

1st Quarterly Monitoring Report

for

Town of Hamilton Well 14
Stone Eden Well
Hamilton, Virginia

Prepared for:

Mayor H. Ray Whitbey
Town of Hamilton

Prepared by:

TRIAD ENGINEERING, INC.
21641 Beaumeade Circle
Suite 300
Ashburn, VA 20147

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William J. Mikalik, CPG

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1.0 INTRODUCTION

The Loudoun County Department of Building and Development approved a Pumping, Monitoring, and Mitigation Plan (PMMP) that was prepared for the Town of Hamilton's Well 14, also known as the Stone Eden Well, in October 2008. The PMMP was prepared to address the groundwater monitoring requirements of Section 6.240, G., I., J., and K. of the Loudoun County Facility Standards Manual (FSM). The PMMP requires that monitoring reports be prepared and submitted to the County on a quarterly basis. This document presents the results of the monitoring activities during the first quarter of active pumping operation in Well 14.

Based on well monitoring data, active start-up pumping operations are believed to have begun on July 29, 2009. This 1st quarterly monitoring report therefore includes the pumping period of August, September, and October 2009, including data from ASI's previously submitted report "Background and Initial Pump Start-up (30-day) Monitoring Report" ("30-Day Report"), dated October 13, 2009. Please refer to this report for details regarding the installation of the probes and the water quality sampling methods. Relevant information on the monitored wells, obtained from Loudoun County well records, is summarized in Table 1 below.

Table 1
Domestic Well Monitoring Locations

Well ID	Residence Address	PIN	Well Yield (gpm)	Total Depth (feet)	Depth to Bedrock (feet)	Static Water Level (feet)	Water-Bearing Depths (feet)
4	Gaston and Kapsang Gutierrez 38286 Alfalfa Ct	419157282	50	380	20	30	180 (2), 365 (48)
5	Robert and Lori Gammache 38280 Alfalfa Ct	419155183	30	400	10	12	190 (4), 360 (26)
6	Hemadri and Aparna Dasari 38274 Alfalfa Ct	419153482	30	275	10	30	253
7	Edward and Courtney Cooke 38268 Alfalfa Ct	419150980	50	250	8	0	225
9	Bernardo and Jackyln Dedekind 17936 Manassas Gap Ct	454105978	60	383	50	30	381
12	James and Amy Walton 17979 Sands Road	454297930	15	380	25	2	365
13	Brian and Sherri Omara 17969 Sands Road	454302227	15	260	51	40	235

2.0 WATER QUALITY MONITORING

Section 4.5 of the PMMP recommended that the monitoring program should include an evaluation of water quality. Accordingly, water samples were collected from the residences from outside spigots where practicable, or from indoor faucets where necessary, after purging water from the piping. The water samples were tested by calibrated field instrumentation for the following parameters: pH, specific conductivity, turbidity and temperature.

2.1 Field Parameters

The first three sampling events were reported in the 30-Day report; these and the results of two additional sampling events have been summarized below in Table 2. The measurement parameters included: pH, specific conductivity, turbidity and temperature. The new results do not appear to change the findings from the 30-Day report that some variations have been recorded in the field measurements, however, additional data will be useful in evaluating any potential trends in the recorded data.

Table 2
Field Parameter Summary

Date	1/9/2009	8/9/2009	8/26/2009	10/6/2009	10/29/2009
Well ID					
pH (Standard Units)					
Well 4	6.79	7.8	7.93	8.17	7.84
Well 5	7.27	7.15	7.42	7.1	7.46
Well 6	6	7.7	7.77	7.61	7.96
Well 9	6.1	7.9	8.16	7.77	8.22
Well 12	7.71	7.54	7.37	7.53	7.54
Well 13	7.41	7.4	7.5	7.34	7.42
Specific Conductivity (µS)					
Well 4	420	288	524	365	424
Well 5	342	355	415	390	416
Well 6	315	271	322	295	290
Well 9	270	229	250	263	244
Well 12	311	286	260	290	277
Well 13	269	284	255	270	333
Temperature (°C)					
Well 4	16	17.5	21.9	16.3	15.8
Well 5	13.3	19	21	17.8	15.8
Well 6	11	21	25.7	18.3	15.9

Date	1/9/2009	8/9/2009	8/26/2009	10/6/2009	10/29/2009
Well ID					
Well 9	11.4	24.5	23.1	19.6	16.9
Well 12	12.4	19.5	23.3	18.8	15.7
Well 13	13.3	21	23.2	19	16.3
Turbidity (NTUs)					
Well 4	0.08	0.2	1.38	0.005	0.51
Well 5	0.01	0.55	0.77	2.84	0.46
Well 6	0	0.89	0.6	0.61	0.16
Well 9	1.23	1.82	0.45	0.64	1.09
Well 12	0.01	0.21	4.5	0.59	0.21
Well 13	0.06	0.83	0.75	0.86	0.17

2.2 Laboratory Analysis

No Laboratory analysis was performed during first quarter of pumping.

3.0 GROUNDWATER LEVEL MONITORING

During the first quarter of pumping, ASI personnel mobilized to the site on August 9, August 26, September 29, October 6, and October 29 to check the operation of the probes and to download data from the probes. On October 6, the probes were re-programmed to collect data on an hourly basis. Water level data collected during the monitoring program have been plotted for each monitor well resulting in graphs that depict changes in water levels over time during the monitoring period. The plots include data from both the background phase and pumping phase of the monitoring program. Graphs for each individual monitor well have been included in Appendix A. An electronic copy of the monitoring data, in csv format, has been included in Appendix C.

3.1 Water Level Analysis

Water level fluctuations in the monitored wells continued in the general pattern described in the 30-day report. The operation of Well 14 apparently continued to be sporadically timed, with extended periods of time in between pumping events.

After the background monitoring phase, significant water level fluctuations in Wells 4, 5, and 6 appeared to coincide very closely, suggesting that the greater drawdowns may have been caused by withdrawals from Well 14. In general, the major drawdowns in the monitored wells during September and October were not as pronounced as was observed in August (included in the 30-Day report). The background water levels in Wells 12 and 13 fluctuated over a greater range than in the other monitored wells. The recovery in all

of the monitored wells was relatively rapid, with water levels usually re-stabilizing at pre-drawdown levels in most wells. This rapid recovery suggests that the wells are strongly recharged by the local aquifer.

In contrast, Wells 9 and 12 exhibited minimal decreases in their water levels during the apparent operation of Well 14, which suggests that withdrawals from Well 14 may have a lesser impact on these two wells than on the other five monitored wells.

3.2 Discharge Data from Well 14

Well 14 discharge data for the month of October were obtained from the Hamilton Water Treatment Plant (WTP). The data includes the dates, duration, and total water volume of pumping. Detailed pumping data were not available for the earlier months.

Withdrawals from Well 14 occurred on nine days in October. Pumping durations varied from 36 minutes to over three hours, with most durations lasting between one and two hours. Average pumping rates during October varied between 253 and 294 gallons per minute (gpm), for an average rate for the month of 272 gpm.

Both the timing and durations of most of the pumping events coincide closely with the date and extent of the drawdown events in the water level data for Wells 4, 5, and 6. The pumping dates and durations are graphically compared to water levels in these wells in Figure 4. The pumping data, including daily pumping durations and volumes, are provided in Appendix B.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The data from the two additional months of monitoring since the 30-day report supports the conclusions from the 30-day report. That is, the nearly simultaneous drops in well water levels during numerous occasions are believed to be associated with the withdrawal of groundwater from Well 14. Recoveries in the wells continues to be strong and no reports of groundwater quantity or quality problems have been received by the Town of Hamilton from these well owners; however, additional monitoring data will be needed to evaluate more long term effects following the continued active operation of Well 14.

Water quality parameters suggested some variation in water quality during the monitoring period, however, the collection of additional quality data will enable a better assessment of water quality trends over time including potential seasonal fluctuations.

According to Mr. Bill Dickey of the Town of Hamilton's WTP, Well 14 was utilized for water supply on an as-needed basis during the month of October 2009. While the times of pump start are not documented, the dates of pumping coincide closely with the major drawdown events in the monitored wells. Furthermore, the durations of pumping appear to be positively related to the drawdown distance, especially noticeable in Well 4, the

closest to Well 14. These phenomena verify that the drawdowns in the monitored wells are a result of the operation of Well 14.

The pumping responses in Wells 4, 5, and 6 were significantly greater than in Wells 9, 12, and 13. The reasons for this difference are not certain; however, the stream channel that runs north to south to the west of Well 14 may mark a hydrogeologic divide, suggesting that responses in wells on the same side of the stream channel feature as Well 14 may be more pronounced than those to the west of the feature.

While the drawdowns in the monitored wells were significant, the strong recharge observed in all the wells suggests that the pumping schedule utilized during October 2009 may be sustainable. While data collected and included in this report are considered useful in evaluating potential effects of the pumping of Well 14, future monitoring data may be more representative of conditions during the active operation of Well 14.

5.0 LIMITATIONS

The work performed in conjunction with this project, and the data developed, are intended as a description of available information at the sample locations indicated and the dates specified. Generally accepted industry standards were used in the preparation of this report.

Laboratory data are intended to approximate actual conditions at the time of sampling. Results from future sampling and testing may vary significantly as a result of natural conditions, a changing environment, or the limits of analytical capabilities. This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a specific location not investigated. The limited sampling conducted was intended to approximate subsurface conditions by extrapolation between data points. Actual conditions may vary.

FIGURES

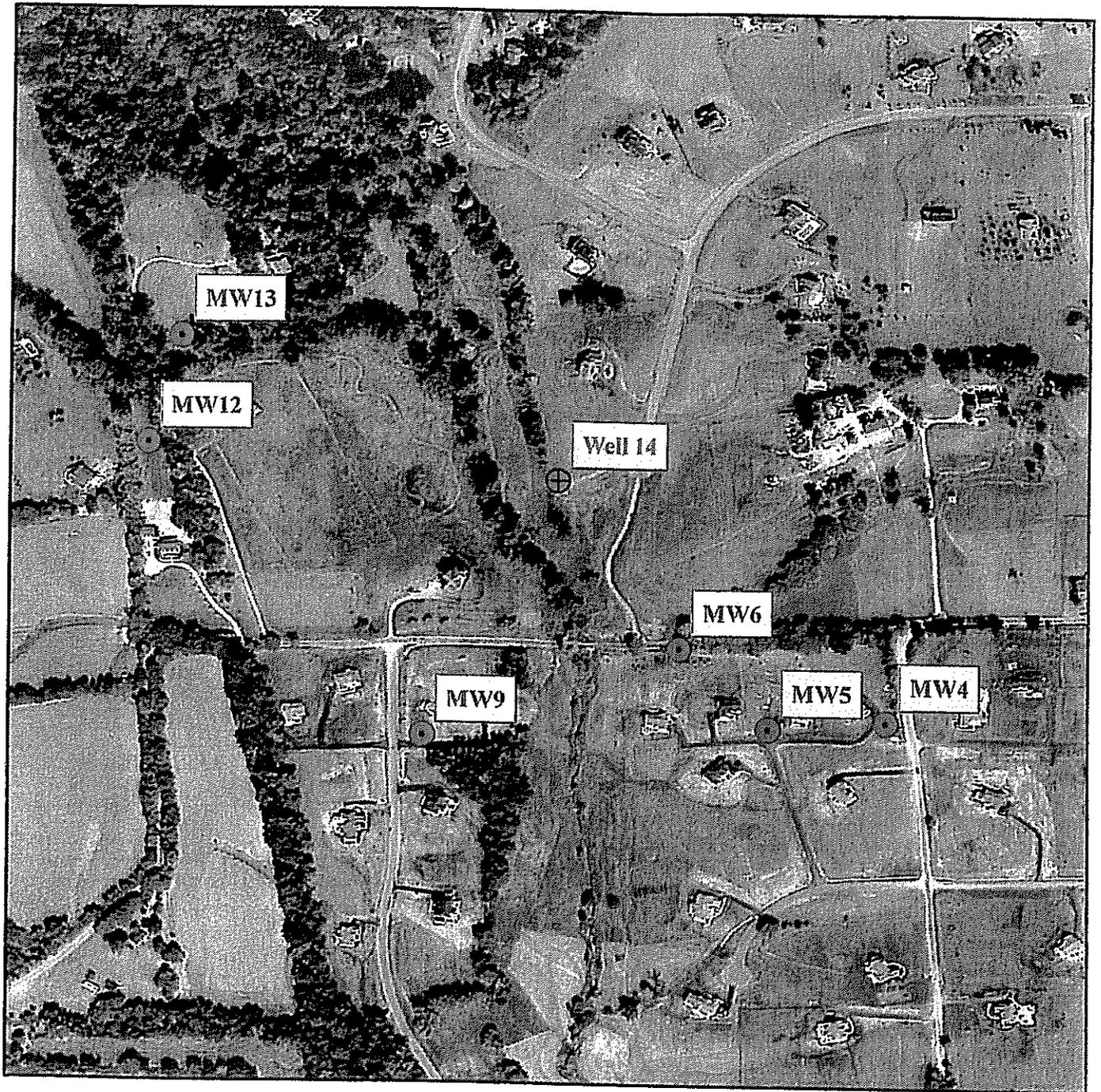


Figure 1. Area of Well Monitoring

Legend

- ⊕ Town of Hamilton Well
- ⊙ Monitored Domestic Supply Wells



500 250 0 500 Feet



Figure 2
Wells 4, 5, and 6

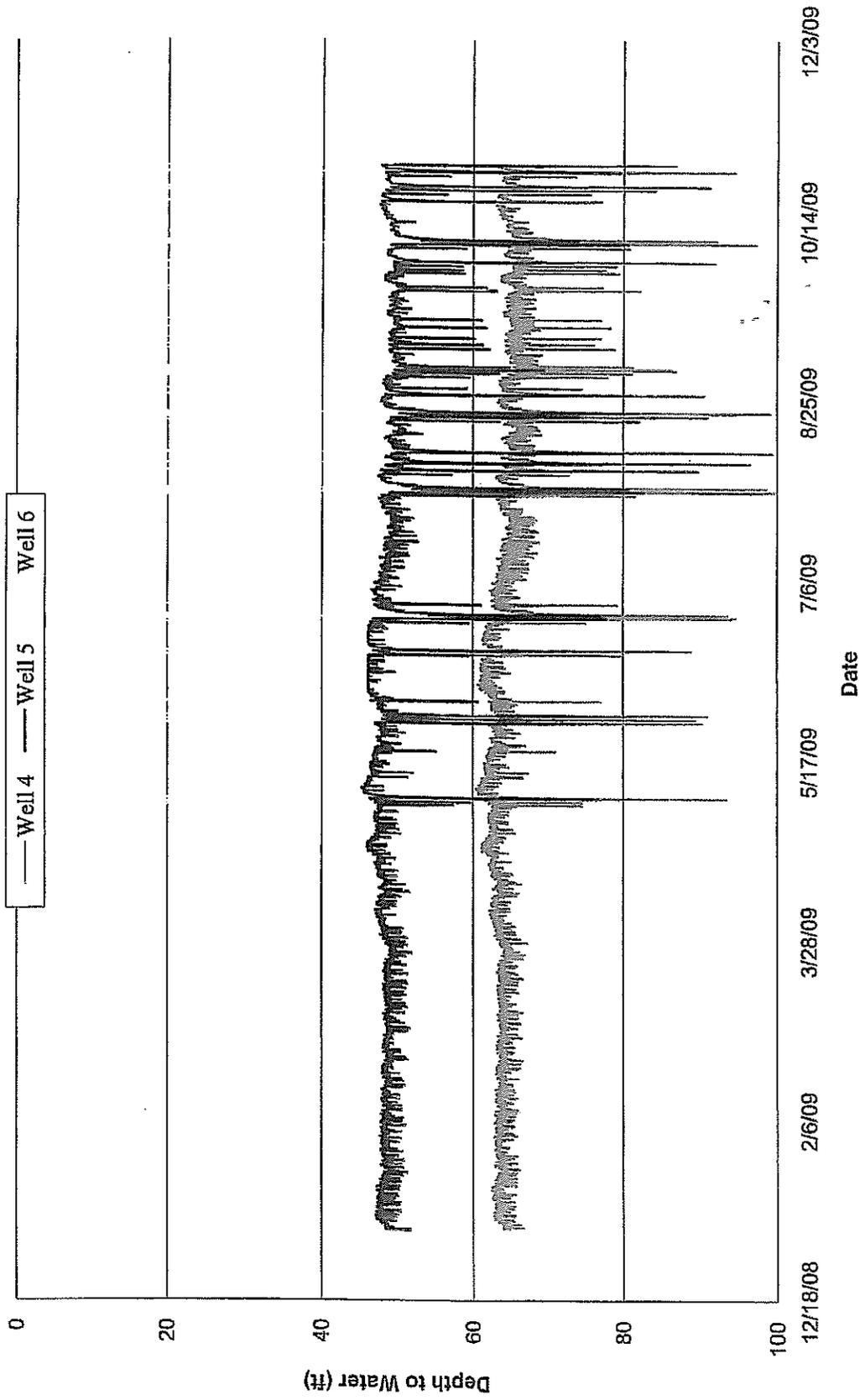


Figure 3
Wells 9, 12, and 13

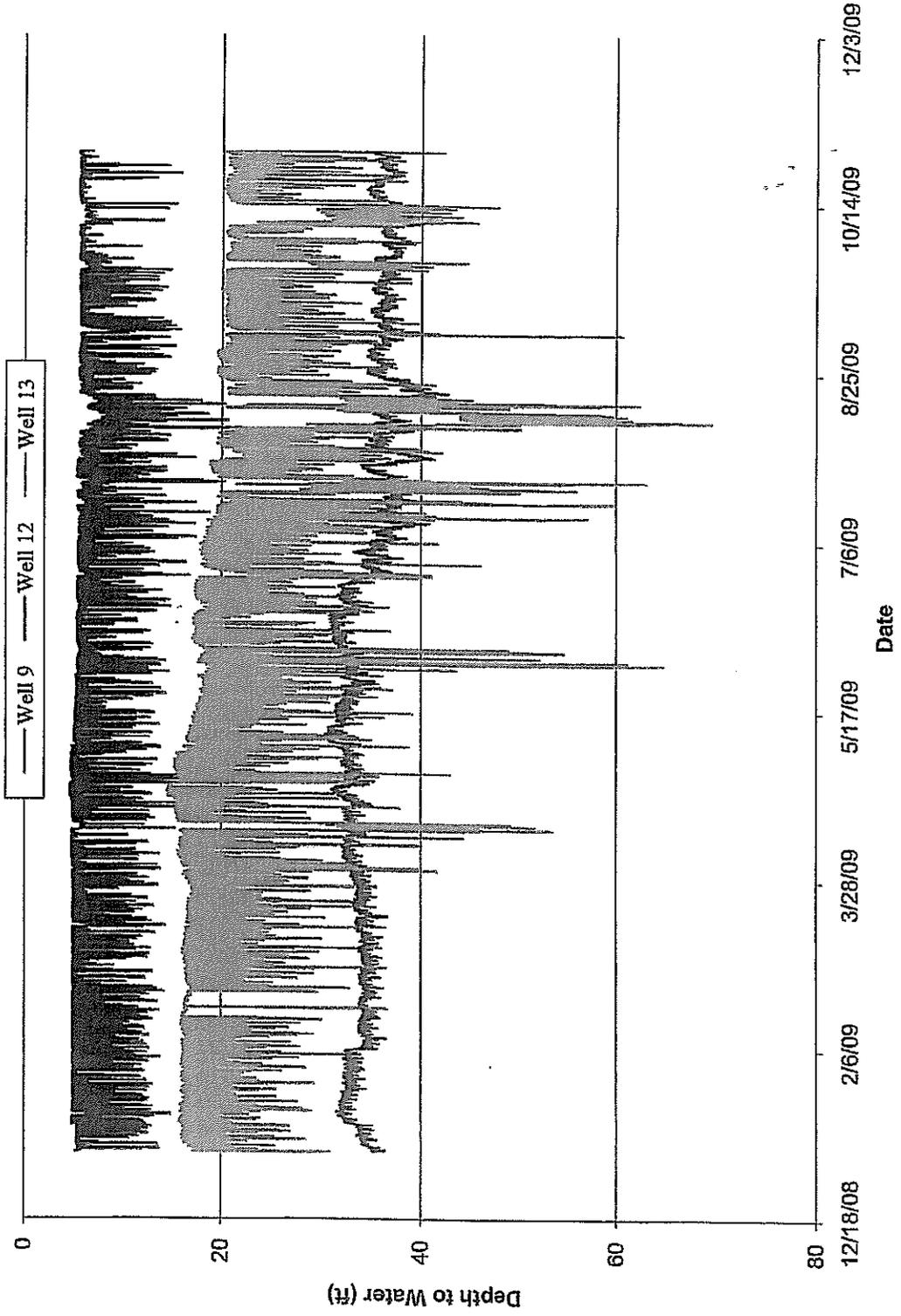
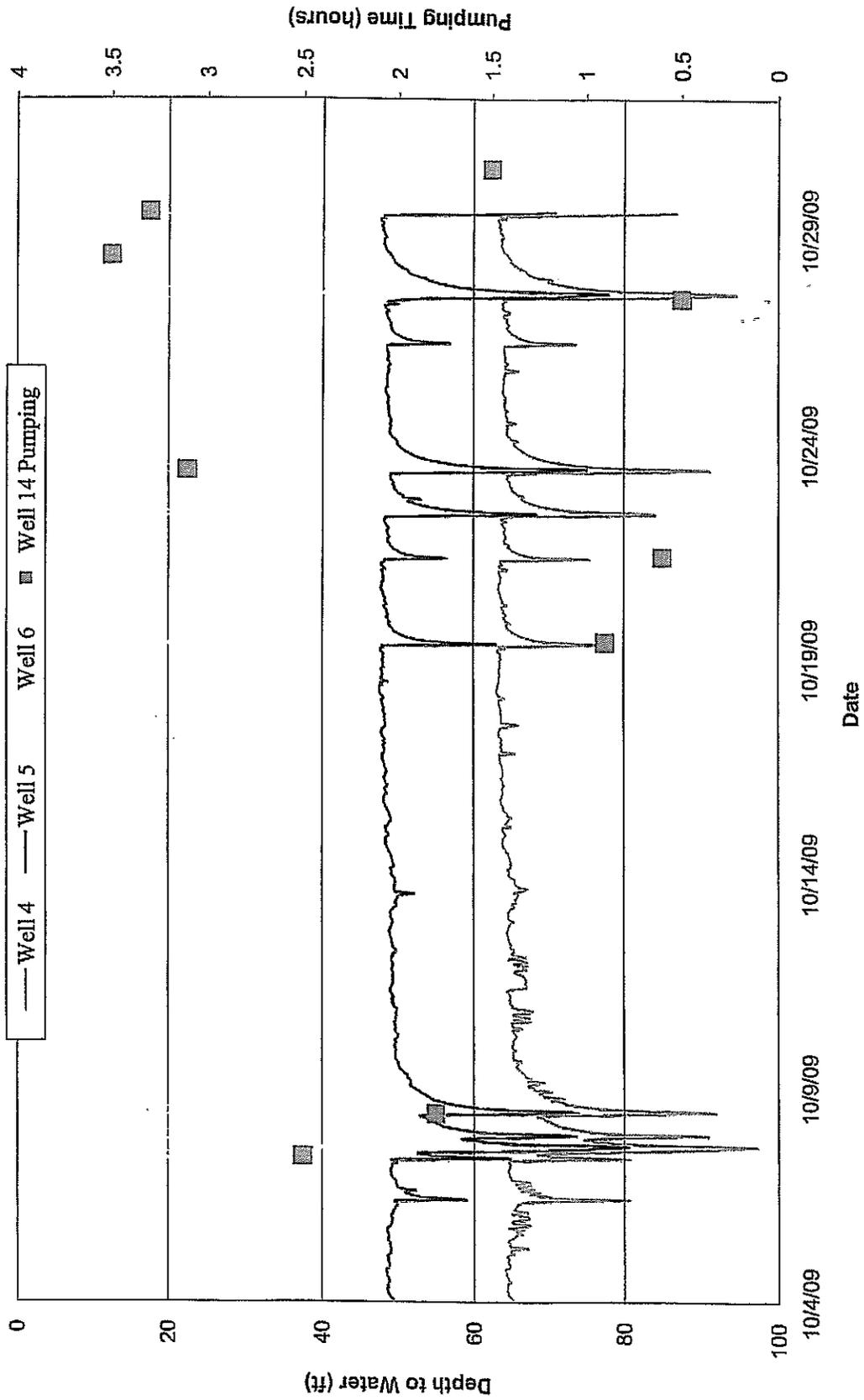


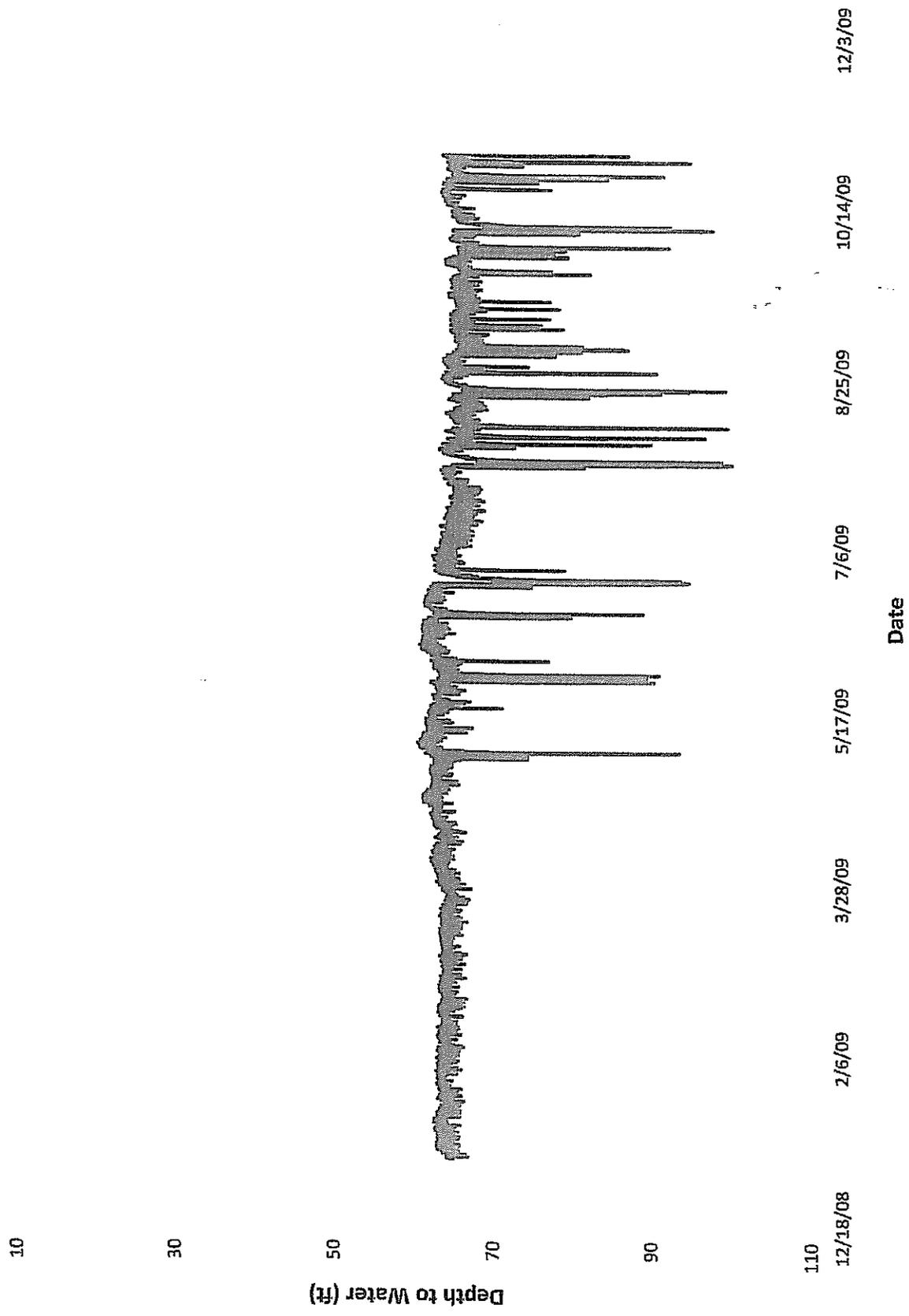
Figure 4
Wells 4, 5, and 6 with Well 14 Pumping Time



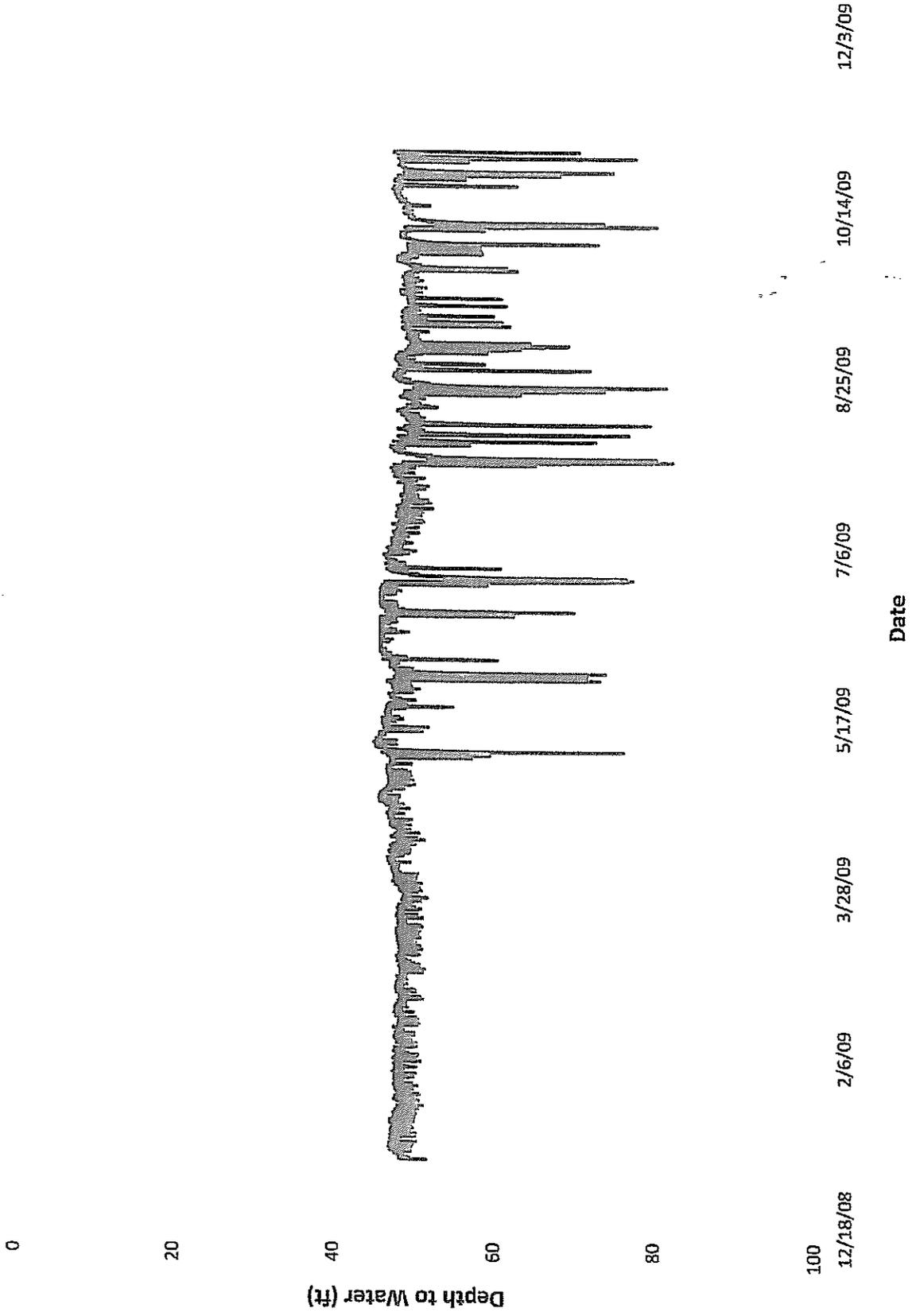
APPENDIX A

GRAPHS OF WATER LEVELS FOR INDIVIDUAL WELLS

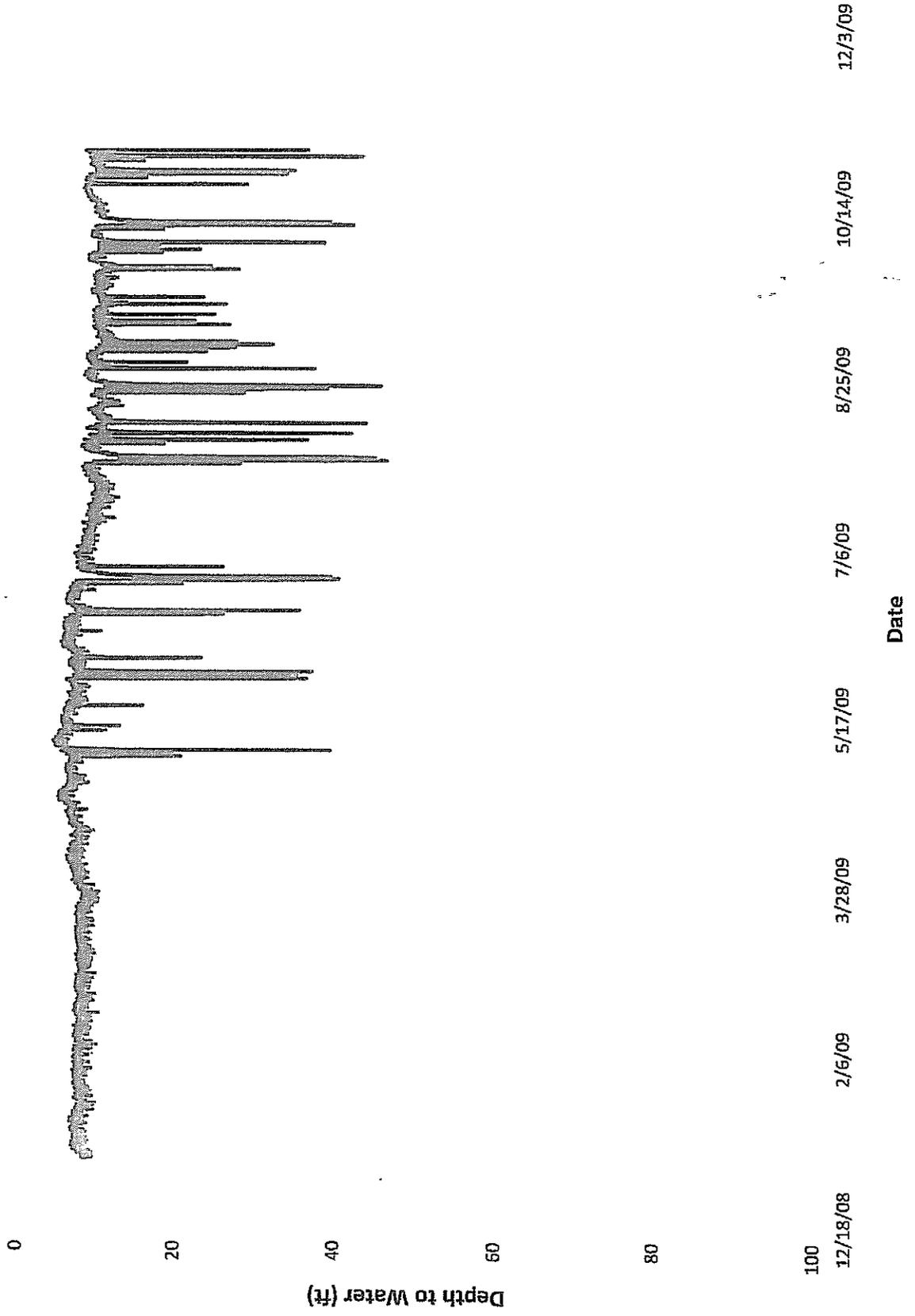
Well 4. Depth to Water



Well 5. Depth to Water



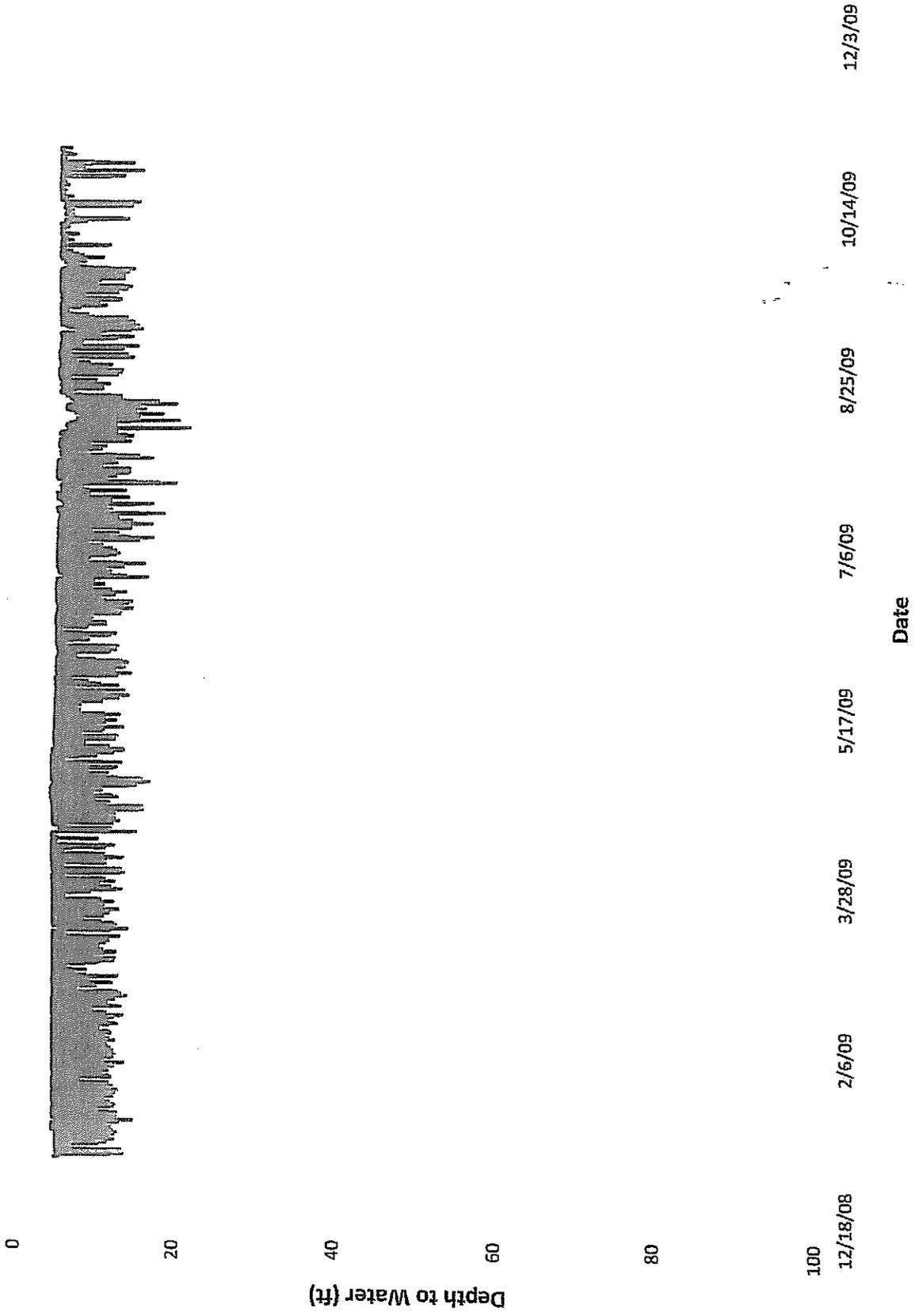
Well 6. Depth to Water



Well 9. Depth to Water



Well 12. Depth to Water



Well 13. Depth to Water



APPENDIX B

WELL 14 PUMPING DATA

Town of Hamilton 1st Quarterly Monitoring Report Appendix D. Well 14 Pumping Data

October 2009

Date	Pumping Time (hours)	Volume (gal)	Pumping Rate (gpm)
1			
2			
3			
4			
5			
6			
7	2.5	38,000	253.3333
8	1.8	31,700	293.5185
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19	0.9	15,000	277.7778
20			
21	0.6	9,500	263.8889
22			
23	3.1	51,900	279.0323
24			
25			
26			
27	0.5	8,400	280
28	3.5	56,200	267.619
29	3.3	53,900	272.2222
30	1.5	23,200	257.7778
31			
Total	17.7	287,800	
Average	1.967		271.69

Note: gpm = gallons per minute

APPENDIX C

ELECTRONIC MONITORING DATA