[3]	S07JS	X		
MW-B	NA			S07PC	X	A	RD/RA
WR-03	X	Q, A	BWPRP[3] RD/RA, RAP	S07SP	X	A	RD/RA
WR-04			RAP	S08JS	X	A	RD/RA
WR-13			RAP	S08PC	X	A	RD/RA
WR-5828			RAP	S09JS	X	Q, A	BWPRP[3] RD/RA
WR-08	X			CMW[4]	N/A	A	
MW-F	X						
MW-G	X	A	RD/RA				

[1] - A Depth-to-groundwater measurement will be recorded if pump is not operating.

[2] - This well was plugged and abandoned prior to excavation activities in the former Northeast Disposal Area.

[3] - Well proposed for sampling under the Barrier Well Pumping Reduction Plan, submitted to MPCA in March 2010 or added per subsequent MPCA comments.

[4] - Conveyance line sample location for combined flow.

NA - Not accessible, obstruction in well

Q - Groundwater samples will be collected from these wells on a quarterly basis until response actions are complete and analyzed for PFOA, PFOS, PFBA, PFHS and PFBS.

A - Groundwater samples will be collected from these wells on an annual basis after completion of response action for 13 PFCs during the 1st and 2nd annual event and may be reduced thereafter.

RD/RA - Well proposed for annual long-term monitoring in the RD/RA Plan.

RAP - Remedial Action Plan

Table 2-2
Summary of Groundwater PFC Sampling Events Since October 2010
Woodbury Site
Woodbury, MN

	Start Date of Sampling Event											
Well ID	**10/21/10**	**02/07/11**	**05/17/11**	**08/22/11**	**09/14/11**	**09/20/11**	**09/27/11**	**10/05/11**	**10/11/11**	**10/18/11**	**10/24/11**	**11/08/11**
B-1	X	X	X	X							X	
B-2	X	X			X	X	X	X	X	X	X	X
B-3	X	X	X	X							X	
B-4	X	X	X	X			X	X	X	X	X	X
MW-2	X	X	X	X							X	
MW-4L	X	X	X	X							X	
MW-4	X	X	X	X							X	
MW-6	X	X	X	X							X	
MW-6L	X	X										
MW-6LR			X	X		X		X			X	X
MW-10								X				
MW-12	X	X	X	X		X		X			X	X
WR-03	X	X	X	X							X	
MW-G	X							X			X	
MW-H	X	X	X	X							X	
S01JS	X	X	X	X		X		X			X	X
S01PC	X	X	X	X		X		X			X	X
S02DR	X	X	X	X		X		X			X	X
S02JS	X	X	X	X		X		X			X	X
S02PC	X	X	X	X		X		X			X	X
S03JS								X			X	X
S03PC								X			X	X
S04PC	X							X			X	
S04SP	X							X			X	
S05JS	X										X	
S05PC	X										X	
S05SP	X										X	
S06JS												
S06PC				X							X	
S07JS												
S07PC											X	
S07SP											X	
S08JS	X										X	
S08PC	X										X	
S09JS	X	X	X	X							X	
CMW											X	

CMW - Sampling point for combined groundwater from Woodbury Barrier Wells.

3. HYDRAULIC EVALUATION

A *Request to Reduce Pumping Plan* (Plan) for the Woodbury site was submitted by 3M to the MPCA on March 16, 2010. The objective of the Plan was to preserve groundwater resources in Woodbury while still preventing groundwater potentially impacted with PFC compounds from migrating off-site. As stated in the Plan, the Woodbury Barrier Well system consists of four (4) wells pumping at an average combined rate of 2,800 to 3,300 gallons per minute (gpm). A number of studies to evaluate the effectiveness of the site Barrier Well network have been completed by several different consultants (Bruce Liesch, Conestoga-Rovers & Assocaites, Barr Engineering, and WESTON). All of these studies have reached the same conclusion that the Barrier Well network provides an effective hydraulic barrier that prevents groundwater originating in the vicinity of the former Main and former Northeast Disposal Areas at the referenced site from migrating off-site. The performance of the Barrier Well system was evaluated by WESTON during two separate studies performed in May 2007 and May 2008 (WESTON, 2007, 2008). These studies combined with calculations provided in the Plan determined that the Barrier Well system was capturing potentially impacted groundwater and that the Barrier Wells flow rates could be reduced and still maintain groundwater capture. The results of the WESTON evaluation were submitted to MPCA in the March 2010 Plan. The MPCA approved a phased implementation of the Plan with comments in a letter to 3M on June 30, 2010. Responses to the June 30, 2010 comments were addressed in a January 12, 2011 letter from 3M to MPCA, following the completion of several infrastructure changes to implement the Barrier Well pumping reduction program.

The initial reduction in pumping was initiated on March 11, 2011 when Barrier Well B-2 was turned off and the flow rate at Barrier Well B-3 was decreased. The overall reduction in pumping amounted to a decrease of approximately 175 gpm, or 5.8 percent. Flow rates for the Barrier Wells are recorded during the groundwater sampling rounds and are also recorded electronically by 3M production systems.

As part of MPCA's approval of 3M's *Request to Reduce Pumping Plan*, MPCA requested that the following tasks be completed:

- Monitoring wells MW-4, MW-4L and MW-6L be gamma, caliper, and video logged to determine whether the open intervals of these wells intersect the high transmissivity zone (HTZ) of the Prairie du Chien Group;

- Transducers be installed in several wells of interest to continually record water level responses to changes in pumping rates.

The actions performed by 3M in response to these requests are provided in the following sections.

3.1 MODIFICATION OF MONITORING WELL MW-6L

Prior to the performance of the borehole geophysics at the monitoring wells requested by MPCA, sediment that had accumulated in the open borehole of monitoring well MW-6L had to be removed. In January 2011, an attempt to redrill this well and remove the sediment was made using an air rotary drilling rig; however, sediment from the overlying glacial drift unit continued to accumulate in the open borehole section (231 to 320 feet below ground surface (ft bgs)) of the well indicating that the outer grout seal of this well was no longer intact. Due to the damaged seal, this well needed to be reconstituted, and a rotosonic drilling rig was mobilized to the site once ground surface conditions improved in April 2011. The rotosonic rig is capable of advancing outer casing during drilling to prevent sediment from entering into the open borehole section of the well.

Using the rotosonic rig, the well was overdrilled to remove the outer steel casing. The well was then redrilled and the rotosonic rig was successful in removing all sediment from the open borehole. After the sediment was removed and the borehole drilled to the previous depth of completion, the rotosonic drill casing was retracted to a depth where borehole collapse was not a risk. Borehole geophysics were then run in the well while the rotosonic rig was set over the borehole. After completion of the borehole geophysics, the well was renamed (MW-6LR) and a 2-inch screen (280 to 320 ft bgs) and riser were placed within the former open borehole interval of the well. The screened interval was targeted to monitor the middle of the Prairie du Chien formation, which is believed to be the HTZ of this formation. The redrilling and modifications to this well were completed

under an approved MDH reconstruction well permit using the existing unique well number (MDH ID No. 520037).

3.2 BOREHOLE GEOPHYSICS

The suite of borehole geophysics (gamma, caliper and video logging) requested by MPCA were completed in monitoring wells MW-4L and MW-6LR in January and April 2011, respectively. Monitoring well MW-4 is screened from 93 to 128 ft bgs across the St. Peter Sandstone and upper Prairie du Chien Group. This depth is too shallow to intersect the HTZ near the middle of the Prairie du Chien Group, so borehole geophysics could not be performed at this location, due to field constraints. The geophysical and video inspection logs for monitoring wells MW-4L and MW-6LR are included in Attachment A.

The following observations/interpretations can be made based on the borehole geophysics performed in each monitor well:

- **Monitoring well MW-4L**
    - The 4-inch steel casing in this well extends to 122 ft bgs, and grout extends to 124.2 ft bgs;
    - The total depth of the well was measured at 187.1 ft bgs;
    - The caliper logs reveal increases in borehole diameter present at approximately 124, 136, 152, 175, and 185 ft bgs;
    - The video inspection log showed water/sediment flowing from higher in the borehole into the fracture present at 152 ft bgs. The fracture at this depth appeared to be horizontal, possibly associated with a bedding plane. Flow observed across this zone is likely due to the pumping of nearby Barrier Well B-3.

- **Monitoring well MW-6LR**

    - The depth that the borehole geophysics and video logging could be performed in this well was limited due to borehole integrity. In order to limit the risk of borehole collapse, the drill stem was advanced to approximately 278 ft bgs. Therefore, the open borehole of the well that was logged using borehole geophysics was from 278 to 321 ft bgs;

    - The total depth of the well was measured at 321 ft bgs;

    - The caliper log identified a significant fracture zone from 280 to 290 ft bgs;

    - The video log was inconclusive due to high turbidity of the water within the borehole that limited visibility and the inability to advance the downhole camera past 286 ft bgs;

After completion of the borehole geophysics, these data obtained were compared to the lithologic logs for each monitoring well. According to the lithologic logs for monitoring well MW-4L, the top of the Prairie du Chien was noted at 110 ft bgs. The lithologic log for monitoring well MW-6L indicated that the top of the Prairie du Chien Group was encountered at approximately 225 ft bgs. The logs indicate that the thickness of the Prairie du Chien Group in monitoring well MW-4L and MW-6L varies from approximately 165 to 205 feet respectively. The Prairie du Chien Group is divided into the upper Shakopee unit and lower Oneota dolomite. Published references indicate that the HTZ is within the middle of the Prairie du Chien Group near the contact between the Shakopee and Oneota dolomite. From this information the HTZ is projected to be at 190 ft bgs in MW-4L and 325 ft bgs in MW-6LR.

Hydraulic communication between the shallow Shakopee and underlying HTZ can occur through vertical fracturing within the upper Prairie du Chien Group (Tipping et al, 2006). This is the likely mechanism for flow observed in the fracture identified at 152 ft bgs in monitoring well MW-4L. While this fracture is above the expected depth of the HTZ, the flow observed in the video inspection log at this depth indicate that the open borehole

section of monitoring well MW-4L is in hydraulic communication with a primary flow zone supplying groundwater to the Barrier Well network. In addition, during the Barrier Well shut down tests performed at the site in May 2007 and May 2008, the groundwater elevation in monitoring well MW-4L is lower compared to adjacent monitoring wells MW-4 and S09JS under pumping conditions. This data, in combination with the data collected during the borehole geophysics program, indicate preferential flow across the zone monitored by the open borehole section of monitoring well MW-4L. Specifically, flow occurs upward from the underlying Jordan Sandstone and downward from the shallow Prairie du Chien unit into a portion of the open borehole section of monitoring well MW-4L.

At monitoring well MW-6LR, the highly fractured zone identified at 280 to 290 ft bgs is approximately 55 feet below the top of the Prairie du Chien Group. This zone is at a depth likely intercepting the upper portion of the HTZ within the Prairie du Chien. However, the depth where different geologic units (e.g. St. Peter Sandstone and Prairie du Chien) are present at monitoring well MW-6LR indicate a vertical offset compared to other areas. A geologic cross-section was constructed to aid in visualizing the subsurface geologic conditions in the vicinity of monitoring wells MW-6LR and MW-4L (see Figure 3-1 for the location of the cross-section). The cross-section was constructed along a north-south transect along the western site property boundary using lithologic information collected during drilling activities. As shown in Figure 3-2, the St. Peter Sandstone and Prairie du Chien Group are interpreted to be vertically displaced downward at monitoring well MW-6LR. Therefore, MW-6LR is not in direct hydraulic communication with other areas of the site due to the vertical displacement of geologic units.

Additional geophysical work is planned in this area to confirm the interpretations presented in the cross-section.

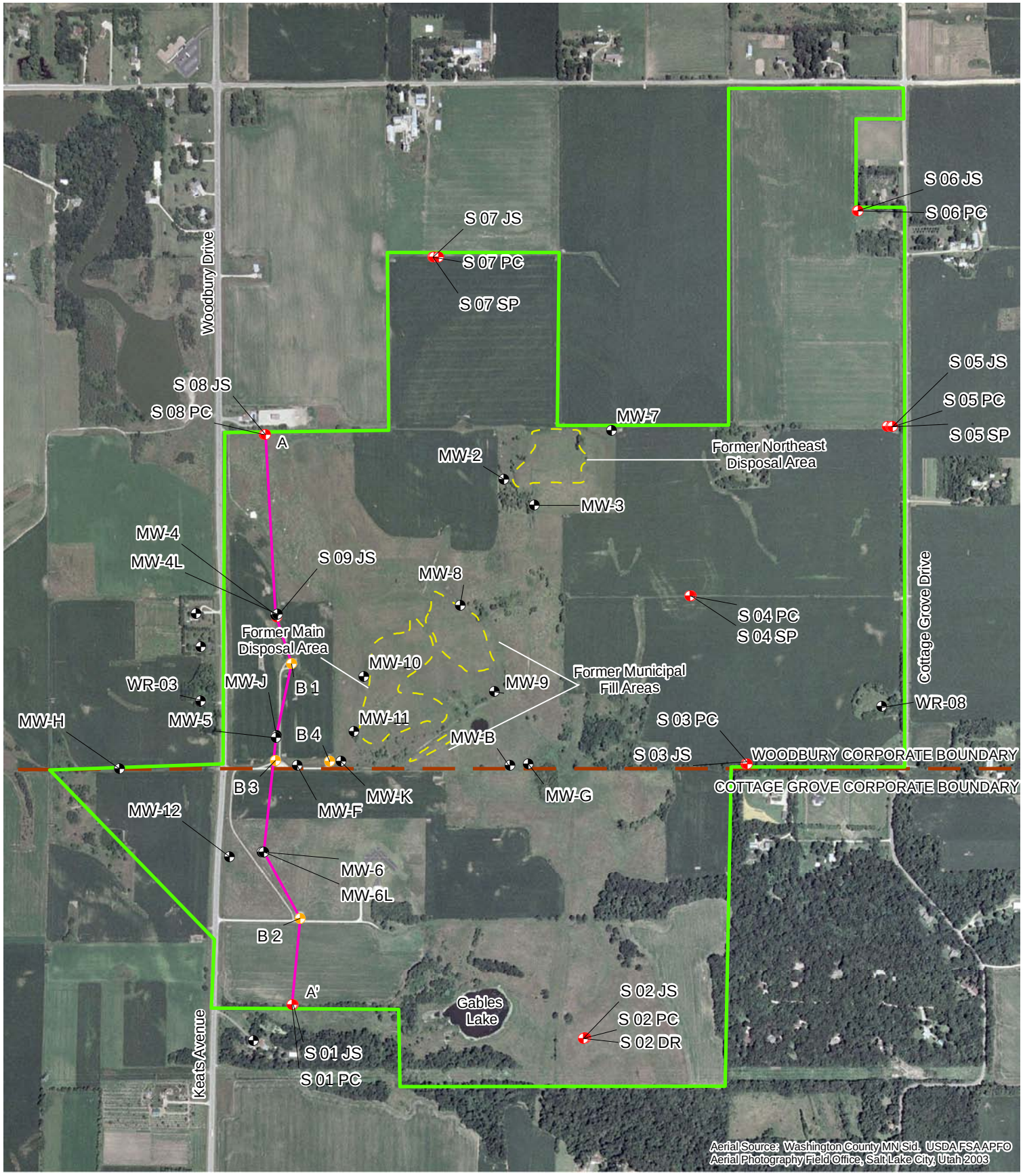
3.3 WATER LEVEL MONITORING

The water level monitoring program for the site consists of monthly manual depth-to-groundwater measurements recorded at all monitoring wells as shown in Table 2-1.

MPCA requested that transducers with the dataloggers be installed in a minimum of four wells completed in the Jordan Sandstone, Prairie du Chien Group, St. Peter Sandstone and glacial drift aquifers. In response to this request, dataloggers were initially installed in January 2011 in the following site monitoring wells:

- Monitor well MW-H – screened within the glacial drift sediments in the buried bedrock valley west of the site;
- Former residential well WR03 – screened within the Jordan Sandstone west of the Barrier Well network;
- Monitor well MW-6 – screened within the St. Peter Sandstone south of Barrier Wells B-1, B-3, and B-4;
- Monitor well MW-4L – screened within the middle of the Prairie du Chien formation near Barrier Well B-1. A transducer was installed in this well prior to monitor well MW-6L being reconstructed. After the re-drilling and reconstruction of monitor well MW-6LR, the transducer in monitor well MW-4L was moved to monitor well MW-6LR.

The four monitoring wells where the dataloggers are installed are the closest monitoring wells that are hydraulically downgradient of the disposal areas. The dataloggers were programmed to collect water level data at 15-minute intervals.



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Approximate Disposal Area Boundaries
- Site Boundary
- Cross Section

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FIGURE 3-1

GEOLOGIC
CROSS SECTION TRANSECT

3M WOODBURY SITE
WOODBURY, MN

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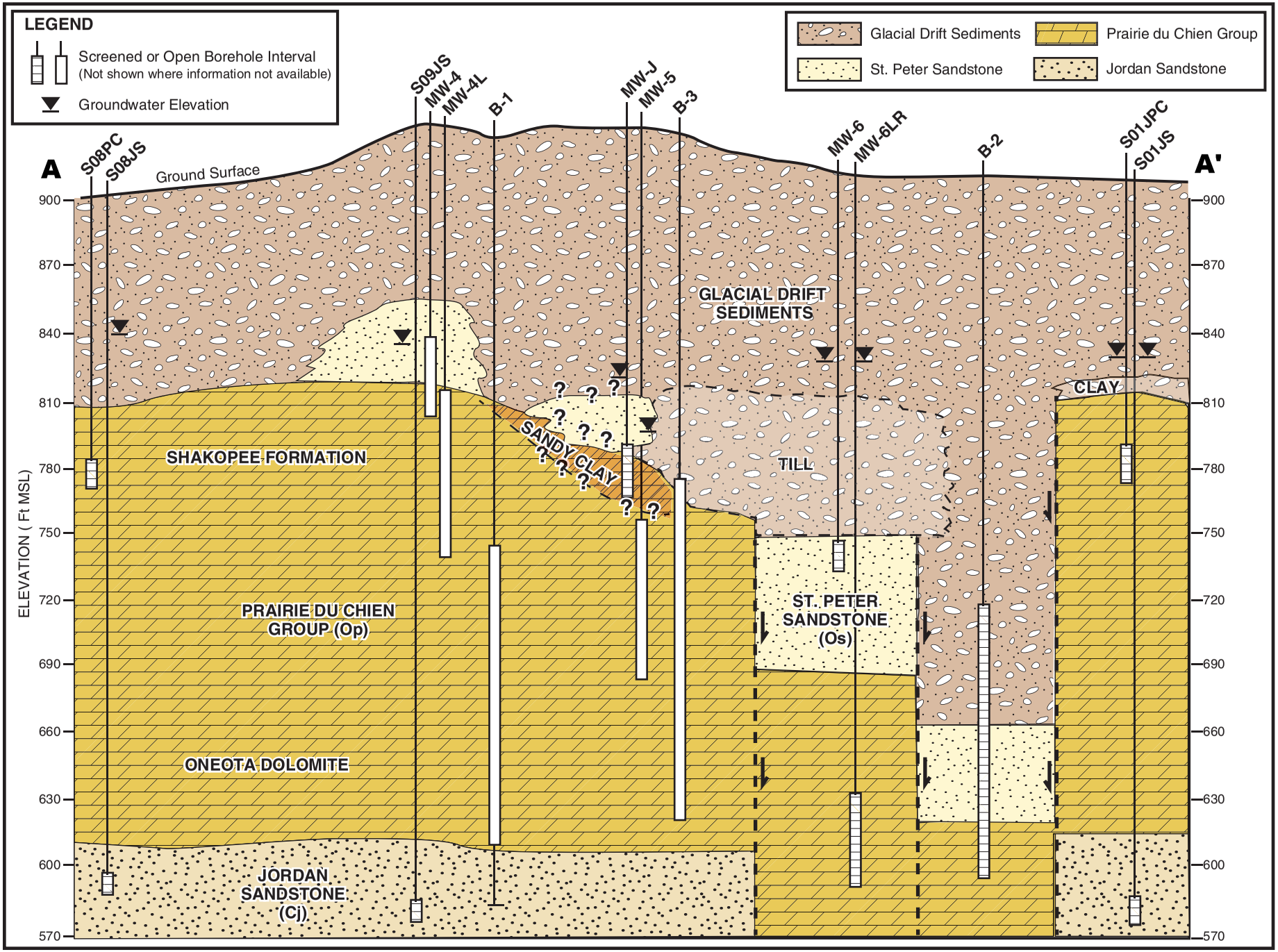

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FIGURE 3-2 GEOLOGIC CROSS SECTION
3M WOODBURY SITE, WOODBURY, MN

4. RESULTS

4.1 GROUNDWATER RESULTS

Table 4-1 provides the groundwater PFC analytical data for the October 2010, February 2011, May 2011 and August 2011 quarterly groundwater sampling events. Subsequent data from the additional sampling rounds performed September 14, 2011 through November 08, 2011 in response to the detection of PFOA and PFOS in S01 and S02 sentinel wells are also included. PFOA, PFOS and PFBA results are also presented on Figures 4-1, 4-2 and 4-3.

4.1.1 Sentinel Well

As shown in Table 4-1, PFBA is the most frequently detected PFC in the site monitor wells. PFBA was detected in groundwater samples collected from sentinel wells located hydraulically upgradient (e.g. S05PC/SP and S08JS/PC) and downgradient (e.g. S01PC and S02DR/PC) of the former disposal areas. The concentration of PFBA detected in groundwater samples collected from the sentinel wells was less than 1.58 parts per billion (ppb) at all locations, well below the Minnesota Department of Health (MDH) established Health Risk Level (HRL) of 7 ppb. PFBA concentrations did not show significant changes in the May 2011 sampling in the same manner as PFOA and PFOS.

Low levels of PFPeA, PFOA and PFHS have been detected historically in groundwater samples collected from S01PC, S02DR and S02PC prior to the shutdown of Barrier Well B-2. In May 2011, PFOA was detected for the first time in S01JS (0.167 ppb). Similar concentrations were detected in the August 2011 quarterly sampling round (0.205 ppb) and in the September 20, 2011 sampling round (0.224 ppb). A decreasing trend is observed in the subsequent sampling rounds from S01JS in October 4th and 25th, 2011 (0.0536 and 0.0781 ppb) and November 8, 2011 (0.0556 ppb). A low concentration of PFOA was detected for the first time in S02JS in the September 20, 2011 sample at a concentration of 0.0785 ppb. Lower concentrations were detected in the two subsequent sampling rounds. Low concentrations of PFOA have also been detected for the first time

during the October 2011 sampling rounds in sentinel wells S03JS, S03PC, S05JS, S05PC, S06PC, S07SP, S08PC and S09JS. PFOA concentrations range from 0.0246 ppb (S08PC) to 0.0991 ppb (S05JS).

The highest concentration of PFOA in the sentinel wells was detected in S02PC in August 2011 at a concentration of 0.670 ppb. Since August 2011, the concentration of PFOA has decreased to <0.0240 ppb in the November 8, 2011 sample.

PFHS was detected at S01PC, S02DR, S02PC and S09JS at low concentrations ranging from 0.0264 ppb (S09JS, August 2011) to 0.192 ppb (S02PC, August 2011). PFHS concentrations in subsequent sample results indicated a decreasing trend.

PFOS was not detected in any sentinel well during the October 2010 and February 2011 sampling rounds. PFOS was detected for the first time in sentinel wells S01JS, S01PC, S02DR, and S02PC in groundwater samples collected during the May 2011 sampling round. In the groundwater samples collected from sentinel well S01JS and S02PC, PFOS was detected at 0.803 and 1.11 ppb, respectively, which is above the MDH HRL value of 0.3 ppb. The other two wells had lower levels. Since May 2011, concentrations in S01 and S02P wells have decreased to levels below the HRL. In subsequent sampling rounds PFOS has also been detected at low levels below the HRL in the sentinel S02JS, S03JS, S03PC, S04PC, S04SP, S05JS, S05PC, S06PC, S07SP, S08JS, S08PC and S09JS. The detected concentrations are above the HRL only in S05PC where the PFOS concentration from the October 2011 sample is 0.322 ppb. For analytical results where PFOS and PFOA were both detected, PFOS was higher in concentration than PFOA in all the sample results except the sample collected from sentinel well S01PC in October 25, 2011.

The only PFC compound detected in groundwater samples collected from nearby former residential well WR-03 was PFBA which was present at concentrations ranging from 0.0666 ppb (August 2011) to 0.100 ppb (February 2011). These concentrations are comparable to PFBA concentrations present in groundwater upgradient of the site and before reductions in the Barrier Well pumping.

4.1.2 Barrier and Monitor Well Results

An inspection of Table 4-1 indicates that the highest concentrations of PFCs in groundwater samples collected from site monitor and Barrier Wells were detected in monitor well MW-2, and in Barrier Wells B-1 and B-4. Monitor well MW2 is located immediately downgradient of the former Northeast Disposal Area. The analytical data provided in Table 4-1, and additional historical data, indicate that the PFCs detected in groundwater samples collected from these wells (MW-2, B-1, and B-4) have a similar chemical fingerprint. PFOA has been detected at much higher concentrations than PFOS in the groundwater samples collected at monitor well MW-2 and Barrier Well B-1. The analytical results for Barrier Well B-3 and monitor well MW-4L indicate a similar chemical fingerprint but at lower concentrations compared to monitor well MW-2 and Barrier Wells B-1 and B-4. PFBA was the only PFC compound detected in groundwater samples collected from Barrier Well B-2.

The results for PFCs in other site monitor wells sampled since October 2010 were below MDH HRL levels except for the groundwater samples collected in May 2011 from monitor well MW-6LR. The May 2011 sampling event was the first time that monitor well MW-6LR was sampled after it was reconstructed (See Section 3.1). Prior to the reconstruction of MW-6L/MW-6LR, PFOA was detected at lower concentrations in monitor well MW-6L while PFOS had not been detected previously. Since May 2011, concentrations at MW-6LR have decreased in recent samples (November 2011). PFOS was detected at a low concentration (0.0885 ppb) and both PFBA and PFOA levels are below method detection limits.

4.1.3 Residential Well Sampling Results

The MPCA identified 23 residential wells to collect samples for PFC and VOC analysis. The residential wells that were sampled were located downgradient (south) of the 3M Woodbury property. The residents were notified by MPCA and on September 30, 2011 MPCA's contractor, West Central Environmental Consultants, collected the samples. WESTON collected split samples at each of the locations.

The results of the PFC analysis indicated that PFOA and PFOS were not detected in any of the samples above the method detection limit. PFBA was detected at concentrations ranging from 0.0308 ppb to 1.72 ppb, well below the MDH HRL of 7 ppb and at levels previously observed.

4.2 HYDRAULIC EVALUATION RESULTS

4.2.1 Barrier Well Flow Rate Data

The flow rate for each Barrier Well is recorded using an automated system connected to each well. The flow rate data for Barrier Wells B-1 through B-4 was obtained for the period January through June 2011, and is provided in Table 4-2. As shown in Table 4-2, Barrier Well B-2 was shut down on March 11, 2011. The flow rate at Barrier Well B-3 was also reduced by approximately 10 percent on this date. The combined flow of the Barrier Wells amounted to a decrease of approximately 175 gpm, or 5.8 percent, after the reduction in pumping was implemented.

4.2.2 Water Level Measurements

Depth-to-groundwater measurements were recorded on an approximate monthly basis prior to, and after, the reduction in pumping. The depth-to-groundwater measurements were recorded from sentinel, monitor, and former residential wells. Measurements could not be recorded in the pumping wells due to the presence of downhole equipment (i.e., pumps, piping). Table 4-3 presents the depth-to-groundwater and calculated groundwater elevations for the wells monitored. In addition to depth-to-groundwater measurements, as discussed in Section 3.3, transducers equipped with dataloggers were installed in four site wells to obtain automated water level data.

Hydrographs, presenting the groundwater elevation data from the dataloggers is plotted with precipitation data in Attachment B.1. Hydrographs presenting the groundwater elevation data collected manually are included in Attachment B.2. An inspection of these hydrographs shows an increase in water levels during the monitoring period presented. The increase in water level is due to recharge from the spring snow melt and above

average spring/early summer precipitation. The increase in groundwater elevations is apparent in all site sentinel and monitor wells and not restricted to a specific area of the site.

The hydrographs constructed for the monitoring wells equipped with transducers show several fluctuations in groundwater levels due to the operation of the Barrier Well network. The most apparent fluctuation in groundwater levels occurred during the annual maintenance event performed over the Memorial Day weekend in late May. During this maintenance event, all Barrier Wells are turned off for a short period. As shown on the hydrographs, a significant increase in groundwater levels occurs after the Barrier Wells are turned off, followed by a sharp decline after the Barrier Wells are turned back on. The hydrographs for monitoring wells MW-H, WR-03, and MW-6 also show a slight fluctuation in groundwater levels due to the shutdown (March 11, 2011), and subsequent restart (September 14, 2011), of Barrier Well B-2 in combination with the adjustment in flow rate at Barrier Well B-3. These fluctuations are minor compared to the change in groundwater levels when all the Barrier Wells are shutdown.

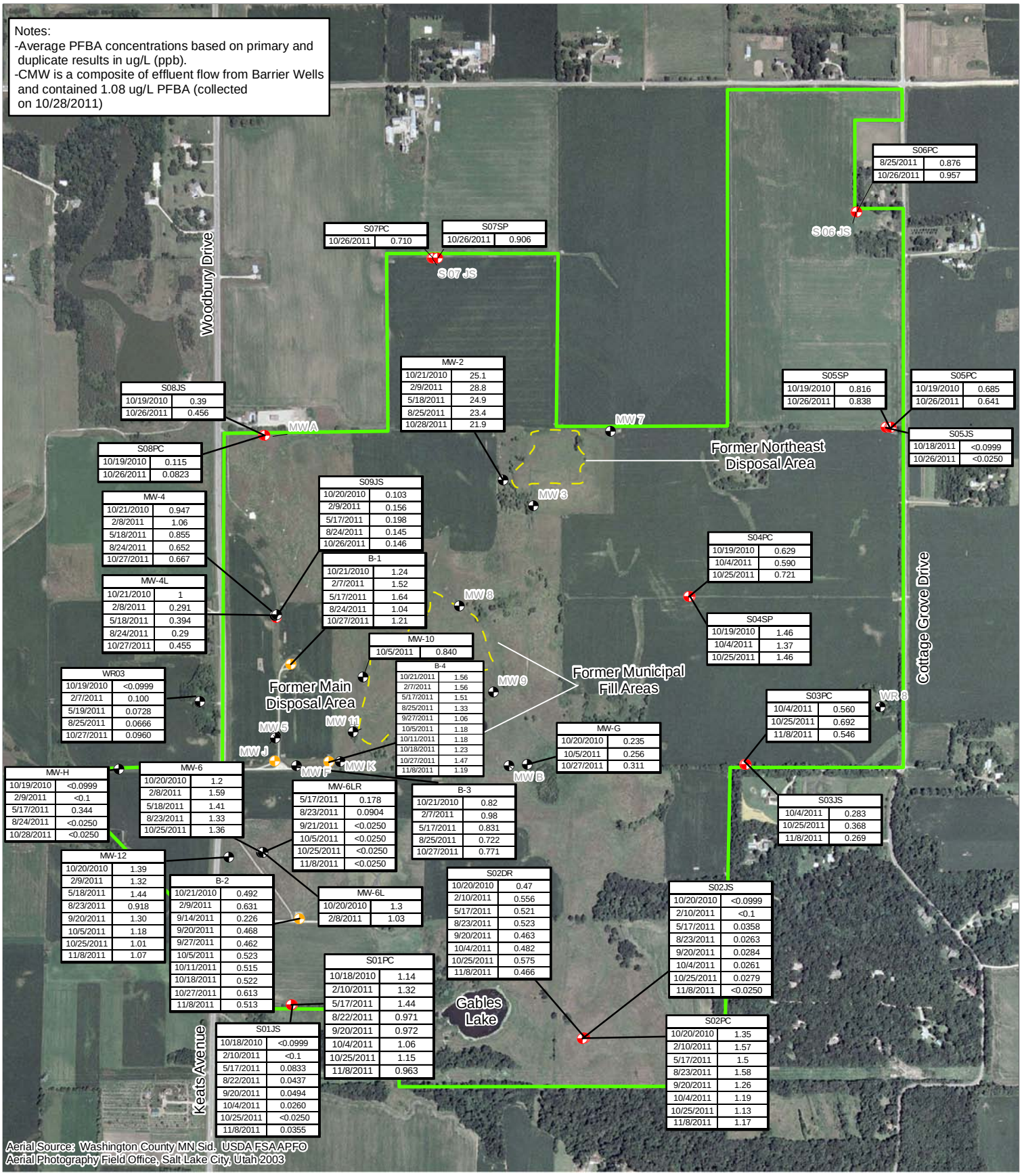
4.2.3 Groundwater Elevation Contour Maps

Groundwater elevation contour maps were created for the shallow, upper Prairie du Chien, and the Jordan Sandstone units using water-level data collected May 19, 2011. Monitor wells completed in different hydrostratigraphic units (e.g. glacial drift, St. Peter Sandstone, Upper Prairie du Chien Group) were used to construct the shallow groundwater elevation contour maps since the water table exists within different units across the site.

Figures 4-4, 4-5 and 4-6 present groundwater elevation maps constructed using October 21, 2010 data for the shallow, upper Prairie du Chien, and Jordan units, respectively. These maps were constructed while Barrier Wells B-1, B-2, B-3, and B-4 were all operating normally prior to the pumping reduction implemented in March 2011. The hydraulic gradient in all three groundwater units in the vicinity of Barrier Well B-2 is toward Barrier Wells B-3 and B-4.

Figures 4-7, 4-8 and 4-9 present groundwater elevation contour maps for May 19, 2011 for the shallow groundwater system, upper Prairie du Chien Group, and Jordan Sandstone unit, respectively. Water level data collected on this date presents site conditions approximately 2 months after the reduction in pumping occurred. The groundwater elevation contours and interpreted groundwater flowlines depicted on Figures 4-7, 4-8, and 4-9 clearly indicate an inward hydraulic gradient toward Barrier Wells B-1, B-3, and B-4 present across the site in all three units. The configuration of the groundwater elevation contours in the May contour maps are comparable to those for October 2010 prior to the reduction in pumping. As shown in these figures, the groundwater flowlines beneath the Northeast and Main Disposal Areas are primarily toward Barrier Wells B-1 and B-4. These two Barrier Wells are closest to the former disposal areas and also operate at the highest flow rates. No changes in flow direction were identified and the configuration of the groundwater elevation contours and flowlines are consistent with data collected during previous hydrogeologic investigations performed in 2007 and 2008, by WESTON.

Figures 4-10, 4-11 and 4-12 present groundwater elevation contour maps for October 31, 2011 for the shallow groundwater system, upper Prairie du Chien Group, and Jordan Sandstone unit, respectively. Water level data collected on this date presents site conditions approximately 1.5 months after Barrier Well B-2 was turned back on and the flow rate at Barrier Well B-3 was increased. The groundwater contours in the October 31, 2011 maps (when Barrier Wells were returned to normal pumping conditions) are comparable to the groundwater contours in the May 19, 2011 maps (when the initial reduction in pumping had been fully implemented and established). This comparison, therefore, shows that the same level of groundwater capture was being achieved when the initial pumping reduction had been implemented as that achieved during pre-reduction pumping conditions.



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Approximate Disposal Area Boundaries
- Site Boundary

Note: Results are in ppb

N W E S

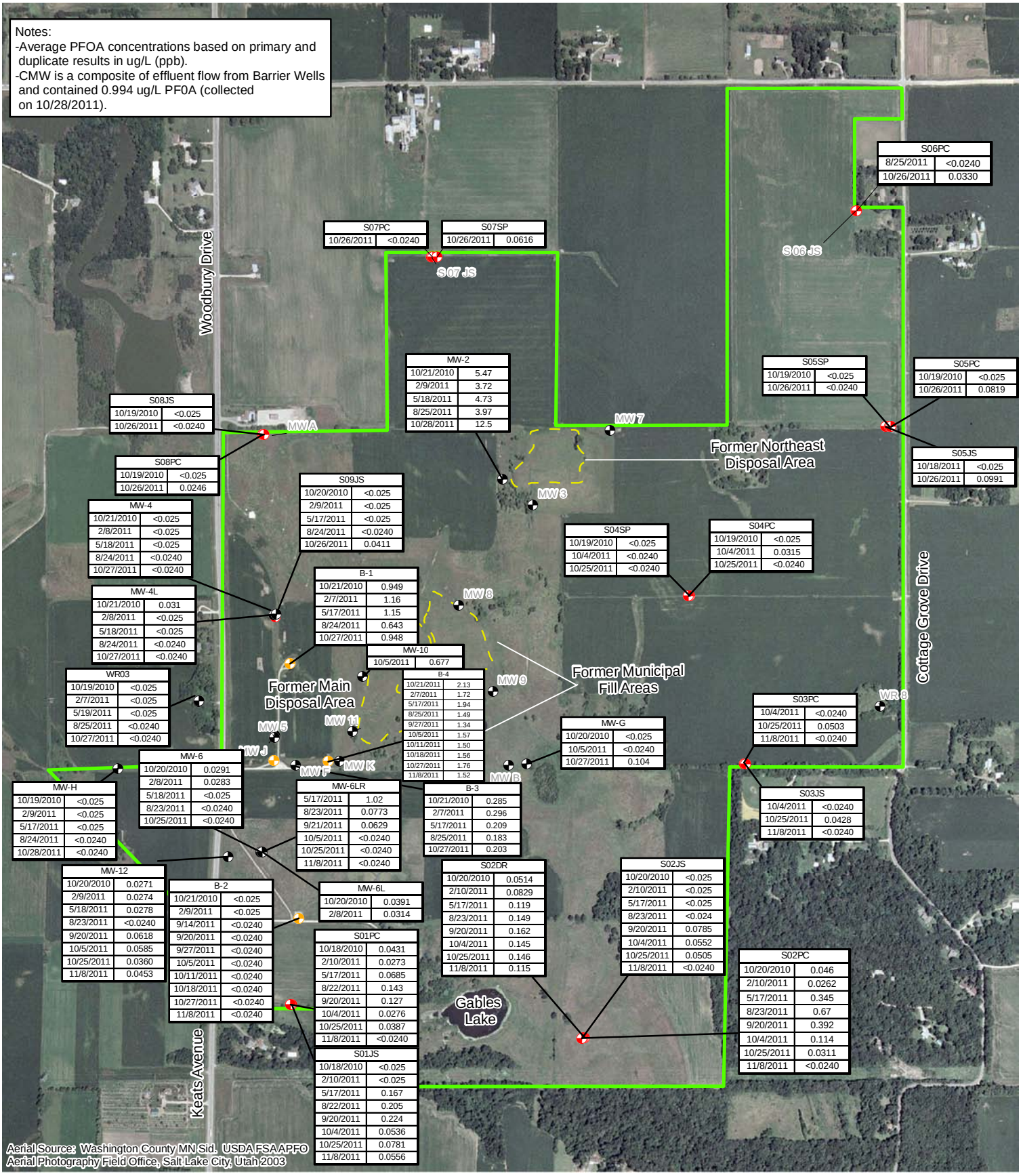
0 500 1,000 Feet

WESTON SOLUTIONS

FIGURE 4-1

PFBA SAMPLING RESULTS

3M WOODBURY SITE
WOODBURY, MN



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Approximate Disposal Area Boundaries
- Site Boundary

Note: Results are in ppb

N W E S

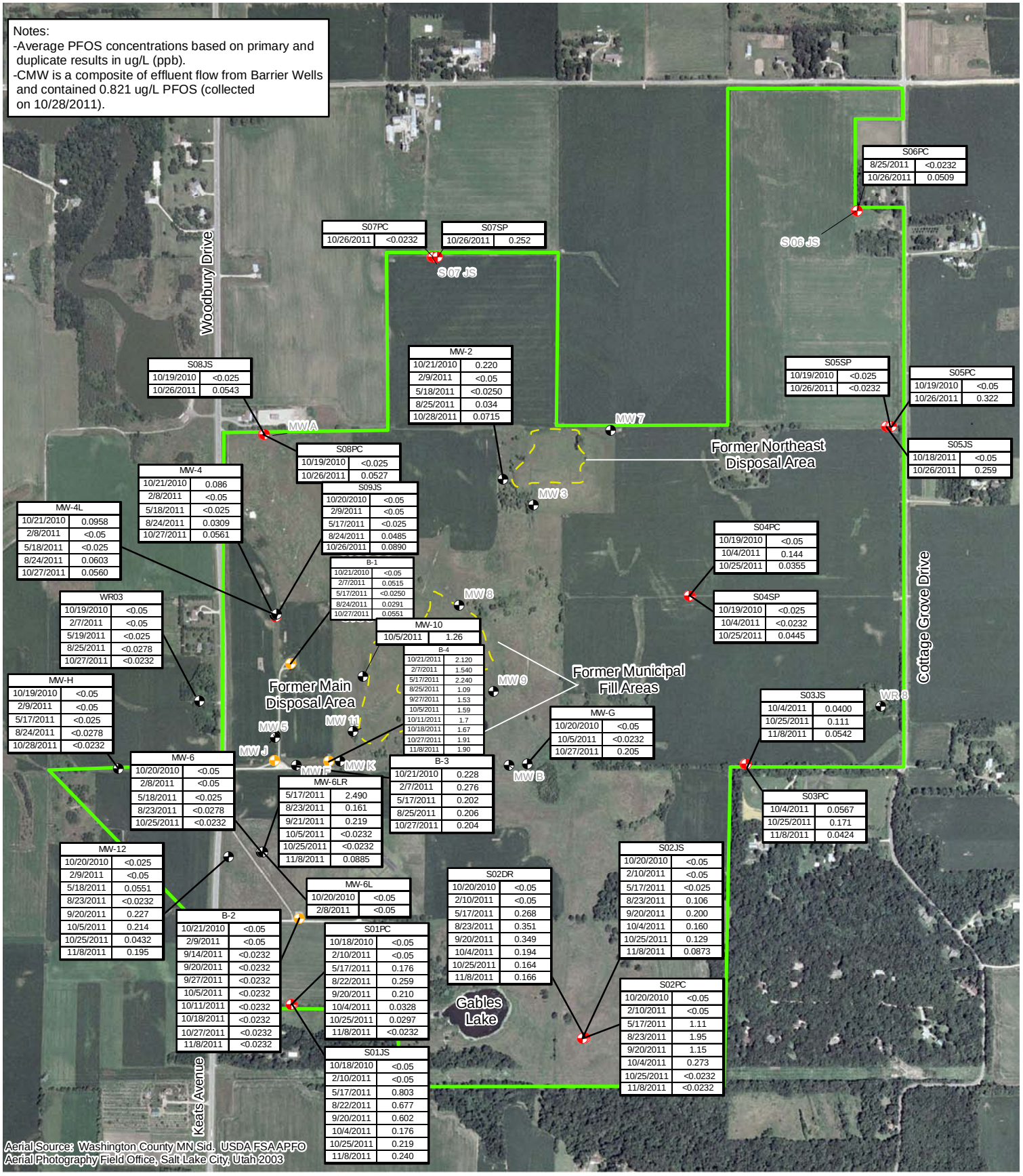
0 500 1,000 Feet

WESTON SOLUTIONS

FIGURE 4-2

PFOA SAMPLING RESULTS

3M WOODBURY SITE
WOODBURY, MN



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Approximate Disposal Area Boundaries
- Site Boundary

Note: Results are in ppb

N W E S

0 500 1,000 Feet

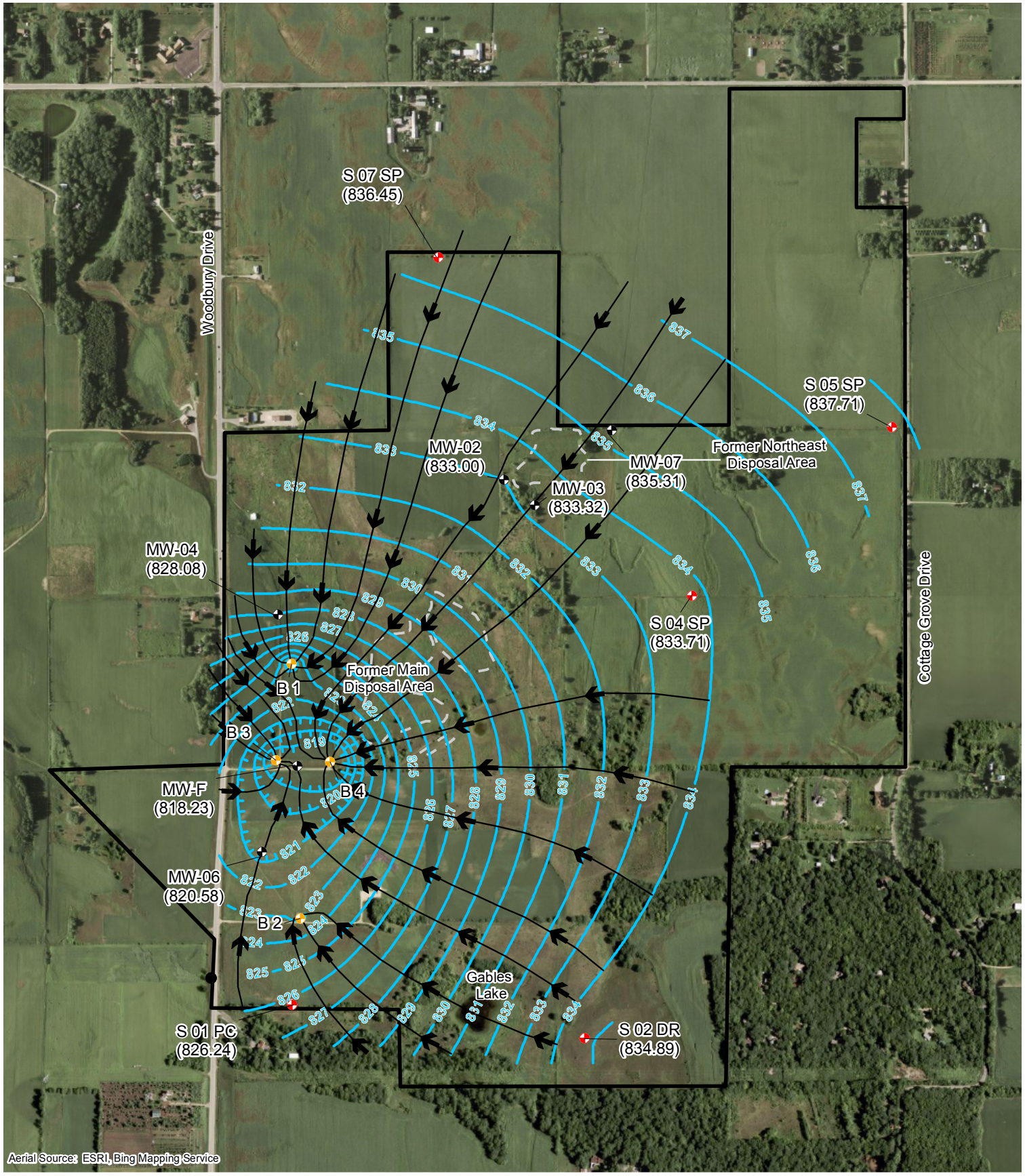
WESTON SOLUTIONS

FIGURE 4-3

PFOS SAMPLING RESULTS

3M WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\PFOS_2011_November_11_29_2011.mxd, 11/29/2011 3:53:02 PM, johna



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (836.82) Groundwater Elevation (ft.msl)
- Site Boundary

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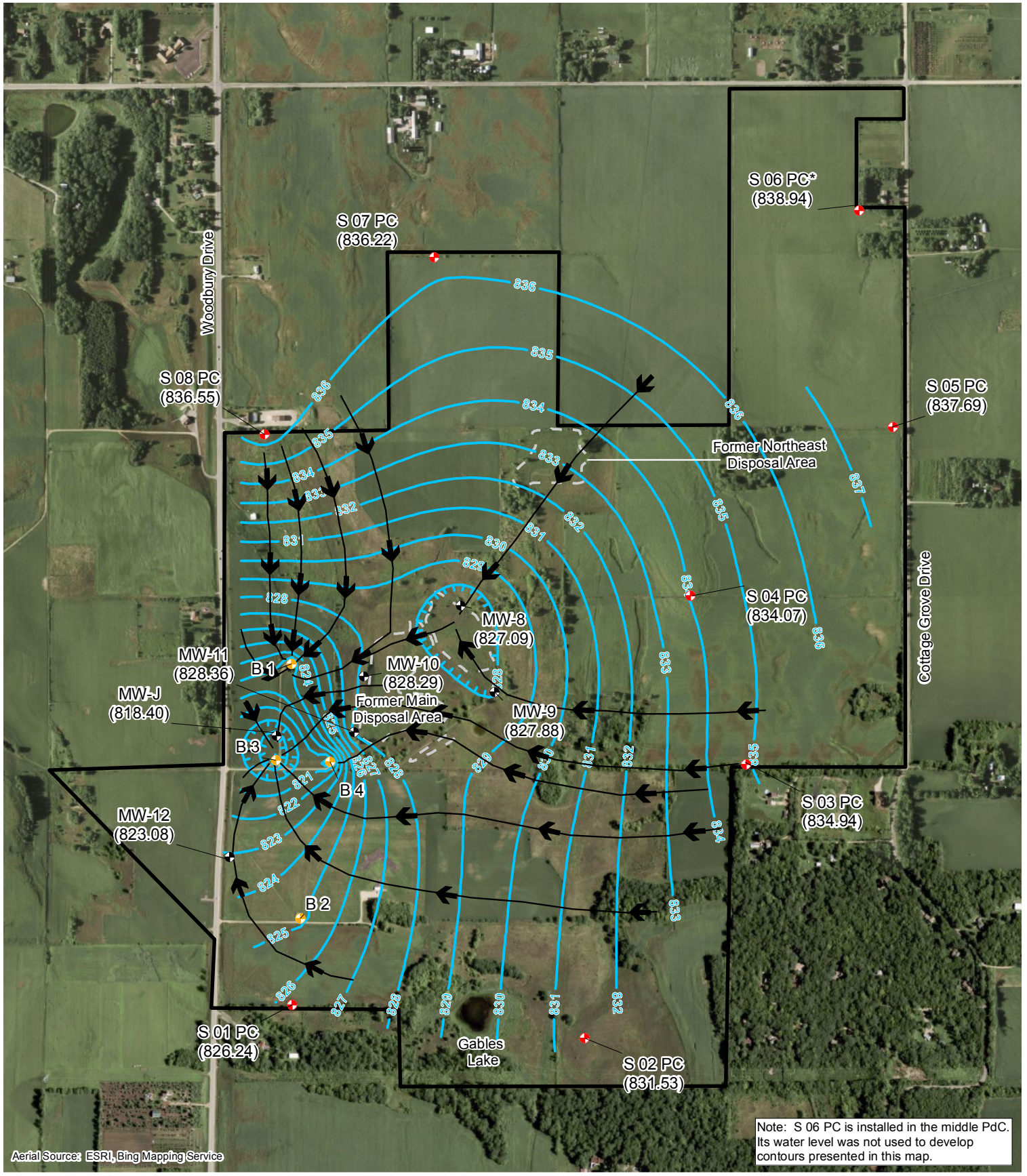
WESTON SOLUTIONS

FIGURE 4-4

GROUNDWATER ELEVATION CONTOUR MAP
SHALLOW WELLS-
PUMPING CONDITIONS
21 OCTOBER 2010

WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\Shallow_MW_Oct2010.mxd, 11/17/2011 1:35:53 PM, ricksc



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (828.53) Groundwater Elevation (ft.msl)
- Site Boundary

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0 500 1,000 Feet

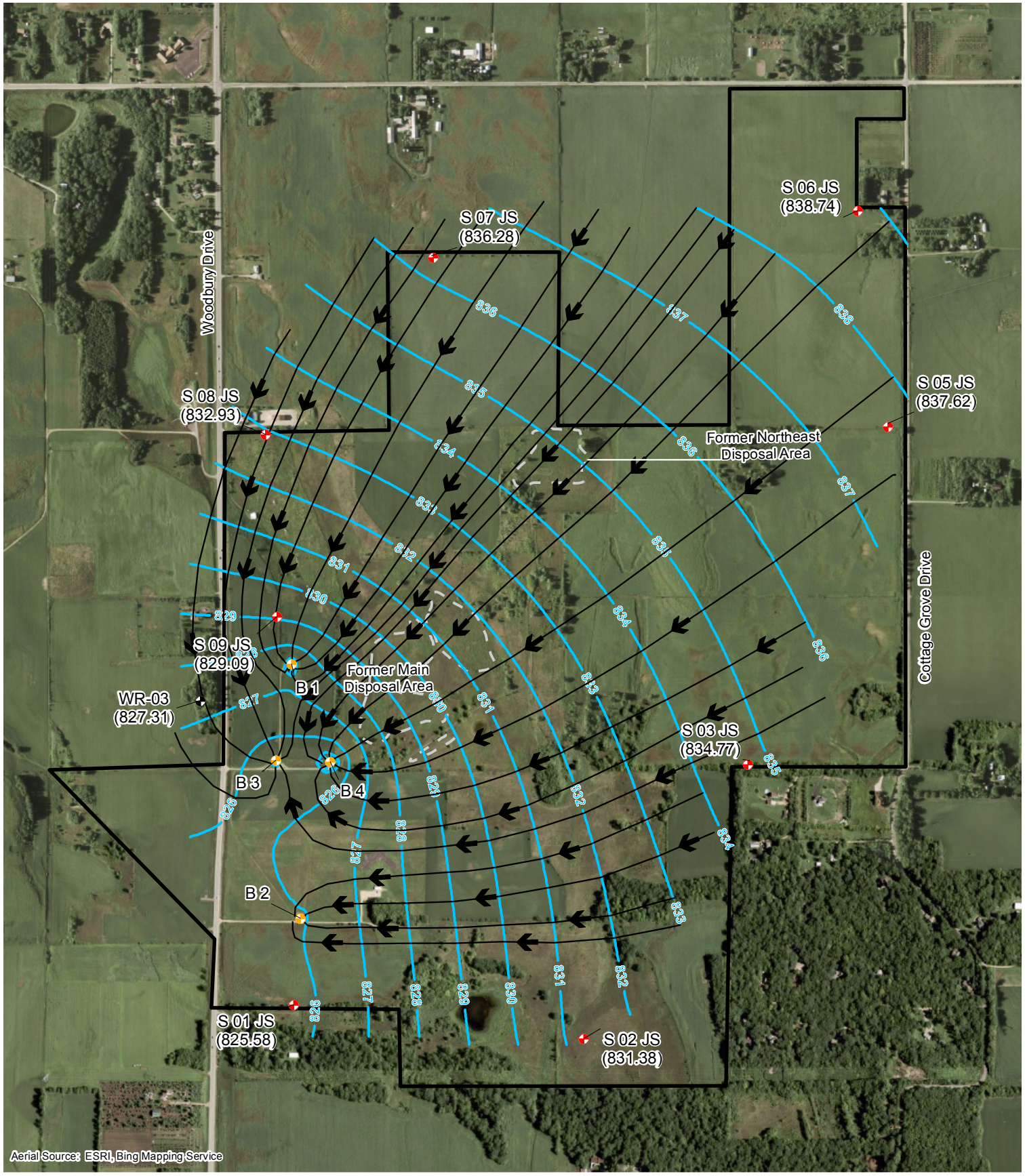
WESTON SOLUTIONS

FIGURE 4-5

GROUNDWATER ELEVATION CONTOUR MAP
SHALLOW PRAIRIE DU CHIEN WELLS
PUMPING CONDITIONS
21 OCTOBER 2010

3M WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\PDC_MW_Oct2010.mxd, 11/17/2011 10:01:33 AM, ricksc



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (833.22) Groundwater Elevation (ft.msl)
- Site Boundary

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0 500 1,000
Feet

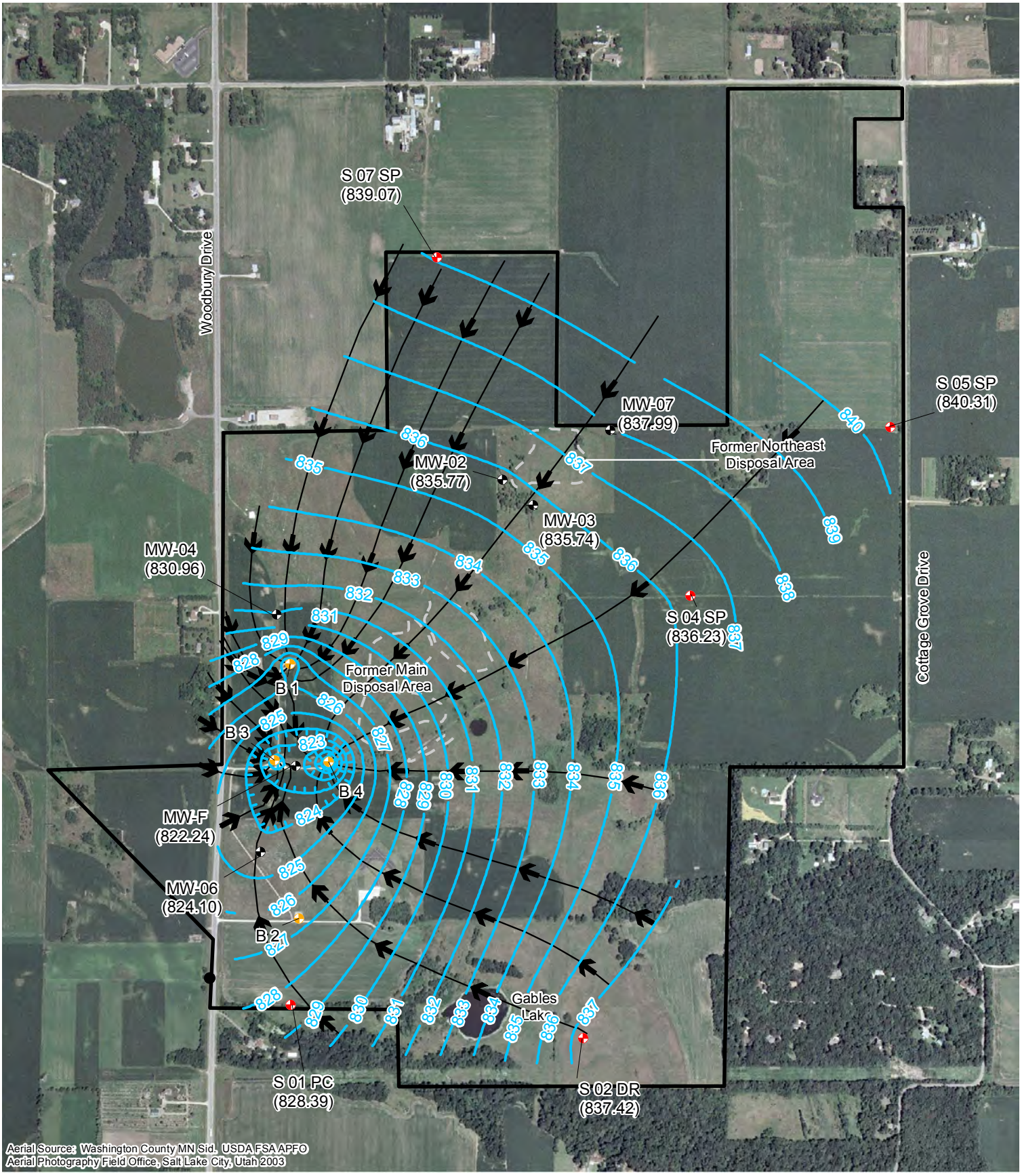
WESTON SOLUTIONS

FIGURE 4-6

GROUNDWATER ELEVATION CONTOUR MAP
JORDAN AQUIFER-
21 OCTOBER 2010

3M WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\Jordan_MW_Oct2010.mxd, 11/17/2011 12:24:19 PM, ricksc



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (836.82) Groundwater Elevation (ft.msl)
- Site Boundary

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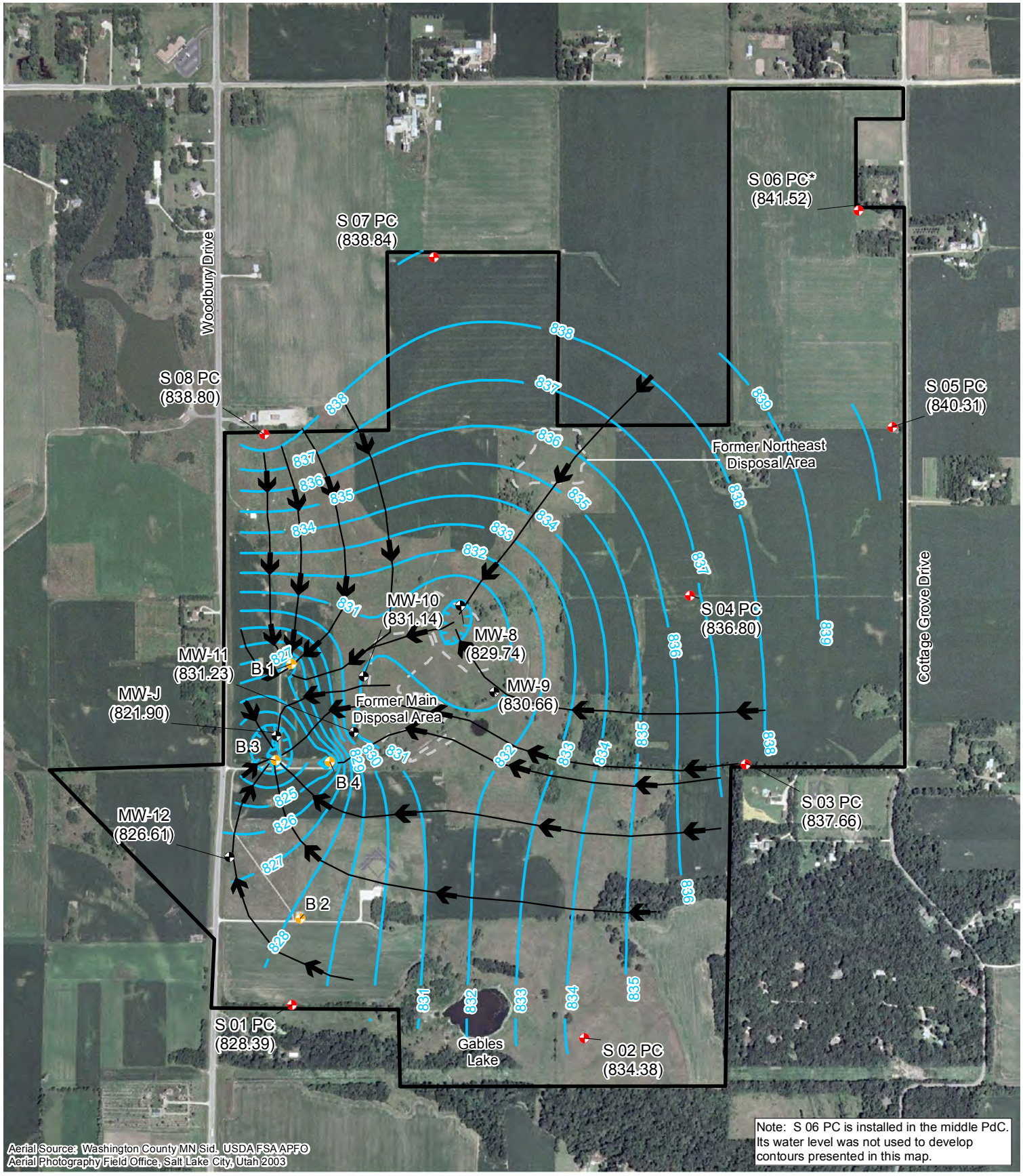
0 500 1,000 Feet

FIGURE 4-7

GROUNDWATER ELEVATION CONTOUR MAP
SHALLOW WELLS-
PUMPING CONDITIONS
19 MAY 2011

WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\Shallow_MW_May2011.mxd, 9/19/2011 4:33:49 PM, ricksc



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (828.53) Groundwater Elevation (ft.msl)
- Site Boundary

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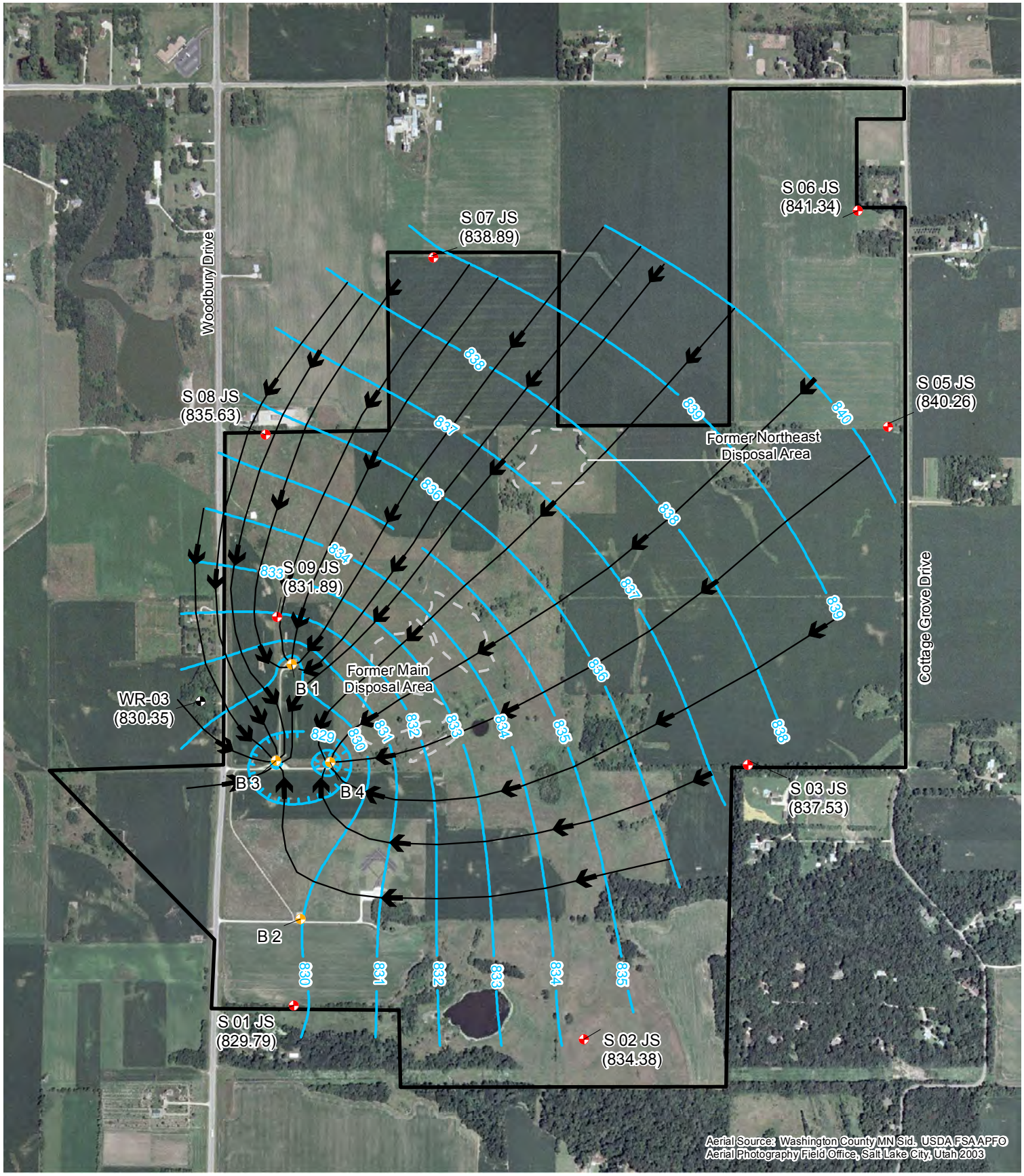
WESTON SOLUTIONS

FIGURE 4-8

GROUNDWATER ELEVATION CONTOUR MAP
SHALLOW PRAIRIE DU CHIEN WELLS
PUMPING CONDITIONS
19 MAY 2011

3M WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\PDC_MW_May2011.mxd, 9/26/2011 3:23:41 PM, ricksc



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (833.22) Groundwater Elevation (ft.msl)
- Site Boundary

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0 500 1,000 Feet

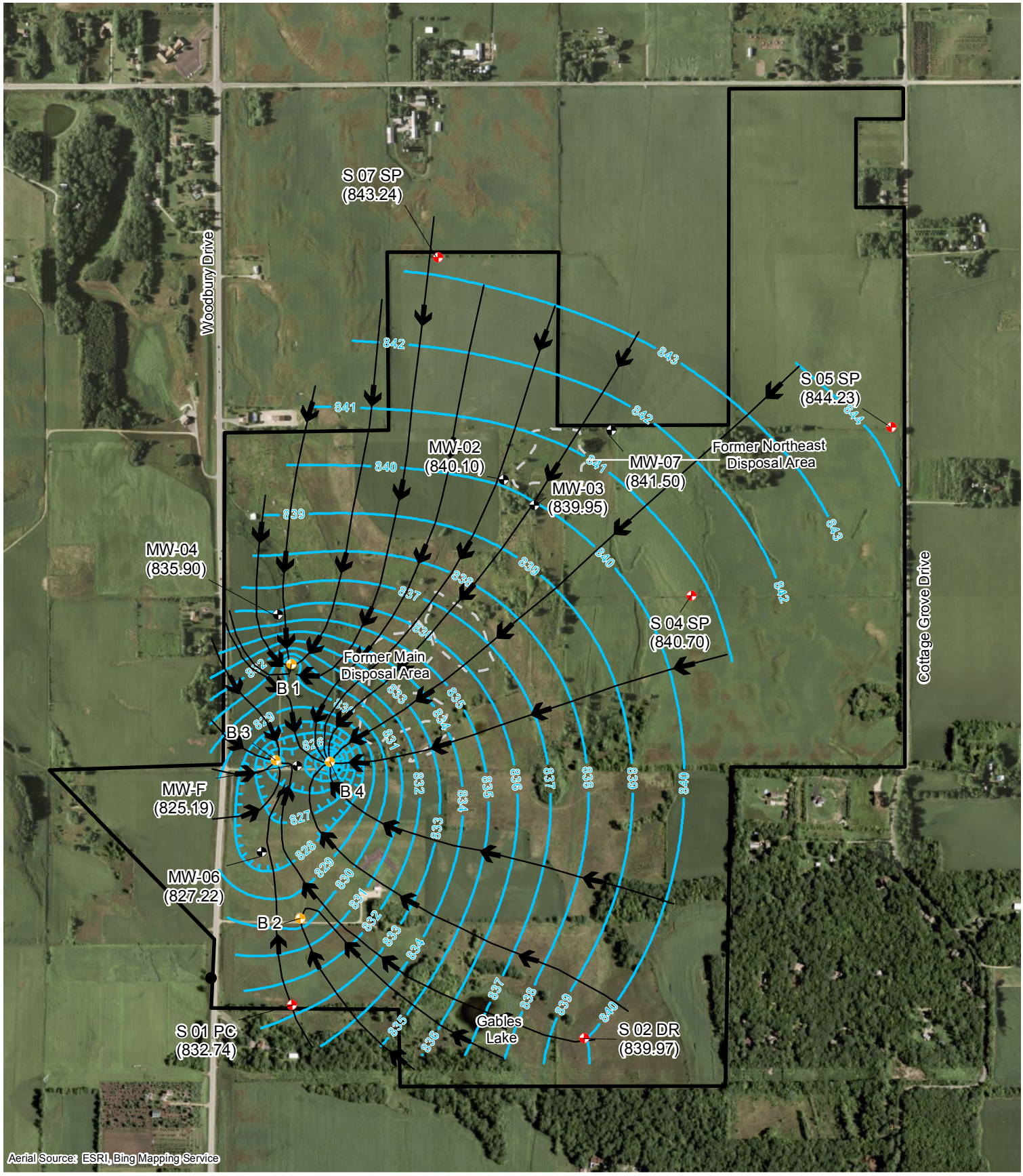
WESTON SOLUTIONS

FIGURE 4-9

GROUNDWATER ELEVATION CONTOUR MAP
JORDAN AQUIFER-
19 MAY 2011

3M WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\Jordan_MW_May2011.mxd, 9/26/2011 4:57:35 PM, ricksc



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (836.82) Groundwater Elevation (ft.msl)
- Site Boundary

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0 500 1,000 Feet

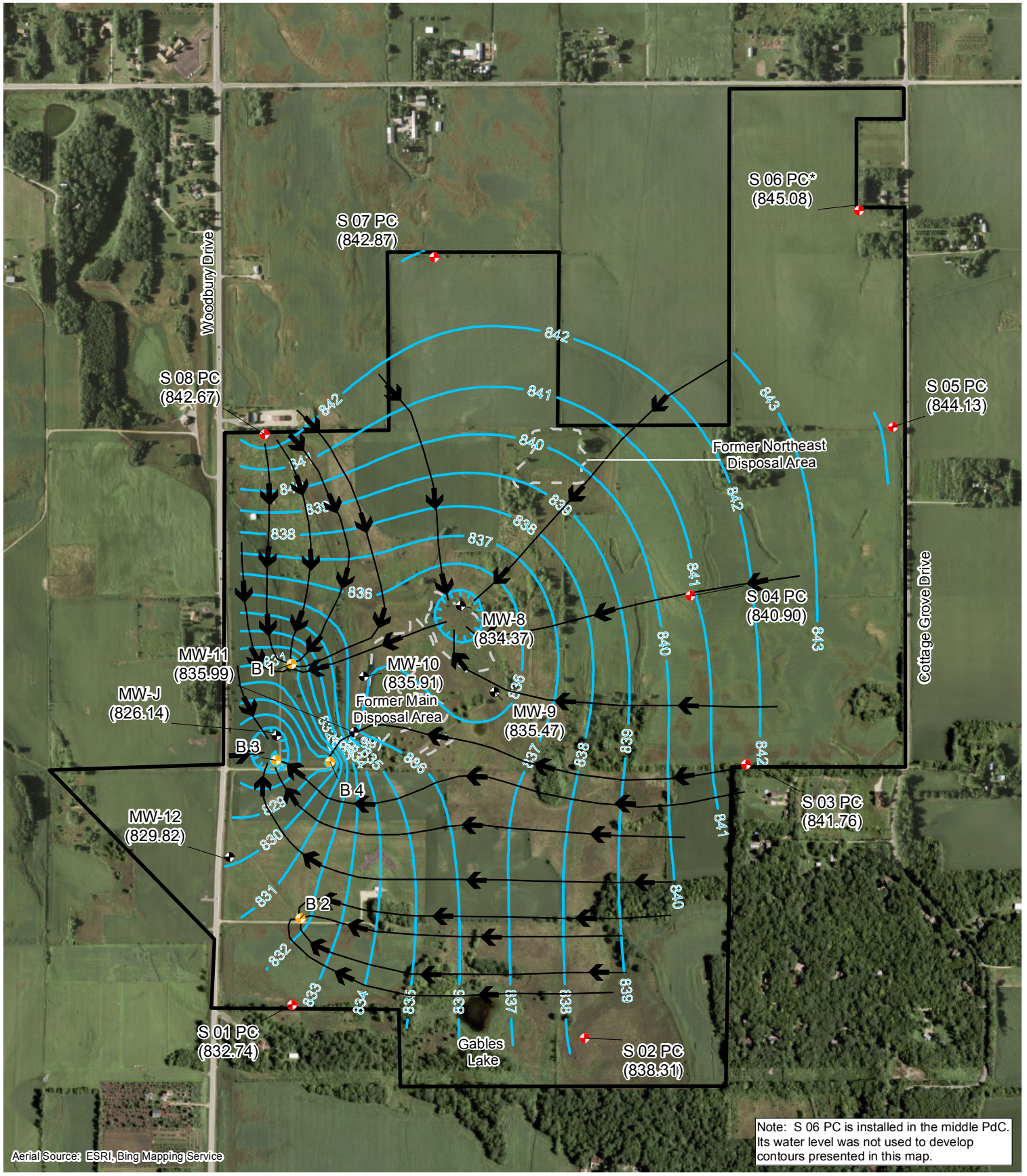
WESTON SOLUTIONS

FIGURE 4-10

GROUNDWATER ELEVATION CONTOUR MAP
SHALLOW WELLS-
PUMPING CONDITIONS
31 OCTOBER 2011

WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\Shallow_MW_Oct2011.mxd, 11/17/2011 10:25:22 AM, ricksc



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (828.53) Groundwater Elevation (ft.msl)
- Site Boundary

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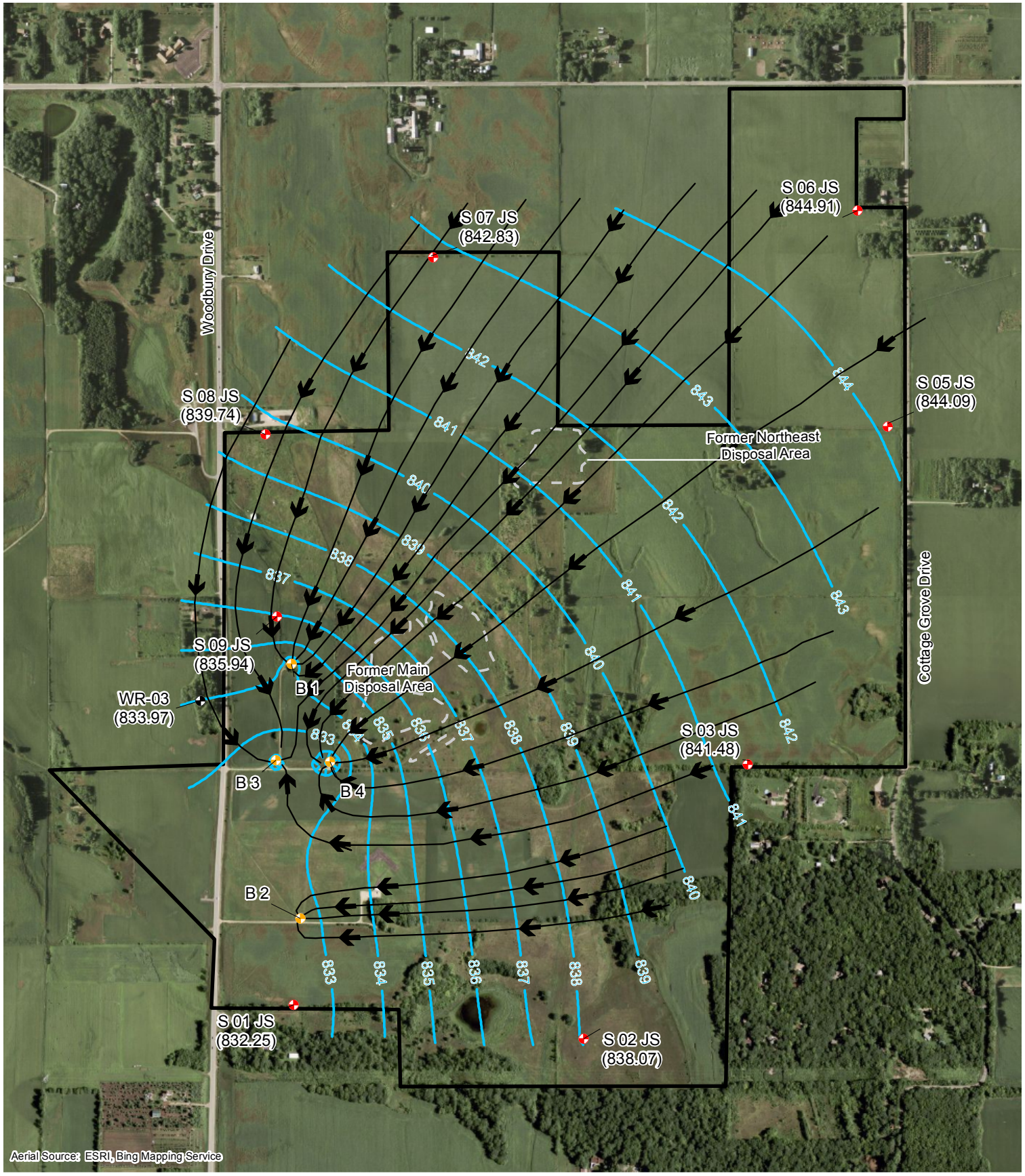
0 500 1,000 Feet

WESTON SOLUTIONS

FIGURE 4-11

GROUNDWATER ELEVATION CONTOUR MAP
SHALLOW PRAIRIE DU CHIEN WELLS
PUMPING CONDITIONS
31 OCTOBER 2011

3M WOODBURY SITE
WOODBURY, MN



Legend:

- Monitoring Well Locations
- Sentinel Well Locations
- Barrier Well Locations
- Groundwater Elevation Contour (contour interval 1 foot)
- Groundwater Flowlines
- (833.22) Groundwater Elevation (ft.msl)
- Site Boundary

N
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0 500 1,000 Feet

FIGURE 4-12

GROUNDWATER ELEVATION CONTOUR MAP
JORDAN AQUIFER-
21 OCTOBER 2010

3M WOODBURY SITE
WOODBURY, MN

File: Y:\3MWoodbury\MXD\Jordan_MW_Oct2011.mxd, 11/17/2011 10:42:07 AM, ricksc

Table 4-1
Summary of Groundwater PFC Analytical Data
October 2010-November 2011 Sampling Events
Woodbury Site, Woodbury, MN

Well ID	DATE	PFBA (ppb, ug/L)	PFPeA (ppb, ug/L)	PFHxA (ppb, ug/L)	PFHpA (ppb, ug/L)	PFOA (ppb, ug/L)	PFBS (ppb, ug/L)	PFHS (ppb, ug/L)	PFOS (ppb, ug/L)
Sentinel Wells									
S01JS	10/18/2010	<0.0999	---	---	---	<0.025	---	---	<0.05
	2/10/2011	<0.1	---	---	---	<0.025	---	---	<0.05
	5/17/2011	0.0833	---	---	---	0.167	---	<0.025	0.803
	8/22/2011	0.0437	---	---	---	0.205	<0.025	<0.025	0.677
	9/20/2011	0.0494	---	---	---	0.224	---	<0.025	0.602
	10/4/2011	0.0260	---	---	---	0.0536	---	---	0.176
	10/25/2011	<0.0250	<0.0250	<0.0500	<0.0250	0.0781	<0.0250	<0.0250	0.219
(MPCA SPLIT)	10/25/2011	0.030 J	<0.050	<0.050	---	0.0700	<0.050	<0.050	0.21
	11/8/2011	0.0355	---	---	---	0.0556	---	---	0.240
S01PC	10/18/2010	1.14	---	---	---	0.0431	---	---	<0.05
	2/10/2011	1.32	---	---	---	0.0273	---	---	<0.05
	5/17/2011	1.44	---	---	---	0.0685	---	0.0331	0.176
	8/22/2011	0.971	---	---	---	0.143	<0.025	<0.025	0.259
	9/20/2011	0.972	---	---	---	0.127	---	0.0274	0.210
	10/4/2011	1.06	---	---	---	0.0276	---	---	0.0328
	10/25/2011	1.15	0.0532	<0.0500	<0.0250	0.0387	<0.0250	<0.0250	0.0297
(MPCA SPLIT)	10/25/2011	1.1	0.040 J	0.014 J	---	0.034 J	0.010 J	0.019 J	0.034 J
	11/8/2011	0.963	---	---	---	<0.0240	---	---	<0.0232
S02DR	10/20/2010	0.47	---	---	---	0.0514	---	---	<0.05
	2/10/2011	0.556	---	---	---	0.0829	---	---	<0.05
	5/17/2011	0.521	---	---	---	0.119	---	0.0544	0.268
	8/23/2011	0.523	---	---	---	0.149	<0.025	0.0589	0.351
	9/20/2011	0.463	---	---	---	0.162	---	0.0561	0.349
	10/4/2011	0.482	---	---	---	0.145	---	---	0.194
	10/25/2011	0.575	0.0451	<0.0500	0.0306	0.146	<0.0250	0.0620	0.164
(MPCA SPLIT)	10/25/2011	0.52	0.031 J	0.017 J	---	0.099	<0.050	0.056	0.15
	11/8/2011	0.466	---	---	---	0.115	---	---	0.166
S02JS	10/20/2010	<0.0999	---	---	---	<0.025	---	---	<0.05
	2/10/2011	<0.1	---	---	---	<0.025	---	---	<0.05
	5/17/2011	0.0358	---	---	---	<0.025	---	<0.025	<0.025
	8/23/2011	0.0263	---	---	---	<0.024	<0.025	<0.025	0.106
	9/20/2011	0.0284	---	---	---	0.0785	---	<0.025	0.200
	10/4/2011	0.0261	---	---	---	0.0552	---	---	0.160
	10/25/2011	0.0279	<0.0250	<0.0500	<0.0250	0.0505	<0.0250	<0.0250	0.129
(MPCA SPLIT)	10/25/2011	0.041 J	<0.050	<0.050	---	0.045 J	<0.050	<0.050	0.13
	11/8/2011	<0.0250	---	---	---	<0.0240	---	---	0.0873
S02PC	10/20/2010	1.35	---	---	---	0.046	---	---	<0.05
	2/10/2011	1.57	---	---	---	0.0262	---	---	<0.05
	5/17/2011	1.5	---	---	---	0.345	---	0.131	1.11
	8/23/2011	1.58	---	---	---	0.67	0.0255	0.192	1.95
	9/20/2011	1.26	---	---	---	0.392	---	0.135	1.15
	10/4/2011	1.19	---	---	---	0.114	---	---	0.273
	10/25/2011	1.13	0.0476	<0.0500	<0.0250	0.0311	<0.0250	0.0486	<0.0232
(MPCA SPLIT)	10/25/2011	1.3	0.046 J	<0.050	---	0.030 J	<0.050	0.049 J	0.011 J
	11/8/2011	1.17	---	---	---	<0.0240	---	---	<0.0232
S03JS	10/4/2011	0.283	---	---	---	<0.0240	---	---	0.0400
	10/25/2011	0.368	<0.0250	<0.0500	<0.0250	0.0428	<0.0250	<0.0250	0.111
(MPCA SPLIT)	10/25/2011	0.32	<0.050	<0.050	---	0.027 J	<0.050	0.010 J	0.096
	11/8/2011	0.269	---	---	---	<0.0240	---	---	0.0542

Table 4-1 (Cont'd)
Summary of Groundwater PFC Analytical Data
October 2010-November 2011 Sampling Events
Woodbury Site, Woodbury, MN

Well ID	DATE	PFBA (ppb, ug/L)	PFPeA (ppb, ug/L)	PFHxA (ppb, ug/L)	PFHpA (ppb, ug/L)	PFOA (ppb, ug/L)	PFBS (ppb, ug/L)	PFHS (ppb, ug/L)	PFOS (ppb, ug/L)
Sentinel Wells (continued)									
S03PC	10/4/2011	0.560	---	---	---	<0.0240	---	---	0.0567
	10/25/2011	0.692	0.0298	<0.0500	<0.0250	0.0503	<0.0250	<0.0250	0.171
(MPCA SPLIT)	10/25/2011	0.61	0.018 J	<0.050	---	0.031 J	<0.050	0.016 J	0.15
	11/8/2011	0.546	---	---	---	<0.0240	---	---	0.0424
S04PC	10/19/2010	0.629	---	---	---	<0.025	---	---	<0.05
	10/4/2011	0.590	---	---	---	0.0315	---	---	0.144
	10/25/2011	0.721	<0.0250	<0.0500	<0.0250	<0.0240	<0.0250	<0.0250	0.0355
(MPCA SPLIT)	10/25/2011	0.69	<0.050	<0.050	---	<0.050	<0.050	<0.050	0.041 J
S04SP	10/19/2010	1.46	---	---	---	<0.025	---	---	<0.025
	10/4/2011	1.37	---	---	---	<0.0240	---	---	<0.0232
	10/25/2011	1.46	0.0614	<0.0500	<0.0250	<0.0240	<0.0250	NR	0.0445
(MPCA SPLIT)	10/25/2011	1.4	0.045 J	0.015 J	---	<0.050 QP	<0.050	<0.050	0.042 J
S05JS	10/18/2011	<0.0999	---	---	---	<0.025	---	---	<0.05
	10/26/2011	<0.0250	<0.0250	<0.0500	<0.0250	0.0991	<0.0250	<0.0250	0.259
(MPCA SPLIT)	10/26/2011	0.023 QP,J	<0.050	<0.050 QP	---	0.094 QP	<0.050 QD,QP	<0.050	0.28
S05PC	10/19/2010	0.685	---	---	---	<0.025	---	---	<0.05
	10/26/2011	0.641	<0.0250	<0.0500	<0.0250	0.0819	<0.0250	<0.0250	0.322
(MPCA SPLIT)	10/26/2011	0.56	<0.050	<0.050	---	0.059 QP	<0.050	<0.050	0.30
(MPCA SPLIT-DUP)	10/26/2011	0.59	<0.050	<0.050	---	0.072 QP	<0.050	0.015 J	0.29
S05SP	10/19/2010	0.816	---	---	---	<0.025	---	---	<0.025
	10/26/2011	0.838	0.0365	<0.0500	<0.0250	<0.0240	<0.0250	<0.0250	<0.0232
(MPCA SPLIT)	10/26/2011	0.78	0.033 J	<0.050	---	<0.050	<0.050	<0.050	0.009 J
S06PC	8/25/2011	0.876	---	---	---	<0.0240	<0.0250	<0.025	<0.0232
	10/26/2011	0.957	0.0334	<0.0500	<0.0250	0.0330	<0.0250	<0.0250	0.0509
(MPCA SPLIT)	10/26/2011	0.88	0.034 J	<0.050	---	0.027 QP,J	<0.050	<0.050	0.050
S07PC	10/26/2011	0.710	0.0373	<0.0500	<0.0250	<0.0240	<0.0250	<0.0250	<0.0232
(MPCA SPLIT)	10/26/2011	0.70	0.029 J	<0.050	---	<0.050	<0.050	<0.050	0.015 J
S07SP	10/26/2011	0.906	0.0389	<0.0500	<0.0250	0.0616	<0.0250	<0.0250	0.252
(MPCA SPLIT)	10/26/2011	0.85	0.024 J	0.019 J	---	0.043 J	<0.050	0.014 J	0.22
S08JS	10/19/2010	0.39	---	---	---	<0.025	---	---	<0.025
	10/26/2011	0.456	<0.0250	<0.0500	<0.0250	<0.0240	<0.0250	<0.0250	0.0543
(MPCA SPLIT)	10/26/2011	0.43	<0.050	<0.050	---	<0.050	<0.050	<0.050	0.055
S08PC	10/19/2010	0.115	---	---	---	<0.025	---	---	<0.025
	10/26/2011	0.0823	<0.0250	<0.0500	<0.0250	0.0246	<0.0250	<0.0250	0.0527
(MPCA SPLIT)	10/26/2011	0.10	<0.050	<0.050	---	0.020 J	<0.050	<0.050	0.053
S09JS	10/20/2010	0.103	---	---	---	<0.025	---	---	<0.05
	2/9/2011	0.156	---	---	---	<0.025	---	---	<0.05
	5/17/2011	0.198	---	---	---	<0.025	---	<0.025	<0.025
	8/24/2011	0.145	---	---	---	<0.0240	<0.0250	0.0264	0.0485
	10/26/2011	0.146	<0.0250	<0.0500	<0.0250	0.0411	<0.0250	<0.0250	0.0890
(MPCA SPLIT)	10/26/2011	0.15	<0.050	<0.050	---	0.036 J	<0.050	0.016 J	0.091

Table 4-1 (Cont'd)
Summary of Groundwater PFC Analytical Data
October 2010-November 2011 Sampling Events
Woodbury Site, Woodbury, MN

Well ID	DATE	PFBA (ppb, ug/L)	PFPeA (ppb, ug/L)	PFHxA (ppb, ug/L)	PFHpA (ppb, ug/L)	PFOA (ppb, ug/L)	PFBS (ppb, ug/L)	PFHS (ppb, ug/L)	PFOS (ppb, ug/L)
Barrier Wells									
B-1	10/21/2010	1.24	---	---	---	0.949	---	---	<0.05
	2/7/2011	1.52	---	---	---	1.16	---	---	0.0515
	5/17/2011	1.64	---	---	---	1.15	---	1.01	<0.0250
	8/24/2011	1.04	---	---	---	0.643	0.805	0.628	0.0291
	10/27/2011	1.21	0.309	0.456	0.0939	0.948	0.939	0.783	0.0551
B-2	10/21/2010	0.492	---	---	---	<0.025	---	---	<0.05
	2/9/2011	0.631	---	---	---	<0.025	---	---	<0.05
	9/14/2011	0.226	---	---	---	<0.0240	---	---	<0.0232
	9/20/2011	0.468	---	---	---	<0.0240	---	<0.0250	<0.0232
	9/27/2011	0.462	---	---	---	<0.0240	---	---	<0.0232
	10/5/2011	0.523	---	---	---	<0.0240	---	---	<0.0232
	10/11/2011	0.515	---	---	---	<0.0240	---	---	<0.0232
	10/18/2011	0.522	---	---	---	<0.0240	---	---	<0.0232
	10/27/2011	0.613	<0.0250	<0.0500	<0.0250	<0.0240	<0.0250	<0.0250	<0.0232
	11/8/2011	0.513	---	---	---	<0.0240	---	---	<0.0232
B-3	10/21/2010	0.82	---	---	---	0.285	---	---	0.228
	2/7/2011	0.98	---	---	---	0.296	---	---	0.276
	5/17/2011	0.831	---	---	---	0.209	---	1.33	0.202
	8/25/2011	0.722	---	---	---	0.183	0.332	1.21	0.206
	10/27/2011	0.771	0.0674	0.104	0.0469	0.203	0.306	1.10	0.204
B-4	10/21/2011	1.56	---	---	---	2.13	---	---	2.120
	2/7/2011	1.56	---	---	---	1.72	---	---	1.540
	5/17/2011	1.51	---	---	---	1.94	---	7.89	2.240
	8/25/2011	1.33	---	---	---	1.49	2	6.69	1.09
	9/27/2011	1.06	---	---	---	1.34	---	---	1.53
	10/5/2011	1.18	---	---	---	1.57	---	---	1.59
	10/11/2011	1.18	---	---	---	1.50	---	---	1.7
	10/18/2011	1.23	---	---	---	1.56	---	---	1.67
	10/27/2011	1.47	0.274	0.512	0.265	1.76	2.10	7.19	1.91
	11/8/2011	1.19	---	---	---	1.52	---	---	1.90
Monitoring Wells									
MW2	10/21/2010	25.1	---	---	---	5.47	---	---	0.220
	2/9/2011	28.8	---	---	---	3.72	---	---	<0.05
	5/18/2011	24.9	---	---	---	4.73	---	0.601	<0.0250
	8/25/2011	23.4	---	---	---	3.97	4.03	0.946	0.034
	10/28/2011	21.9	3.99	3.88	0.666	12.5	9.49	6.95	0.0715
MW4	10/21/2010	0.947	---	---	---	<0.025	---	---	0.086
	2/8/2011	1.06	---	---	---	<0.025	---	---	<0.05
	5/18/2011	0.855	---	---	---	<0.025	---	0.0328	<0.025
	8/24/2011	0.652	---	---	---	<0.0240	<0.0250	0.0431	0.0309
	10/27/2011	0.667	0.0751	0.0633	<0.0250	<0.0240	<0.0250	0.0578	0.0561
MW4L	10/21/2010	1	---	---	---	0.031	---	---	0.0958
	2/8/2011	0.291	---	---	---	<0.025	---	---	<0.05
	5/18/2011	0.394	---	---	---	<0.025	---	0.0664	<0.025
	8/24/2011	0.29	---	---	---	<0.0240	0.0558	0.0735	0.0603
	10/27/2011	0.455	0.0313	<0.0500	<0.0250	<0.0240	0.0267	0.0586	0.0560
MW6	10/20/2010	1.2	---	---	---	0.0291	---	---	<0.05
	2/8/2011	1.59	---	---	---	0.0283	---	---	<0.05
	5/18/2011	1.41	---	---	---	<0.025	---	0.0486	<0.025
	8/23/2011	1.33	---	---	---	<0.0240	0.0275	0.045	<0.0278
	10/25/2011	1.36	0.0555	<0.0500	<0.0250	<0.0240	0.0280	0.0441	<0.0232
(MPCA SPLIT)	10/25/2011	1.3	0.049 J	0.019 J	---	0.022 J	0.025 J	0.037 J	<0.050

Table 4-1 (Cont'd)
Summary of Groundwater PFC Analytical Data
October 2010-November 2011 Sampling Events
Woodbury Site, Woodbury, MN

Well ID	DATE	PFBA (ppb, ug/L)	PFPeA (ppb, ug/L)	PFHxA (ppb, ug/L)	PFHpA (ppb, ug/L)	PFOA (ppb, ug/L)	PFBS (ppb, ug/L)	PFHS (ppb, ug/L)	PFOS (ppb, ug/L)
Monitoring Wells (continued)									
MW6L	10/20/2010	1.3	---	---	---	0.0391	---	---	<0.05
	2/8/2011	1.03	---	---	---	0.0314	---	---	<0.05
MW6LR	5/17/2011	0.178	---	---	---	1.02	---	0.141	2.490
	8/23/2011	0.0904	---	---	---	0.0773	0.1	0.101	0.161
	9/21/2011	<0.0250	---	---	---	0.0629	---	<0.0250	0.219
	10/5/2011	<0.0250	---	---	---	<0.0240	---	---	<0.0232
	10/25/2011	<0.0250	<0.0250	<0.0500	<0.0250	<0.0240	<0.0250	<0.0250	<0.0232
(MPCA SPLIT)	10/25/2011	<0.050	<0.050	<0.050	---	<0.050	<0.050	<0.050	0.014 J
	11/8/2011	<0.0250	---	---	---	<0.0240	---	---	0.0885
MW10	10/5/2011	0.840	---	---	---	0.677	---	---	1.26
MW12	10/20/2010	1.39	---	---	---	0.0271	---	---	<0.025
	2/9/2011	1.32	---	---	---	0.0274	---	---	<0.05
	5/18/2011	1.44	---	---	---	0.0278	---	0.119	0.0551
	8/23/2011	0.918	---	---	---	<0.0240	0.0266	0.0257	<0.0232
	9/20/2011	1.30	---	---	---	0.0618	---	0.107	0.227
	10/5/2011	1.18	---	---	---	0.0585	---	---	0.214
	10/25/2011	1.01	0.0479	<0.0500	<0.0250	0.0360	0.0379	0.0382	0.0432
(MPCA SPLIT)	10/25/2011	1.0	0.041 J	0.014 J	---	0.029 J	0.030 J	0.039 J	0.070
	11/8/2011	1.07	---	---	---	0.0453	---	---	0.195
MW-G	10/20/2010	0.235	---	---	---	<0.025	---	---	<0.05
	10/5/2011	0.256	---	---	---	<0.0240	---	---	<0.0232
	10/27/2011	0.311	<0.0250	<0.0500	<0.0250	0.104	<0.0250	0.0353	0.205
MW-H	10/19/2010	<0.0999	---	---	---	<0.025	---	---	<0.05
	2/9/2011	<0.1	---	---	---	<0.025	---	---	<0.05
	5/17/2011	0.344	---	---	---	<0.025	---	<0.025	<0.025
	8/24/2011	<0.0250	---	---	---	<0.0240	<0.0250	<0.025	<0.0278
	10/28/2011	<0.0250	<0.0250	<0.0500	<0.0250	<0.0240	<0.0250	<0.0250	<0.0232
Former Residential Well									
WR03	10/19/2010	<0.0999	---	---	---	<0.025	---	---	<0.05
	2/7/2011	0.100	---	---	---	<0.025	---	---	<0.05
	5/19/2011	0.0728	---	---	---	<0.025	---	<0.025	<0.025
	8/25/2011	0.0666	---	---	---	<0.0240	<0.0250	<0.025	<0.0278
	10/27/2011	0.0960	<0.0250	<0.0500	<0.0250	<0.0240	<0.0250	<0.0250	<0.0232
Combined Effluent Flow from Barrier Wells									
CMW	10/28/2011	1.08	0.200	0.335	0.137	0.994	1.14	3.32	0.821

--- - not analyzed.

ND - not detected at or above the limit of quantitation.

NR - not reportable.

ppb - parts per billion

ug/L - micrograms per liter

Note: Results for PFNA, PFDA, PFUnA, and PFDoA were not reported or were not detected at all sample locations. Therefore, these data have been omitted from this table.

Table 4-2
Barrier Well Flow Rates
Former Woodbury Disposal Site
Woodbury, MN

Date/Month	Combined Flow (gpm)	Barrier Well B-1	Barrier Well B-2	Barrier Well B-3	Barrier Well B-4
Jan-11	2982	756	136	735	1355
Feb-11	2982	758	135	733	1356
3/1/11 - 3/11/11	2987	757	135[(1)]	730	1365
3/11/11 - 3/31/11	2827	762	0	649	1417
Mar-11	2847	759	0	688	1400
Apr-11	2820	762	0	639	1419
May-11	2751	744	0	632	1374
Jun-11	2624	728	0	717	1180
Jul-11	2637	754	0	719	1163
Aug-11	2597	751	0	709	1138
Sep-11	2482	739	138[(1)]	666	1013
Oct-11	2488[(2)]	738	141	661	948[(2)]

[(1)]-Barrier Well BW-02 shut down on 3/11/11, turned back on 9/14/11.
[(2)]-Improper operation of well B-4 flow meter is suspected. Plant will be repairing/calibrating the meter soon.

Note : Flow rates reported represent monthly average flow calculated from data obtained from automated monitoring system.

Table 4-3
Depth-to-Groundwater and Groundwater Elevation Data
October 2010 - October 2011
Former Woodbury Disposal Site
Woodbury, Minnesota

Well ID	October-10		January-11		February-11		March-11		April-11		May-11		June-11	
	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)
MW-02	136.47	833.00	135.13	834.34	135.10	834.37	134.68	834.79	134.24	835.23	133.70	835.77	132.2	837.27
MW-03	137.45	833.32	136.41	834.36	136.25	834.52	136.01	834.76	135.54	835.23	135.03	835.74	133.65	837.12
MW-04L	106.15	826.65	103.84	828.96	104.22	828.58	105.04	827.76	104.19	828.61	103.39	829.41	101.96	830.84
MW-04	105.98	828.08	103.88	830.18	104.88	829.18	104.45	829.61	103.70	830.36	103.10	830.96	101.49	832.57
MW-05	141.82	793.23	128.01	807.04	136.78	798.27	139.70	795.35	135.63	799.42	135.23	799.82	140.03	795.02
MW-06	94.27	820.58	90.53	824.32	92.09	822.76	91.71	823.14	91.40	823.45	90.75	824.10	90.06	824.79
MW-06L[a]	92.08	822.95	89.41	825.62	89.79	825.24	89.60	825.43	NA	NA	NA	NA	NA	NA
MW-06LR[a]	NA	NA	NA	NA	NA	NA	NA	NA	87.56	827.00	87.07	827.49	86.16	828.87
MW-07	137.50	835.31	136.24	836.57	136.18	836.63	135.87	836.94	135.87	836.94	134.82	837.99	133.50	839.31
MW-08	76.85	827.09	74.30	829.64	75.80	828.14	75.66	828.28	75.07	828.87	74.20	829.74	72.47	831.47
MW-09	72.45	827.88	70.31	830.02	71.25	829.08	71.17	829.16	70.38	829.95	69.67	830.66	67.91	832.42
MW-10	90.10	828.29	NA	NA	NA	NA	88.98	829.41	88.10	830.29	87.25	831.14	85.53	832.86
MW-11	89.54	828.36	87.60	830.30	88.30	829.60	88.42	829.48	87.53	830.37	86.67	831.23	84.97	832.93
MW-12	89.43	823.08	86.50	826.01	87.58	824.93	86.82	825.69	86.34	826.17	85.90	826.61	84.83	827.68
MW-F	110.11	818.23	105.40	822.94	108.82	819.52	109.63	818.71	106.80	821.54	106.10	822.24	105.90	822.44
MW-G	50.70	829.79	48.61	831.88	49.30	831.19	48.72	831.77	48.10	832.39	47.51	832.98	46.25	834.24
MW-H	97.68	824.84	95.19	827.33	96.18	826.34	95.58	826.94	94.92	827.60	94.40	828.12	93.22	829.30
MW-J	116.49	818.40	111.72	823.17	114.92	819.97	114.73	820.16	113.71	821.18	112.99	821.90	111.90	822.99
MW-K	98.87	826.13	96.52	828.48	96.41	828.59	96.33	828.67	96.16	828.84	95.53	829.47	93.72	831.28
S-01JS	85.58	825.58	83.51	827.65	83.94	827.22	82.53	828.63	81.85	829.31	81.37	829.79	80.27	830.89
S-01PC	84.60	826.24	83.21	827.63	83.07	827.77	82.91	827.93	82.33	828.51	82.45	828.39	80.86	829.98
S-02DR	43.50	834.89	43.14	835.25	43.09	835.30	42.69	835.70	41.66	836.73	40.97	837.42	39.87	838.52
S-02JS	46.09	831.38	44.42	833.05	44.61	832.86	44.24	833.23	43.60	833.87	43.09	834.38	41.83	835.64
S-02PC	46.25	831.53	44.60	833.18	44.78	833.00	44.59	833.19	43.95	833.83	43.40	834.38	42.09	835.69
S-03JS	92.52	834.77	91.02	836.27	91.15	836.14	90.94	836.35	90.34	836.95	89.76	837.53	88.40	838.89
S-03PC	92.27	834.94	90.80	836.41	90.85	836.36	90.70	836.51	90.16	837.05	89.55	837.66	88.14	839.07
S-04PC	137.34	834.07	135.81	835.60	136.60	834.81	135.85	835.56	135.28	836.13	134.61	836.80	133.20	838.21
S-04SP	137.15	833.71	135.79	835.07	136.20	834.66	135.51	835.35	135.22	835.64	134.63	836.23	132.90	837.96
S-05JS	108.00	837.62	106.72	838.90	106.65	838.97	106.34	839.28	105.94	839.68	105.36	840.26	104.08	841.54
S-05PC	107.85	837.69	106.80	838.74	106.48	839.06	106.19	839.35	105.82	839.72	105.23	840.31	103.96	841.58
S-05SP	107.91	837.71	106.62	839.00	106.47	839.15	106.16	839.46	105.87	839.75	105.31	840.31	104.00	841.62
S-06JS	143.40	838.74	142.19	839.95	142.05	840.09	141.73	840.41	141.37	840.77	140.80	841.34	139.58	842.56
S-06PC	143.31	838.94	142.10	840.15	141.95	840.30	141.65	840.60	141.30	840.95	140.73	841.52	139.53	842.72
S-07JS	80.14	836.28	78.99	837.43	79.17	837.25	79.32	837.10	78.28	838.14	77.53	838.89	76.13	840.29
S-07PC	79.99	836.22	78.89	837.32	79.03	837.18	79.28	836.93	78.19	838.02	77.37	838.84	75.89	840.32
S-07SP	78.86	836.45	77.65	837.66	NA	NA	77.95	837.36	77.05	838.26	76.24	839.07	74.65	840.66
S-08JS	71.15	832.93	69.69	834.39	70.31	833.77	70.42	833.66	69.19	834.89	68.45	835.63	67.11	836.97
S-08PC	67.01	836.55	66.98	836.58	67.48	836.08	67.75	835.81	65.88	837.68	64.76	838.80	63.21	840.35
S-09JS	104.58	829.09	102.52	831.15	103.90	829.77	103.23	830.44	102.35	831.32	101.78	831.89	100.61	833.06
WR-03	107.63	827.31	105.69	829.25	99.10	835.84	105.95	828.99	NA	NA	104.59	830.35	104.68	830.26
WR-08	99.32	837.26	98.05	838.53	NA	NA	97.73	838.53	97.28	838.53	96.65	838.53	95.32	841.26

ft MSL - feet above mean sea level.
ft btoc - feet below top of casing.
NA - Not available or accessible.
[a] - Monitor well MW-6L was redrilled in mid April 2011 and reconstructed as monitor well MW-6LR to monitor the middle of the Prairie du Chien unit.

Table 4-3 (Cont'd)
Depth-to-Groundwater and Groundwater Elevation Data
October 2010 - October 2011
Former Woodbury Disposal Site
Woodbury, Minnesota

Well ID	July-11		5-Oct-2011		31-Oct-2011		Groundwater Elevation Data		
	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft MSL)	Minimum	Maximum	Standard Deviation
MW-02	131.58	837.89	129.75	839.72	129.37	840.10	833.00	840.10	2.40
MW-03	133.09	837.68	131.18	839.59	130.82	839.95	833.32	839.95	2.27
MW-04L	101.96	830.84	98.35	835.71	98.94	833.86	826.65	835.71	2.80
MW-04	101.07	832.99	98.80	834.00	98.16	835.90	828.08	835.90	2.42
MW-05	137.63	797.42	130.99	804.06	135.54	799.51	793.23	807.04	4.17
MW-06	89.57	825.28	87.36	827.49	87.63	827.22	820.58	827.49	2.06
MW-06L[a]	NA	NA	NA	NA	NA	NA	822.95	825.62	1.25
MW-06LR[a]	85.79	829.24	84.55	830.48	84.69	830.34	827.00	830.48	1.43
MW-07	133.15	839.66	131.60	841.21	131.31	841.50	835.31	841.50	2.11
MW-08	72.61	831.33	69.68	834.26	69.57	834.37	827.09	834.37	2.51
MW-09	67.73	832.60	65.10	835.23	64.86	835.47	827.88	835.47	2.60
MW-10	85.21	833.18	82.70	835.69	82.48	835.91	828.29	835.91	2.81
MW-11	84.64	833.26	82.15	835.75	81.91	835.99	828.36	835.99	2.65
MW-12	84.72	827.79	82.79	829.72	82.69	829.82	823.08	829.82	2.08
MW-F	105.58	822.76	102.35	825.99	103.05	825.29	818.23	825.99	2.58
MW-G	45.86	834.63	44.01	836.48	43.85	836.64	829.79	836.64	2.26
MW-H	92.63	829.89	90.70	831.82	91.06	831.46	824.84	831.82	2.24
MW-J	111.72	823.17	108.35	826.54	108.75	826.14	818.40	826.54	2.61
MW-K	93.43	831.57	90.80	834.20	90.25	834.75	826.13	834.75	2.72
S-01JS	79.92	831.24	79.13	832.03	78.91	832.25	825.58	832.25	2.21
S-01PC	80.50	830.34	78.53	832.31	78.10	832.74	826.24	832.74	2.11
S-02DR	39.55	838.84	38.59	839.80	38.42	839.97	834.89	839.97	1.95
S-02JS	41.41	836.06	39.61	837.86	39.40	838.07	831.38	838.07	2.21
S-02PC	41.71	836.07	39.71	838.07	39.47	838.31	831.53	838.31	2.25
S-03JS	87.88	839.41	86.06	841.23	85.81	841.48	834.77	841.48	2.26
S-03PC	87.58	839.63	85.72	841.49	85.45	841.76	834.94	841.76	2.31
S-04PC	132.65	838.76	130.73	840.68	130.51	840.90	834.07	840.90	2.39
S-04SP	132.25	838.61	130.45	840.41	130.16	840.70	833.71	840.70	2.44
S-05JS	103.38	842.24	101.87	843.75	101.53	844.09	837.62	844.09	2.18
S-05PC	103.45	842.09	101.75	843.79	101.41	844.13	837.69	844.13	2.17
S-05SP	103.46	842.16	101.76	843.86	101.39	844.23	837.71	844.23	2.17
S-06JS	139.21	842.93	137.50	844.64	137.23	844.91	838.74	844.91	2.06
S-06PC	139.13	843.12	137.51	844.74	137.17	845.08	838.94	845.08	2.04
S-07JS	75.65	840.77	73.74	842.68	73.59	842.83	836.28	842.83	2.36
S-07PC	75.39	840.82	73.44	842.77	73.34	842.87	836.22	842.87	2.43
S-07SP	74.24	841.07	72.21	843.10	72.07	843.24	836.45	843.24	2.49
S-08JS	66.53	837.55	64.40	839.68	64.34	839.74	832.93	839.74	2.46
S-08PC	62.48	841.08	60.74	842.82	60.89	842.67	835.81	842.82	2.71
S-09JS	99.90	833.77	97.70	835.97	97.73	835.94	829.09	835.97	2.40
WR-03	103.97	830.97	100.83	834.11	100.97	833.97	827.31	835.84	2.81
WR-08	94.73	841.85	92.95	843.63	92.60	843.98	837.26	843.98	2.49

ft MSL - feet above mean sea level.
ft btoc - feet below top of casing.
NA - Not available or accessible.
a - Monitor well MW-6L was redrilled in mid April 2011 and reconstructed as monitor well MW-6LR to monitor the middle of the Prairie du Chien unit.

5. FINDINGS

A reduction in Barrier Well pumping program was implemented at the Woodbury site on March 11, 2011, that included the shutdown of Barrier Well B-2 and a reduction in pumping at Barrier Well B-3. The total reduction in pumping amounted to a decrease of approximately 175 gpm, or 5.8 percent. Groundwater sampling events were performed in October 2010 and February 2011 prior to the reduction in pumping to establish a baseline prior to the reduction. Subsequent quarterly groundwater sampling rounds were performed in May and August 2011 after the reduction in pumping was implemented.

As a result of an increase in PFC concentrations in the May and August 2011 quarterly sampling rounds, specifically PFOA and PFOS in sentinel wells S01 and S02, the number of wells and sample frequency was increased. As a precaution, on September 14, 2011 Barrier Well B-2 was returned to service and the pumping rate at B-3 was increased to previous production rates. The results from the additional sampling rounds showed decreasing trends PFOS and PFOA concentrations in the S01 and S02 wells however low concentrations of PFOA and PFOS were detected for the first time in other sentinel wells considered to be hydraulically up gradient from the former disposal areas.

The following findings were noted in the groundwater analytical data:

- The groundwater analytical results show that a similar chemical fingerprint is present in monitor wells (MW-4L and MW-2) in proximity to the former disposal areas and Barrier Wells B-1, B-3, and B-4.
- The groundwater analytical results show that PFBA was detected in groundwater following pumping reduction at concentrations comparable with historical values. Following the implementation of the Barrier Well pumping reduction, PFOA and PFOS were initially detected in groundwater samples collected from several monitor wells and sentinel wells where FC compounds were either not detected, or are at higher concentrations than prior results.

- After the August sampling, (Barrier Well pumping was restored in mid September), PFOA and PFOS concentrations in the southern sentinel wells started decreasing, but have not yet returned to historic concentration levels.

- The only PFC compound detected in the groundwater samples collected from Barrier Well B-2 was PFBA.

The following findings were noted regarding the site hydrogeologic data:

- A general increase in water levels is apparent in all site wells in the monitoring period (January 2011 through June 2011) presented in this report. This increase in water levels is likely due to recharge from the spring snow melt and above normal precipitation during the first half of the year.

- The groundwater elevation contour maps constructed using data collected during the May 2011 sampling event show that groundwater flow beneath the former Northeast and Main Disposal Areas is toward the Barrier Well (B-1, B-3, and B-4) network. In addition, the hydraulic gradient in the vicinity of Barrier Well B-2 is northward and toward the other three Barrier Wells.

In response to the May and August 2011 analytical data that indicated PFC compounds were present near the southern site property boundary, 3M returned the Barrier Well network to pre-reduction operation. In addition, 3M implemented a more frequent monitoring of groundwater conditions in the wells near Barrier Well B-2 where FC compounds were detected during the May 2011 sampling event. Continued monitoring at the site will determine whether these FC compounds are consistently present in the groundwater along the southern site property boundary.

6. RECOMMENDATIONS

Based on the evaluation of the groundwater analytical results and the hydraulic evaluation data, the following activities are being or will be implemented:

- Continue the groundwater monitoring program to determine trends in the PFC data and to confirm that groundwater capture is maintained. Decrease sampling from bi-weekly to monthly.
- Evaluate data from the sampling events and geophysical survey work to determine possible causes for the increase in sentinel well concentrations.
- Submit quarterly reports to the MPCA; in addition, any significant changes will be verbally conveyed to MPCA.
- Implement geophysical surveys (ER and seismic) to provide more information on site geology.
- Collect additional hydrogeologic data to evaluate the potential for mobilization of PFCs during excavation activities:
    - Rehabilitate and reconstruct monitor wells MW-B and MW-G. Install well screens in each well to prevent borehole collapse and isolate target zones to monitor within the geologic stratigraph.
    - Install an additional well in the uppermost water-bearing zone near MW-G.
- Install an additional well pair to evaluate groundwater quality between B-2 and sentinel well cluster S02.

ATTACHMENT A
GEOPHYSICAL AND VIDEO
INSPECTION LOGS

DVC VIDEO INSPECTION LOG

3M COMPANY – Monitoring Well-4L **Date Video Logged** – January 25, 2011
Minnesota Unique Well No: 00520034 **County:** Washington **Address** – 5981 Woodbury Drive
Purpose – Stratigraphic Inspection **Northing:** 4967988 **Easting:** 507786
Elevation – 930.16 feet **Drilling Method** – Non-specified Rotary
Date Drilled (Comp.) – December 11, 1992 **Reported Formation** – Prairie du Chien
Drilling Company – E.H. Renner & Sons, Inc. **Driller** – Mr. Victor Praught
Depth Reference – Grade **Pump Setting** – n.a. **Reported 4 inch Casing** - to 120 feet
Reported ? inch Open Hole – 120 to 190 feet
Original Drilled Depth – 190 feet **Original Completed Depth** – 190 feet **Reported (2011) Depth** – 190 feet
Depth Reference – Top of 4 inch Stickup **Stickup** – 29 inches above Grade
Static Water Level – 104.2 feet **4 inch Casing** – to 124.2 feet
4 inch Open Hole – 124.2 to 187.1 feet **Depth Video Logged** – 187.1 feet
Consulting Firm – Weston Solutions, Inc. **Project Manager / Geologist** – Mr. David J. Cairns
Inspected By - Jim H. Traen

Recording Time		Depths(in feet)	Remarks/Observations
			Centering Guides @ 3.5 inches
			Aries 2 Inch Dual View Camera
09:44	0:00:00	004.9	Start Inspection (4 inch Casing)
09:50	0:05:25	016.0	Casing Joint – Welded
09:55	0:10:43	037.0	Casing Joint – Welded
10:01	0:16:53	058.1	Casing Joint – Welded
10:07	0:22:31	079.6	Casing Joint – Welded
10:12	0:27:49	100.8	Casing Joint – Welded
10:15	0:30:22	104.2	Static Water Level
10:26	0:41:37	124.2	Bottom of Grout
10:38	0:53:31	152.8	Horizontal Fracture / Bedding Plane
10:50	1:05:17	187.1	Current Bottom of Open Hole / Well
11:03	1:18:40	152.7	Flow into Well
11:28	1:43:38	004.8	End of Inspection

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E-mail: Jim@DownholeWellServices.com, **Web Site:** www.downholewellservices.com
Wireline Services Manager: James Traen

PROJECT NAME: 3M - Monitoring Well 4L January 25, 2011

LOCATION

Address: 5981 Woodbury Drive **City:** Woodbury **County:** Washington **State:** Minnesota **USGS Quad:** St Paul Park
Northing: 4967988 **Easting:** 507786 **Township Name:** **Twp:** 28N **Range:** 21W **Section:** 35
Quarter Section: CCBABD **MN Unique Well No.:** 520034 **Project No.:** 1625-002 **Cutting Set No.:** MGSnone **File:** 3Mmw4L012511.LAS

GENERAL DATA

Property Owner: 3M Company
Drilling Company: E.H. Renner & Sons, Inc.
Engineering Co. / Client: Weston Solutions, Inc.
Logging Unit/Truck: 201
Representative: Mr. David J. Cairns
Driller: Mr. Victor Praught
Project Manager / Geologist: Mr. David J. Cairns
Other Services: Dual View Color Video Inspection

BOREHOLE DATA

Depth Drilled: 192.4 feet **Reported Depth:** 192.4 feet **Depth Logged:** 187.1 feet **Depth Reference:** Top of 4 inch Casing
Elevation: 932.6 feet **Stickup:** 29 inches above Grade

	Bit Size	From	To	Casing Size	From	To	Comments
1.	08.00 inch	002.4 feet	122.0 feet	04 inch	0.0 feet	122.0 feet	Steel
2.	04.00 inch	122.0 feet	187.1 feet				Open Hole

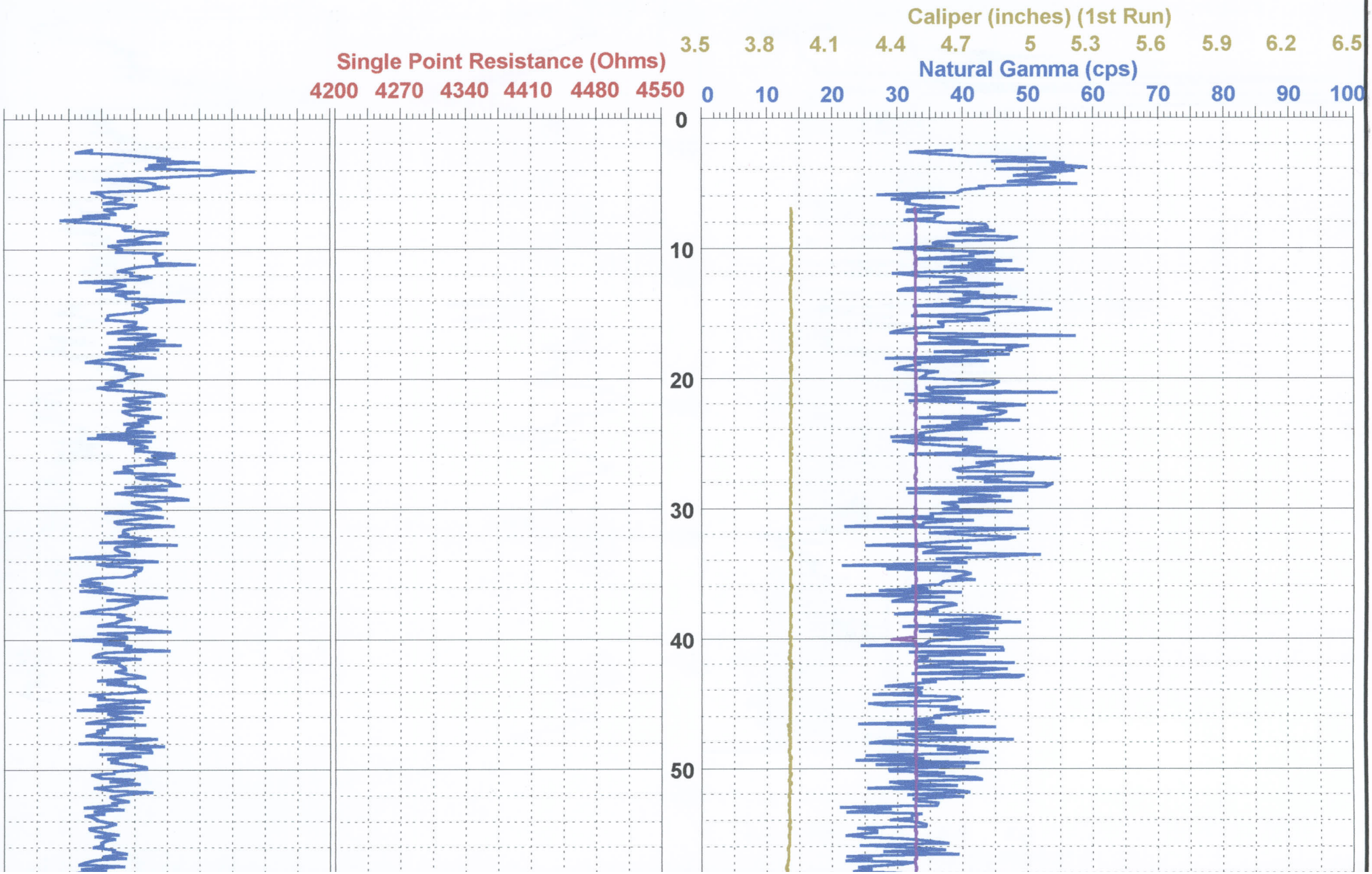
Drilling Method: Non-specified Rotary **Date Drilled:** December 11, 1992 **Fluid Level.:** 104.2 feet **Mud Type:** Bentonite
Hole Medium: Water **Date Logged:** January 25, 2011 **Time Since Circulation:** unknown

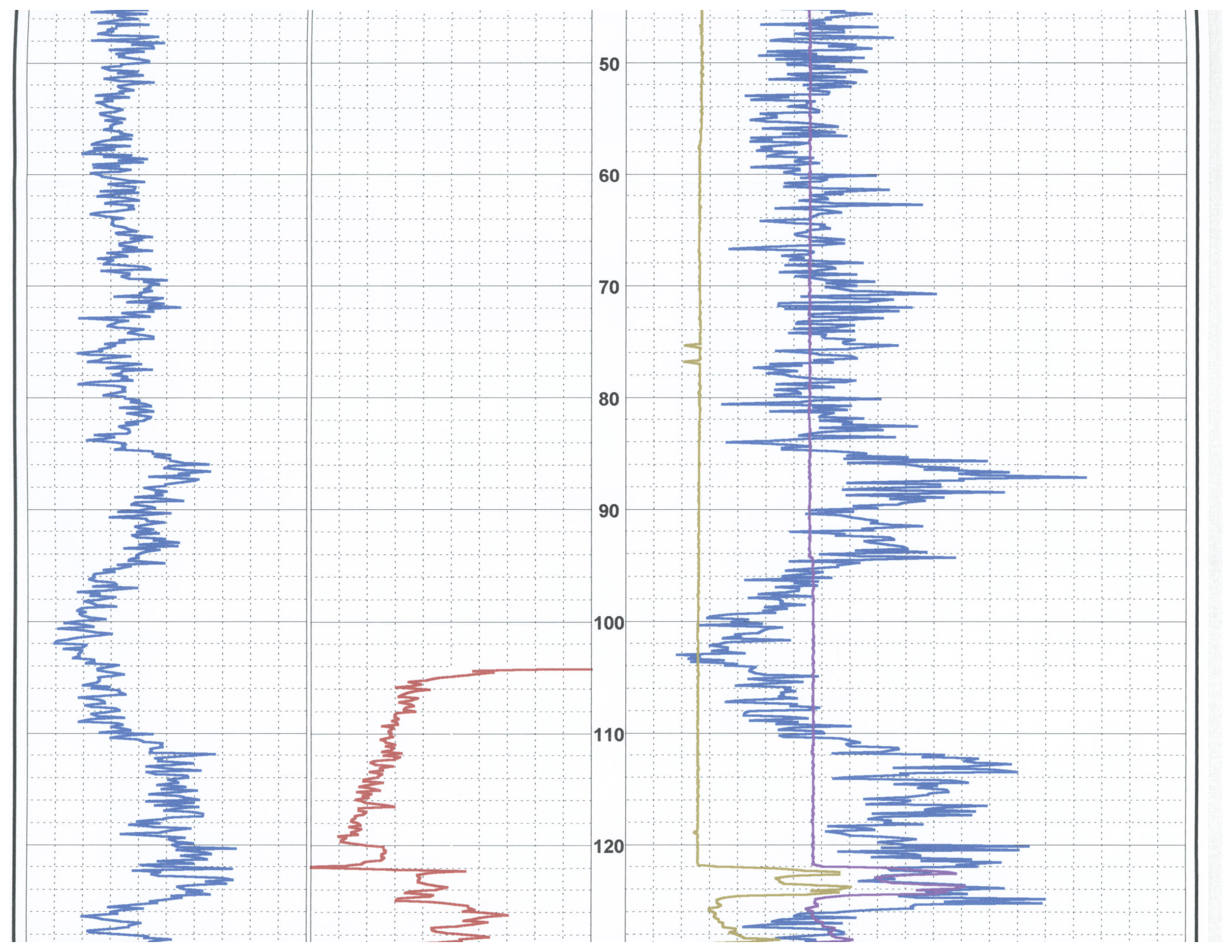
LOGGING DATA

Log Name	Run No.	Probe S/N	Logger S/N	Dig. Int.	Logging Speed	Detector Type	Source Type	Source Size	Logged Interval.: From To
1. N. Gamma	one	2613	1038	0.16ft.	10ft./min.	Scintillometer			002 feet 187 feet
2. Electric	one	2613	1038	0.16ft.	10ft./min.	Electrodes			186 feet 002 feet
3. Caliper	three	2707,2613	1038	0.16ft.	10ft./min.	Mech.Arms			187 feet 07.0 feet
4. Caliper	four	2707,2613	1038	0.16ft.	10ft./min.	Mech.Arms			187 feet 07.0 feet

Remarks: Conclusions and recommendations associated with formation contacts are based, in part, on information Downhole Well Services, LLC obtained with current sources. Downhole Well Services' depictions of these contacts are based partially on Downhole Well Services' observations along with review and comments provided by the appropriate state or federal agencies. Verification of the authenticity or accuracy of this information is not warranted or guaranteed by Downhole Well Services, LLC.

3M - Monitoring Well 4L - January 25, 2011




50
60
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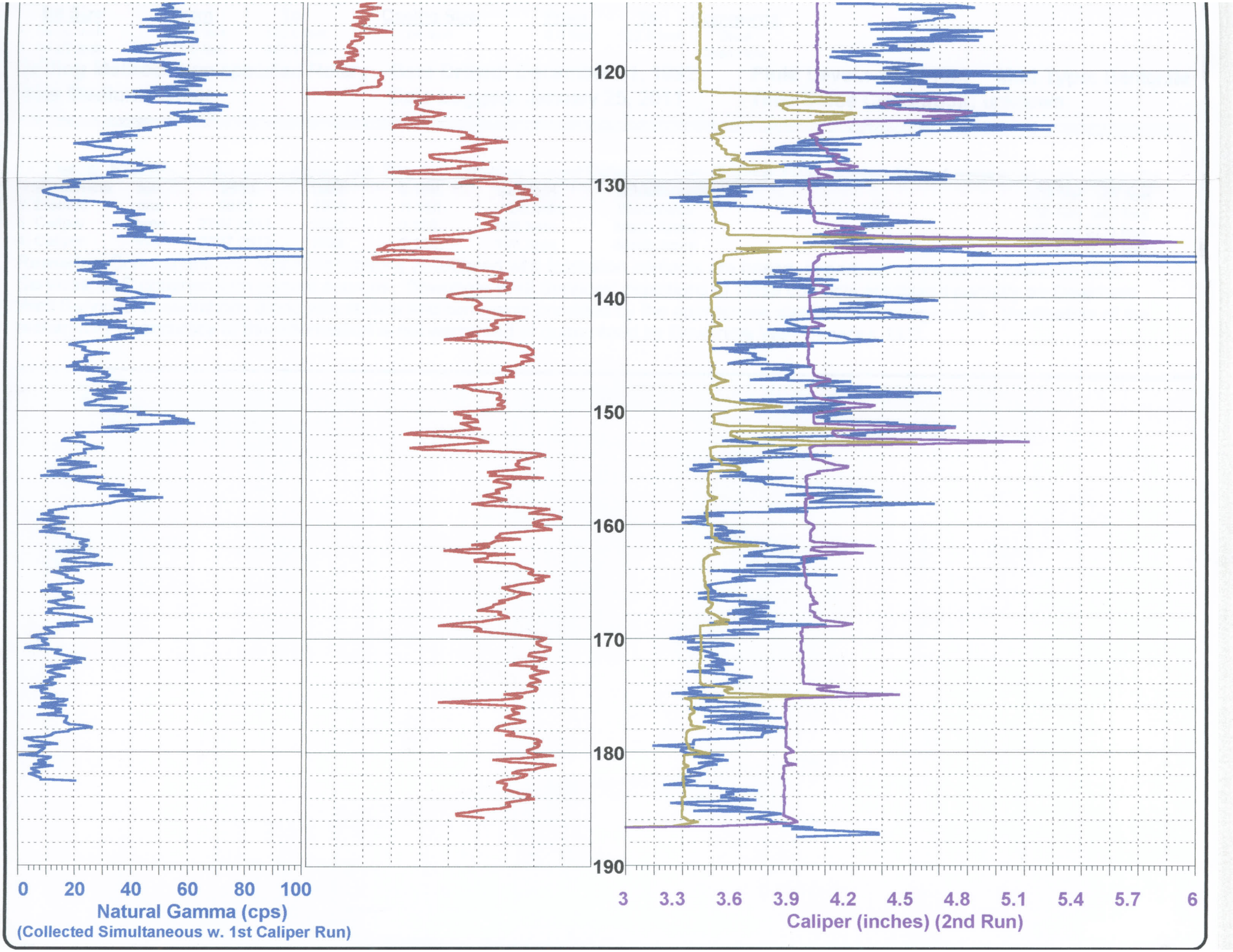
120


120
130
140
150
160
170
180
190
0
20
40
60
80
100
Natural Gamma (cps)
(Collected Simultaneous w. 1st Caliper Run)
3
3.3
3.6
3.9
4.2
4.5
4.8
5.1
5.4
5.7
6
Caliper (inches) (2nd Run)

VIDEO INSPECTION LOG

CONFIDENTIAL – MONITORING WELL 6L-R (ReDrill) **Date Video Logged** – April 21, 2011
MN UNIQUE WELL NO. – 520037 **Address** – 5981 Woodbury Drive
Date MW-6L Drilled (Completed) – Dec. 10, 1992 **Purpose of Inspection** – General Open Hole Inspection
County – Washington **Township** – 28N, **Range** – 21W, **Section** – 2, **Quarter Section** – BBC
Ground Elevation – 913.16 feet (MSL) **Northing:** 4967432 **Easting:** 507753
Drilling Co. – E.H. Renner & Sons, Inc. **Driller** – Mr. Rob Schaefer **Drilling Method** – Non-specified Rotary
Reported Formation – Prairie du Chien **Depth Reference** – Grade
Reported 4 inch Casing – to 23 feet **Reported ? inch Open Hole** – 23 to 320 feet
Drilled Depth – 320 feet **Completed Depth** – 320 feet **Reported Depth (2011)** – NA
Date MW-6L-R Drilled (Completed) – April 21, 2011
Drilling Co. – Mark J. Traut Wells, Inc. **Driller** – Mr. Daryl Karasch **Drilling Method** – Sonic
Depth Reference – Grade **Reported 8 inch Casing** – to 241 feet **6 inch Drill Column** – to 278 feet
Reported 6.5 inch Open Hole – 278 to 332 feet **Static Water Level** – 87.7 feet
Pump Setting – n.a. **Bottom Depth Inspected** – 320.6 and 286.9 feet
Engineering Company / Client – Weston Solutions, Inc. **Representative** – Mr. Mike Corbin
Geologist – Mr. Timothy R. Frinak, P.G.
Inspected By – Jim H. Traen

Recording Time		Depths(in feet)	Remarks/Observations
			Centering Guides @ 5 inches
08:53	0:00:00	000.1	Start Inspection – 6 inch Sonic Drill Column
08:58	0:04:48	087.7	Water Level
08:59	0:06:30	126.4	Top of Mud (Bentonite)
09:11	0:17:57	319.7 + 0.9 feet	Descent Halted
			Zero Visibility
			Trouble Reentering Drill Column
09:20	0:27:00	126.4	Top of Mud (Bentonite)
09:23	0:30:20	001.1	End of 1st Descent
10:00		*Caliper Logging*	
11:20		*Electric Logging*	
		Driller Flushes Well	
			VIDEO INSPECTION LOG - Post Flushing
12:43	0:30:20	000.8	Start of 2nd Descent
12:46	0:33:10	078.3	Water Level
12:52	0:39:13	281.0	End of 6 inch Sonic Drill Column
			Standby for Personnel
13:09	0:39:13	281.0	
13:12	0:42:53	286.0 + 0.9 feet	Obstructed
			Little Visibility
13:14	0:44:25	281.0	End of 6 inch Sonic Drill Column
13:22	0:52:56	000.9	End of 2nd Descent / Inspection

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Wireline Services Manager: James Traen

PROJECT NAME: Confidential - Monitoring Well 6L-R (Redrill) - April 20, 2011

LOCATION

Address: 5981 Woodbury Drive **City:** Woodbury **County:** Washington **State:** Minnesota
Northing: 4967432 **Easting:** 507753 **Quadrant:** 102-B **Twp. Name:** **Twp.:** 28N **Range:** 21W **Section:** 2
Quarter Section: BBC **MN Unique Well No.:** 520037 **Project No.:** 1625-003 **Cutting Set No.:** MGSnone **File:** confidential6LR.LAS

GENERAL DATA

Property Owner: 3M Company
Drilling Company: E.H. Renner & Sons, Inc.
ReDrilling Company: Mark J. Traut Wells, Inc.

Engineering Company / Client: Weston Solutions, Inc.

Logging Unit/Truck: 201

Representative:
Driller: Mr. Rob Schaefer
Driller: Mr. Daryl Karasch
Project Manager: Mr. Rob Vix
Representative: Mr. Mike Corbin
Geologist: Mr. Timothy R. Frinak, P.G.
Other Services: Radial View Color Video Inspection

BOREHOLE DATA

Depth Drilled: 320 feet **Depth ReDrilled:** 332 feet **Reported Depth:** 321 feet **Depth Logged:** 321 feet **Depth Reference:** Grade
Elevation: 913.16 feet MSL (Ground) **Stickup:** 44 inches above Grade

	Bit Size	From	To	Casing Size	From	To	Comments
1.	08.50 inch	000.0 feet	241.0 feet	08.0 inch	-0.00 feet	241.0 feet	Steel
2.	06.50 inch	241.0 feet	332.0 feet	06.0 inch	-2.67 feet	278.0 feet	Drill Column
3.							

ReDrilling Method: Sonic **Date ReDrilled:** April 19, 2011 **Fluid Level:** 90 feet **Mud Type:** Quik Gel
Hole Medium: Water **Date Logged:** April 20 & 21, 2011 **Time Since Circulation:** 17 hours

LOGGING DATA

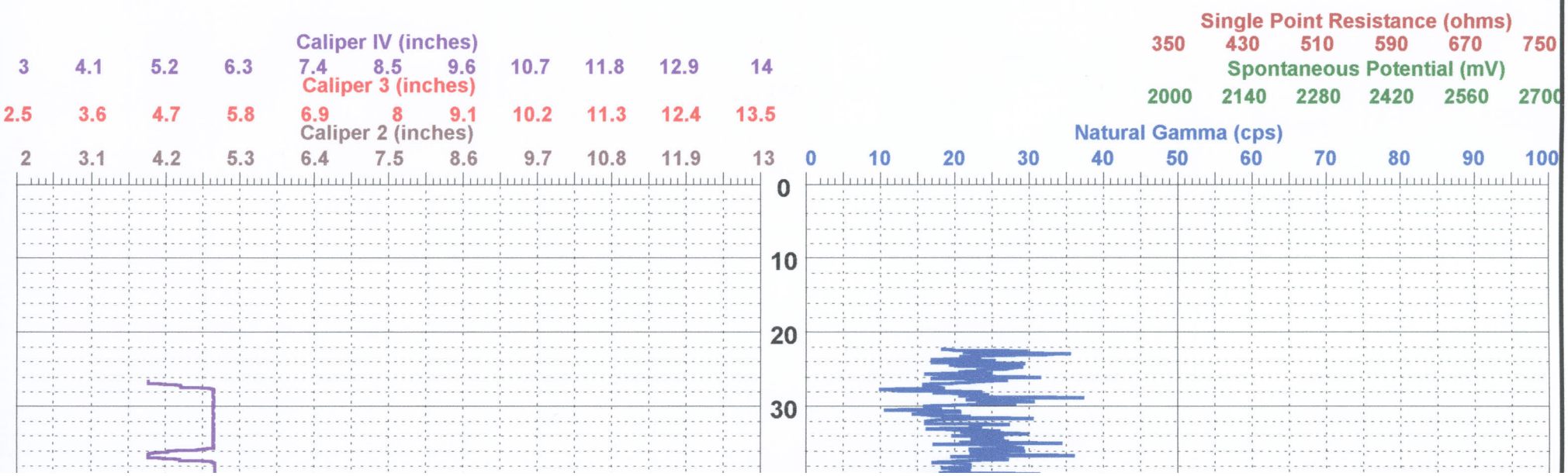
Log Name	Run No.	Probe S/N	Logger S/N	Dig. Int.	Logging Speed	Detector Type	Source Type	Source Size	Logged Interval.: From To
1. N.Gamma	4	2613	1038	0.16ft.	12ft./min.	Scintillometer			323 feet 022.0 feet
2. Caliper	8,9,10	2707,2613	1038	0.16ft.	11ft./min.	Mech. Arms			320 feet 026.0 feet
3. Electric	12	2613	1038	0.16ft.	15ft./min.	Electrodes			319 feet 088.0 feet

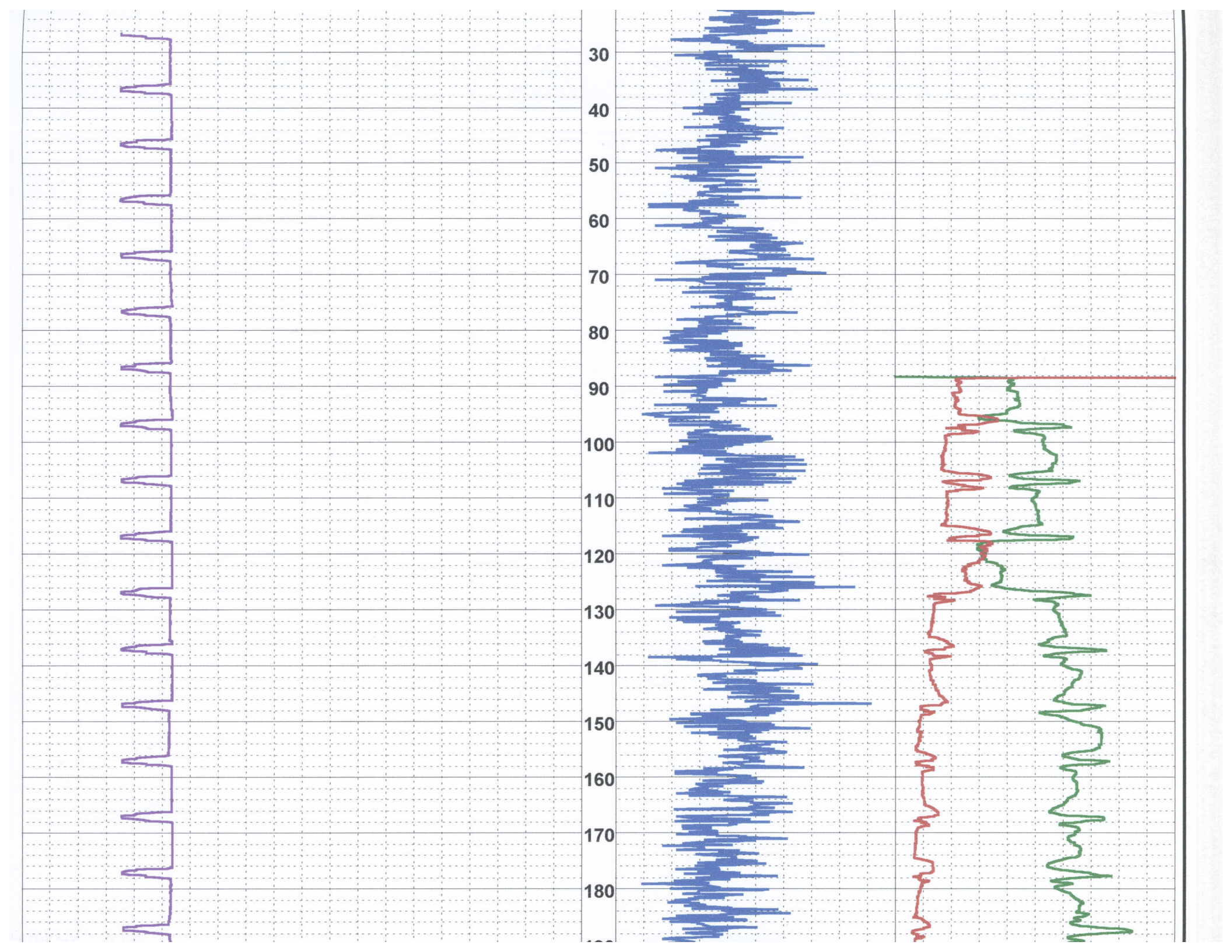
Remarks: Conclusions and recommendations associated with formation contacts are based, in part, on information Downhole Well Services, LLC obtained with current sources. Downhole Well Services' depictions of these contacts are based partially on Downhole Well Services' observations along with review and comments provided by the appropriate state or federal agencies. Verification of the authenticity or accuracy of this information is not warranted or guaranteed by Downhole Well Services, LLC

Confidential - Monitoring Well 6L-R (Redrill) - April 20, 2011

Logging Chronology

Run No.	Time	Direction	Method	
April 20, 2011				
1.	8:29	D	Polyelectric Log (N. Gamma, Electric, N. Resistivity, F. Resistivity, Temperature)	Obstructed @ 249 ft.
2.	8:53	U	Polyelectric Log (N. Gamma, Electric, N. Resistivity, F. Resistivity, Temperature)	Obstructed @ 249 ft.
Driller Clears Well to 323 feet				
3.	10:22	D	Natural Gamma Log	to 323 ft.
4.	10:50	U	Natural Gamma Log	from 323 ft.
5.	12:47	U	Caliper I / Natural Gamma Log	No Good
April 21, 2011				
6.	07:46	D-D	Polyelectric Log (N. Gamma, Electric, N. Resistivity, F. Resistivity, Temperature)	No Good
7.	08:53	D & U	RVC Video Inspection I Zero Visibility Below Mud (Bentonite) Level	to / from 320.6 ft.
8.	10:00	U	Caliper II / N. Gamma Log	from 321 ft.
9.	10:23	U	Caliper III / N. Gamma Log	from 321 ft.
10.	10:53	U	Caliper III / N. Gamma Log	from 321 ft.
11.	11:20	D	Electric Log (Spontaneous Potential / Single Point Resistance)	to 321 ft.
12.	11:41	U	Electric Log (Spontaneous Potential / Single Point Resistance)	from 321 ft.
Driller Flushes Well				
13.	12:43	D & U	RVC Video Inspection II	Obstructed @ 287 ft.

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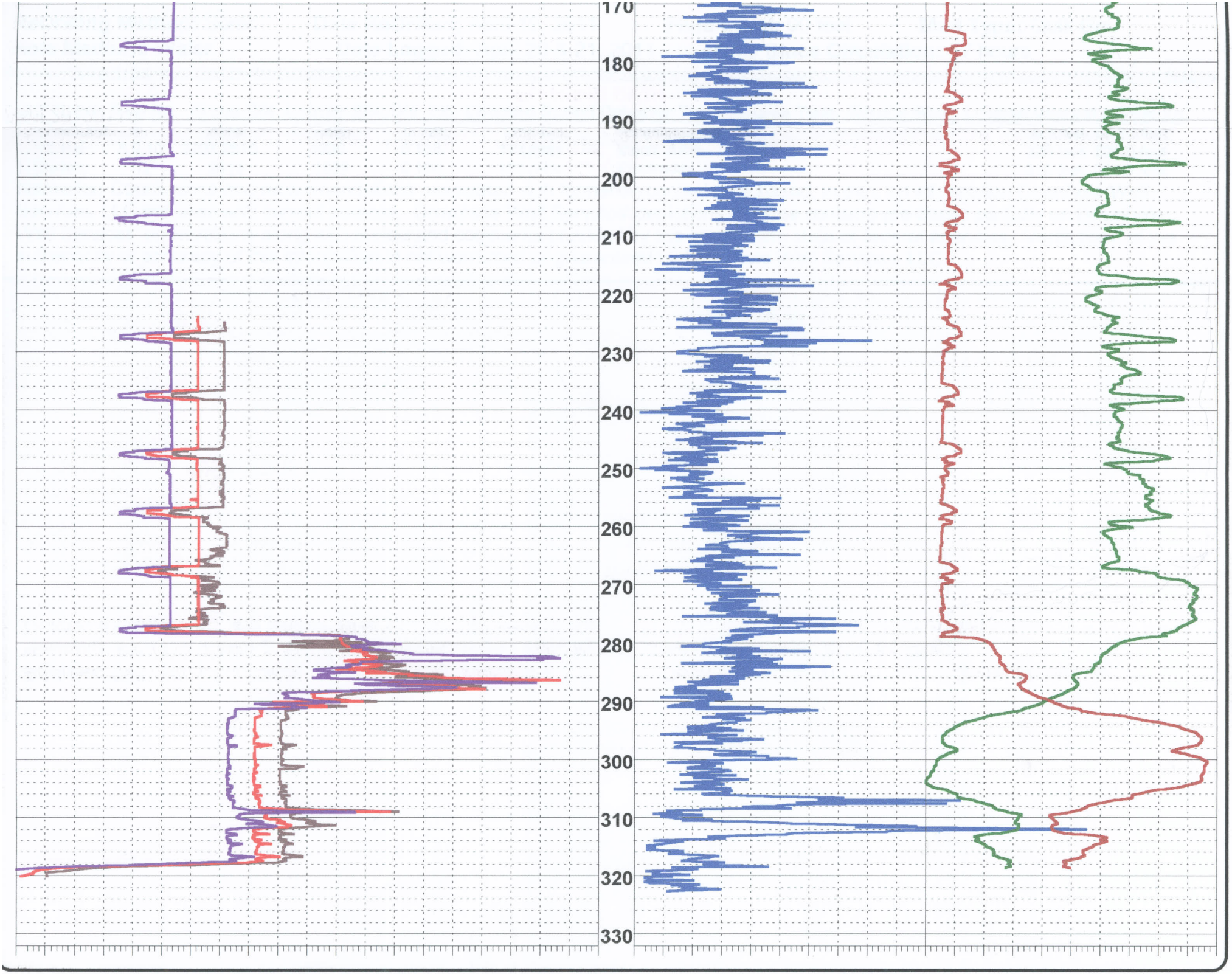
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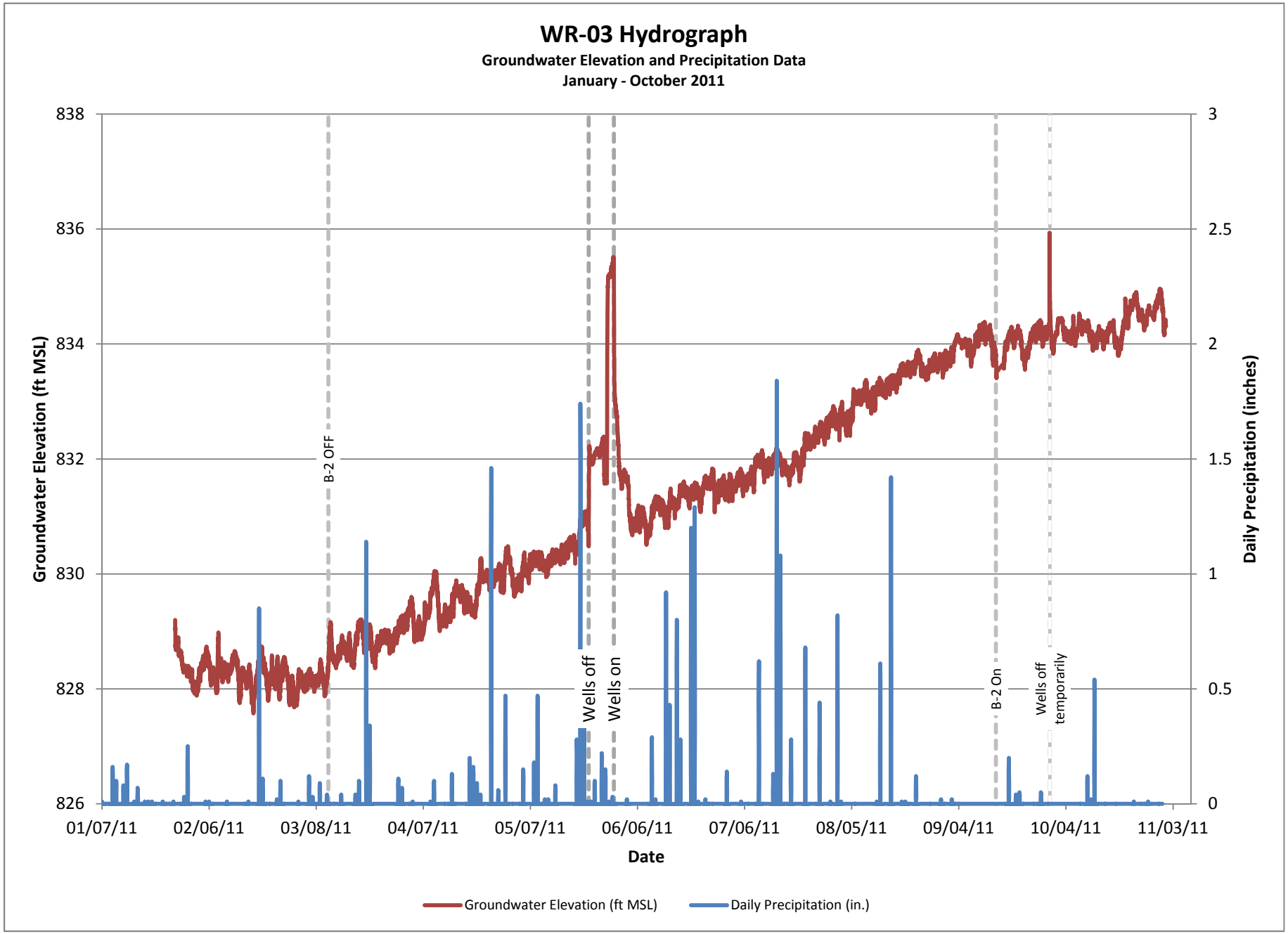
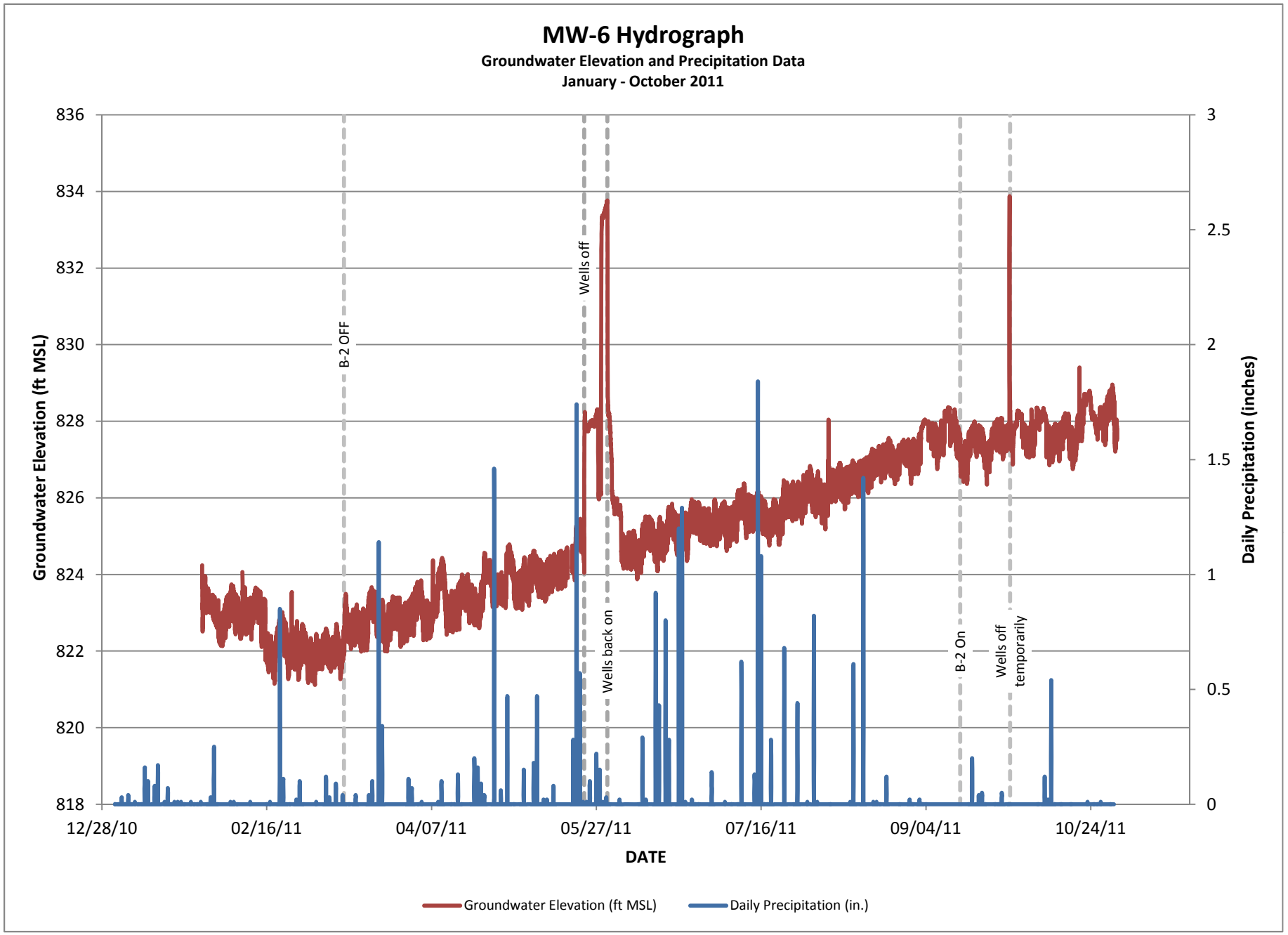
ATTACHMENT B
HYDROGRAPHS

ATTACHMENT B1
GROUNDWATER HYDROGRAPHS
MONITORING WELLS EQUIPPED WITH DATALOGGERS

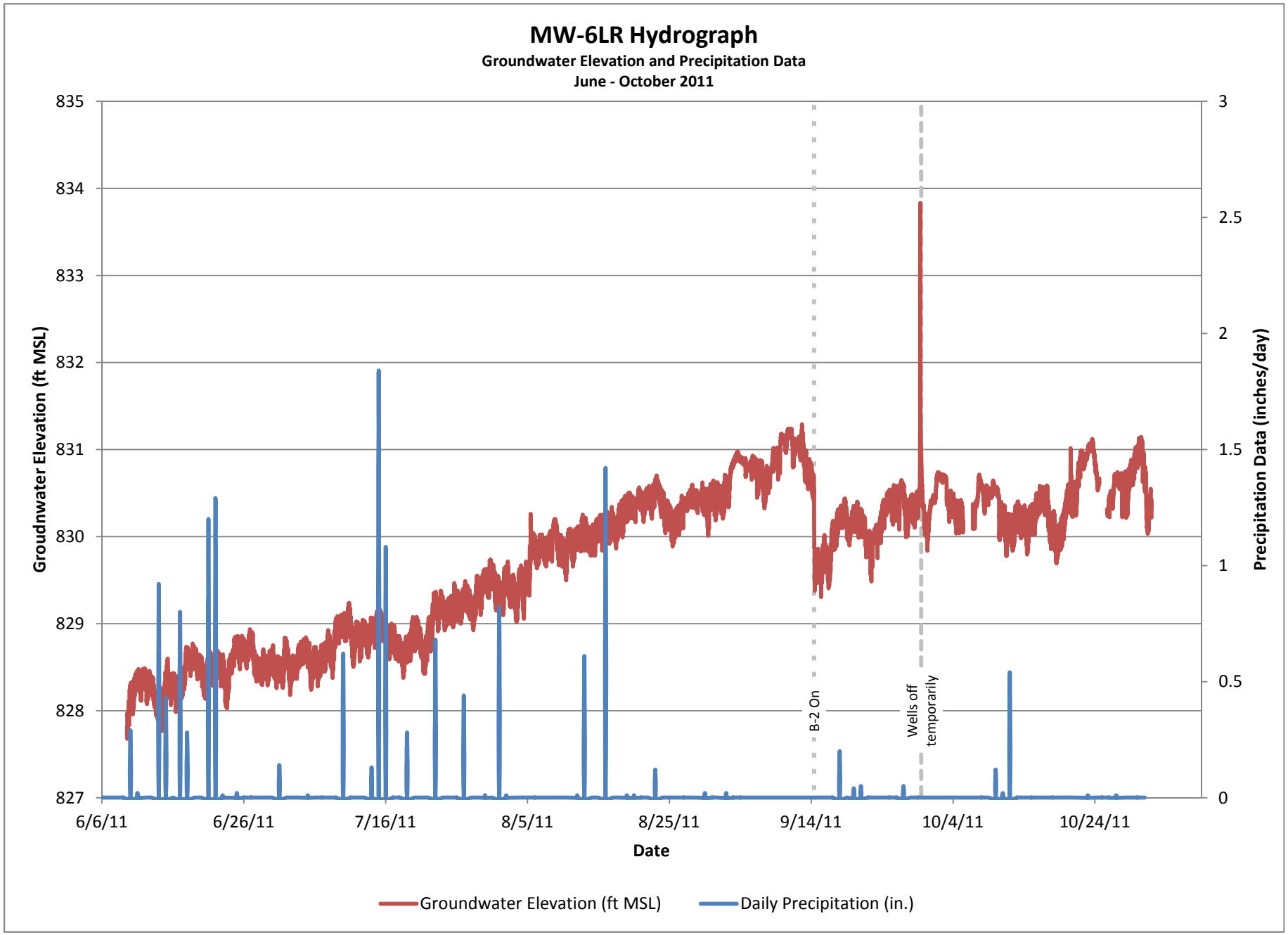


Note: Barrier Wells were shut off for annual maintenance from 5/23-5/30/2011.

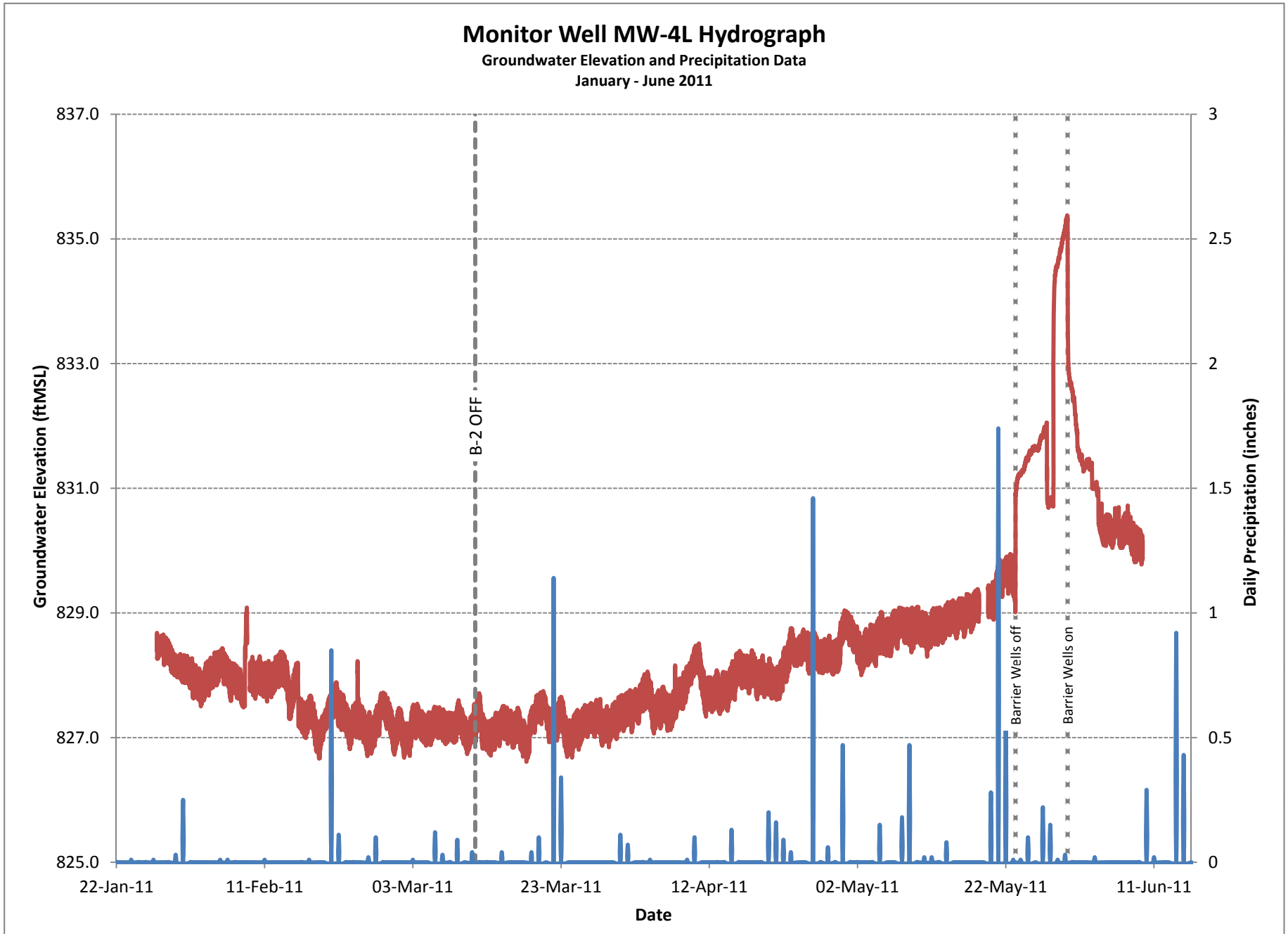
WR03-XD-DataChart1



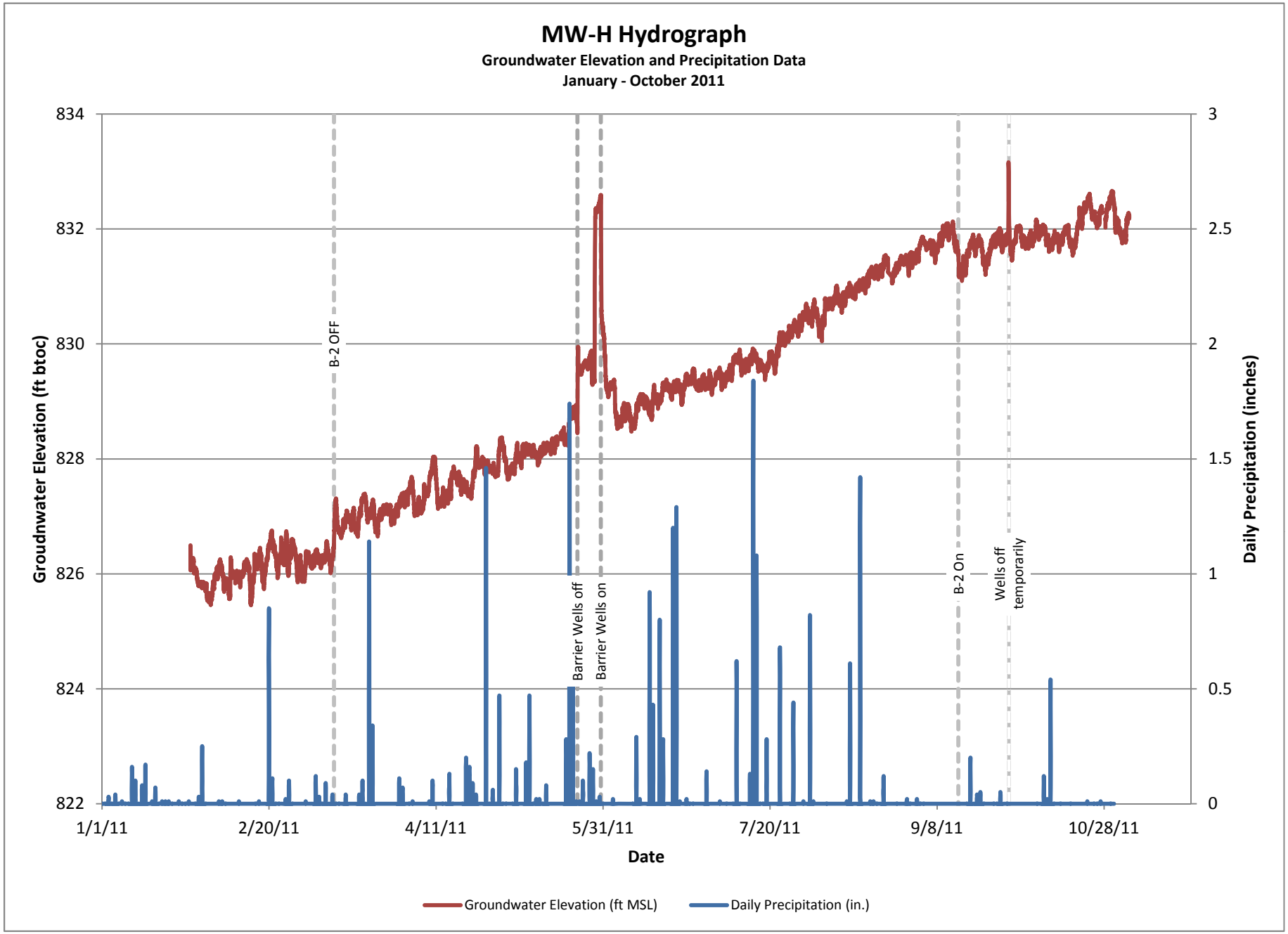
Note: Barrier Wells were shut off for annual maintenance from 5/23-5/30/2011



Note: Transducer installed in MW-6LR on 6/9/2011



Note: Barrier Wells were shut off for annual maintenance from 5/23-5/30/2011

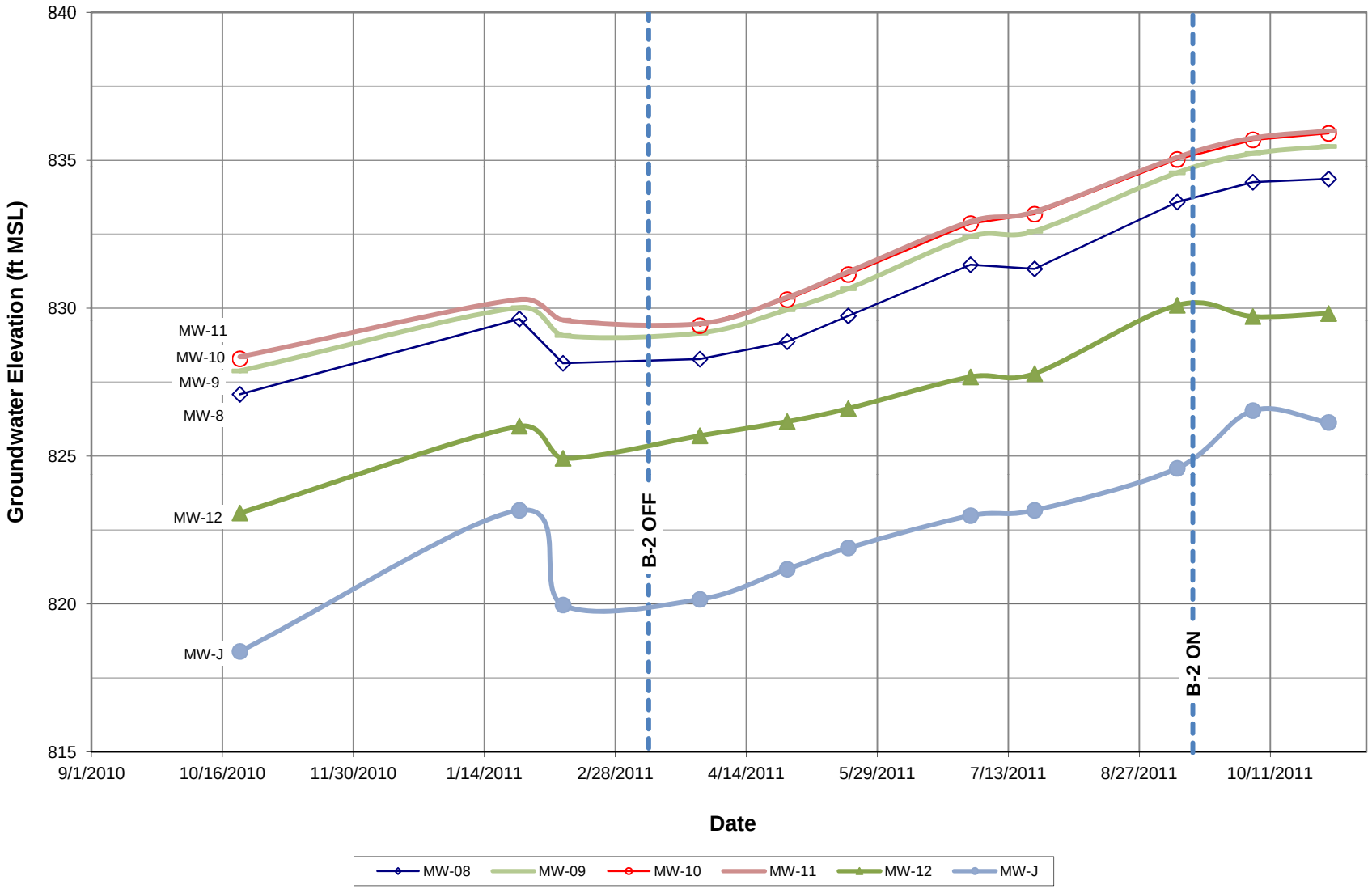


Note: Barrier Wells were shut off for annual Maintenance from 5/23 - 5/30/2011.

ATTACHMENT B2
GROUNDWATER HYDROGRAPHS
MANUAL DEPTH-TO-GROUNDWATER MEASUREMENTS

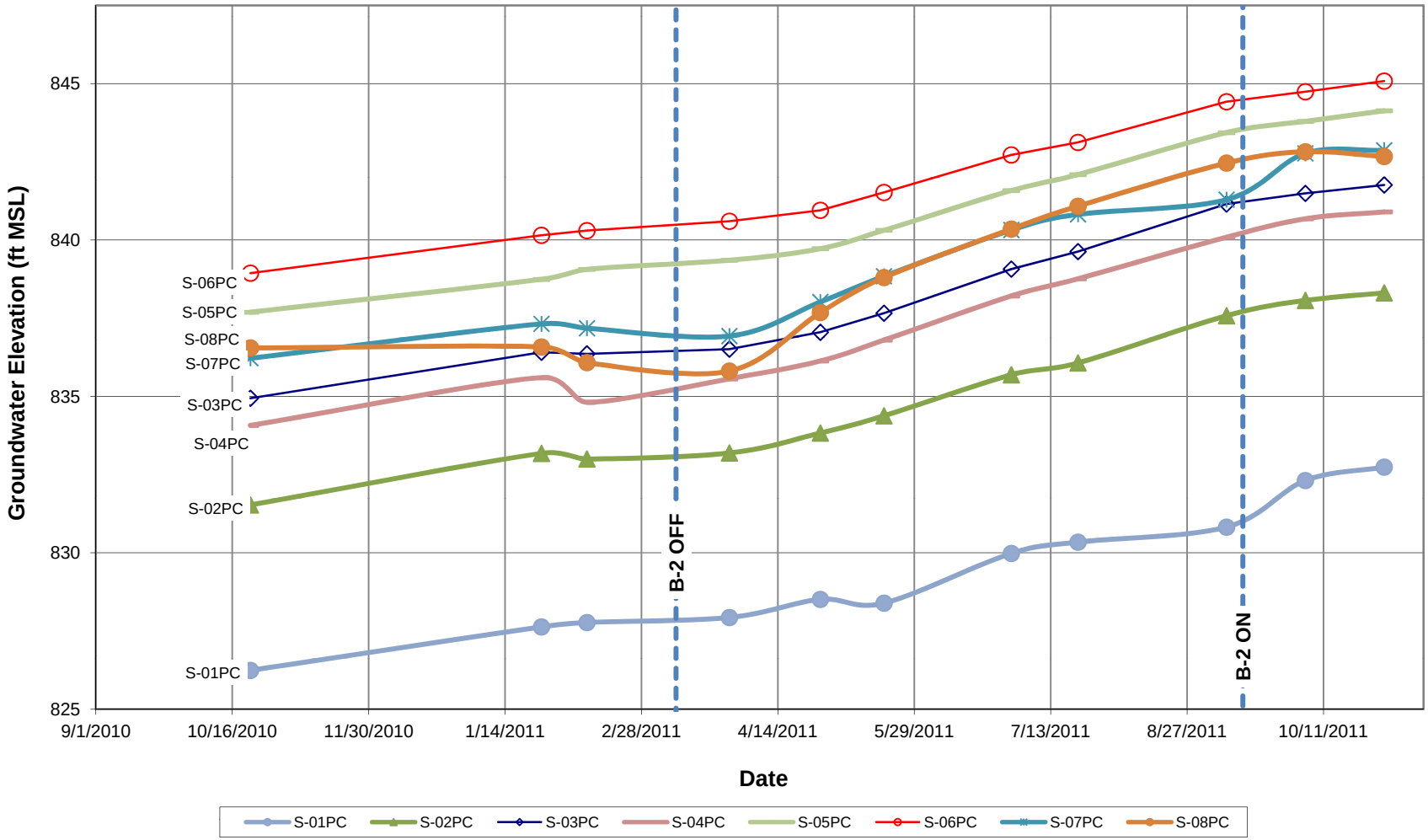
Groundwater Hydrograph

Prairie du Chien Monitor Wells
(Group 1)
1 October 2010 - 31 October 2011



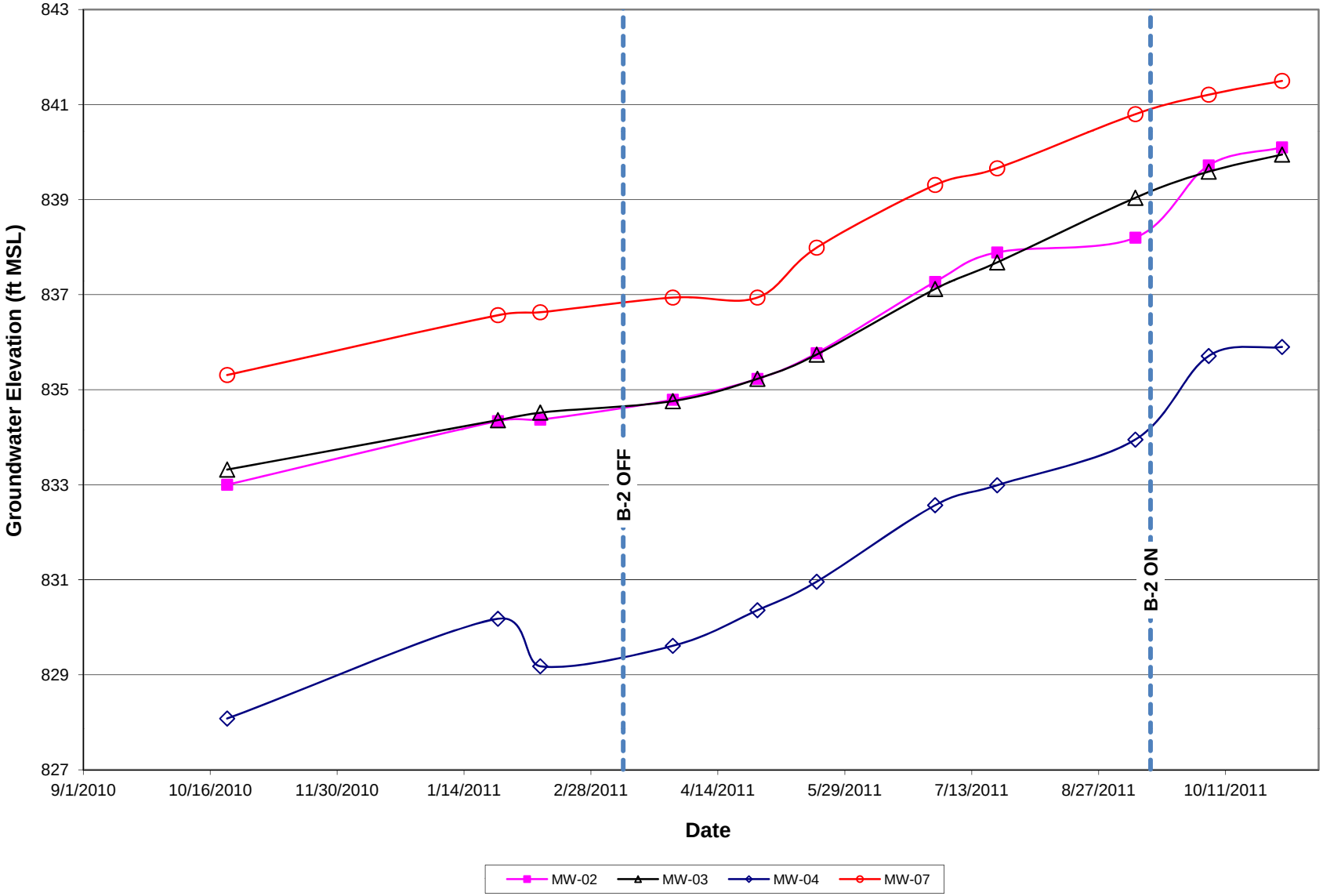
Groundwater Hydrograph

Prairie du Chien Monitor Wells
(Group 2)
1 October 2010 - 31 October 2011



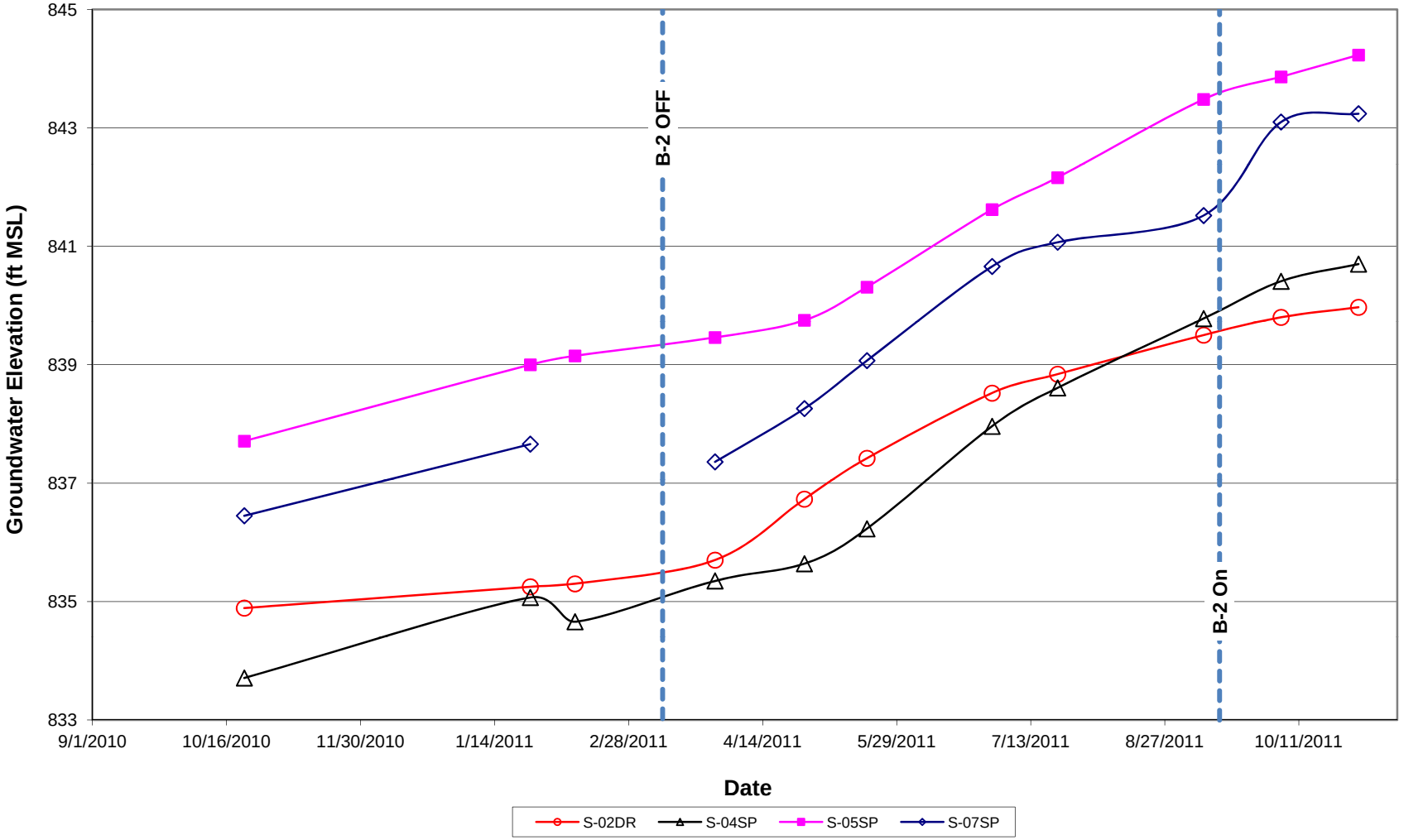
Groundwater Hydrograph

1 October 2010 - 31 October 2011
Shallow Monitor Wells MW-02, MW-03, MW-04 and MW-07
(Group 1)



Groundwater Hydrograph

1 October 2010 -31 October 2011
Shallow Monitor Wells S02DR, S04SP, S05SP, and S07SP
(Group 2)



Groundwater Hydrograph

Jordan Sandstone Monitor Wells
1 October 2010 - 31 October 2011