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Our File: 9507

February 24, 2014

Township of Puslinch
 7404 Wellington Road 34
 Guelph, ON
 N1H 6H9

Attention: Karen Landry
 CAO

Dear Mrs. Landry:

Re: PTTW – Meadows of Aberfoyle (MOE Ref. # 5626-7WLQ3W)

We have reviewed the 2013 Monitoring Report for the Permit to Take Water for the Meadows of Aberfoyle.

The rate of water taking at Meadows of Aberfoyle is well within the permissible limits listed on the Permit to Take Water. In our last review of this file in 2011 we noted an anomalously high rate of water consumption during the summer months. This high summer rate of consumption appears to have decreased in 2012 and 2103. We spoke with the author of the 2013 report, Mr. Bill Banks, P.Eng., and he indicated that 2011 was still a period of growing in for many lawns which may explain the high use.

The groundwater levels are not trending downward, therefore there does not appear to be a year over year impact on the groundwater levels.

There does appear to be a trend in the mini piezometer MP4 data suggesting a 20% decline in upward hydraulic gradient within Aberfoyle Creek adjacent to Gilmour Road (Graph 12 – attached). A review of the on-site overburden monitoring well data does not show a similar trend. However, a review of data obtained from Puslinch Groundwater Monitoring Network monitors MW1, MW2 and MW6 does suggest a

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potential declining trend between 2008 and 2013. From previous studies done in this area we understand Aberfoyle Creek to be a productive trout fishery in the area of Gilmour Road and therefore we suggest that this trend be reviewed in 2014.

The data obtained from mini-piezometer MP3 located on the west side of Brock Road indicates that unlike previous years, groundwater discharge conditions occurred throughout the year. Discharge conditions are beneficial to Mill Creek and therefore this is seen as a positive observation.

A visual inspection of the hydrographs of the Howlett and the Huether domestic wells indicate that these wells are not being impacted by the water taking.

In summary, water taking at the Meadows of Aberfoyle is within the permitted rates and that long term impacts of the water taking are not occurring.

If you have any questions or comments regarding this submission please do not hesitate to contact Stan Denhoed at 519-826-0099.

Respectfully submitted,



Stan Denhoed, M.Sc., P.Eng
Harden Environmental

6.5(b)

Banks Groundwater Engineering Limited

940 Watson Road South, RR 1 Puslinch, Ontario NOB 2J0
519.829.4808 www.banksgroundwater.ca

29 January 2014

RECEIVED

JAN 29 2014

Township of Puslinch

Township of Puslinch
7404 Wellington Road 34
Puslinch, ON N1H 6H9

**Re: Meadows of Aberfoyle - 2013 Annual Monitoring Report
Permit to Take Water No. 5626-7WLQ3W**

Dear Madam/Sir,

Enclosed is a copy of our Annual Monitoring Report that has been prepared in fulfilment of the above-referenced Permit to Take Water Conditions. This copy is submitted to the Township of Puslinch as a Condition of the Permit.

Should there be any questions about the report or the on-going monitoring program, please do not hesitate to contact me.

Sincerely,
Banks Groundwater Engineering Limited

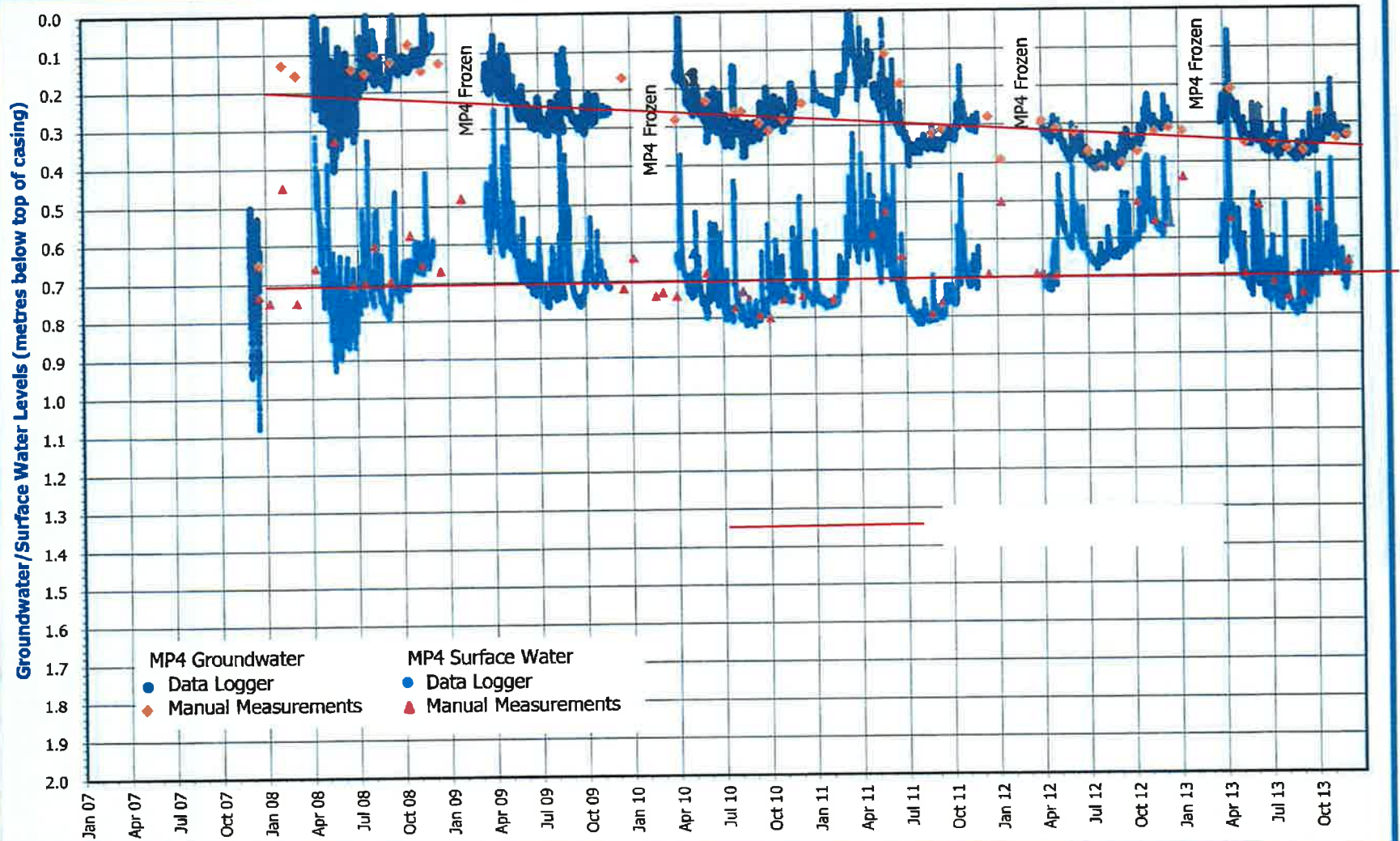


William D. Banks, P.Eng.
Principal Hydrogeologist

Encl.

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Groundwater & Surface Water Levels - Mini-Piezometer MP4 (April 2007 to December 2013)



**2013 Annual Monitoring Report
Meadows of Aberfoyle
Permit to Take Water No. 5626-7WLQ3W**

January 2014

Prepared for:

**Wellington Vacant Land
Condominium Corporation No. 147
Puslinch, Ontario**

Prepared by:

 **Banks Groundwater Engineering Limited**
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29 January 2014

Ms. Belinda Koblik, Director, Section 34, OWRA
Ministry of the Environment, West Central Region
Technical Support Section, Water Resources
12th Floor
119 King Street West
Hamilton, ON L8P 4Y7

**Re: Meadows of Aberfoyle - 2013 Annual Monitoring Report
Permit to Take Water No. 5626-7WLQ3W**

Dear Ms. Koblik,

On behalf of Wellington Vacant Land Condominium Corporation No. 147, enclosed is the Annual Monitoring Report in fulfilment of Conditions 4.1 to 4.5 of the above-referenced Permit to Take Water. This report presents the monitoring data required to comply with these conditions, as they apply to a communal water supply system for the Meadows of Aberfoyle residential development. This community is located in the southwest half of Lot 23, Concessions 7 and 8, Township of Puslinch, Wellington County.

Please note that in Section 2.5.2 of the enclosed report we make the following conclusions and recommendation for your consideration:

On the basis of the observations and analyses presented in this report and the preceding four reports, it is concluded there is no evidence that pumping of PW6 and PW7 has any effects on off-site groundwater levels, surface water levels, and surface water flow at any of the respective monitoring stations.

Therefore, with reference to Condition 4.5 of the PTTW (as underlined on the previous page), it is recommended that the Director approve a reduction in the frequency of manual monitoring from monthly to quarterly (e.g. January, April, July, and October). This would apply to all monitored locations. However, for those stations that are also monitored with data loggers, water levels will continue to be recorded on an hourly basis in the same manner as previous years. It is anticipated that this revised monitoring protocol can be approved prior to April 2014, and as such quarterly manual monitoring would begin in April 2014.

I trust that the information provided herein meets the Permit requirements. Should you have any questions or comments, please contact me. We look forward to your response to our recommendation for a reduction in the frequency of manual monitoring.

Respectfully submitted,
Banks Groundwater Engineering Limited



William D. Banks, P.Eng.
Principal Hydrogeologist

Encl.

Copies: Wellington Vacant Land Condominium Corporation No. 147
Township of Puslinch

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Appendixes

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Appendix B: 2013 Daily Pumping Records for PW6 and PW7

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Appendix D: Monitoring Program Graphs

Appendix E: Monitoring Program Data

Meadows of Aberfoyle - 2013 Annual Monitoring Report

Permit to Take Water No. 5626-7WLQ3W

1 Introduction

The following annual monitoring report has been prepared to comply with Conditions 4.1 to 4.5 of Permit to Take Water (PTTW) Number 5626-7WLQ3W. This report presents the monitoring data required to comply with these conditions, as they apply to a communal water supply system for the Meadows of Aberfoyle residential development. This community is located in the southwest half of Lot 23, Concessions 7 and 8, Township of Puslinch, Wellington County. It comprises 55 building lots and has been considered fully occupied since May 2011.

Banks Groundwater Engineering Limited was retained in September 2012, by Wellington Vacant Land Condominium Corporation No. 147, to assume groundwater and surface water level monitoring and reporting responsibilities. This report is the fifth annual report submitted to meet the PTTW Monitoring Conditions. The PTTW is included for reference in Appendix A.

2 PTTW - Monitoring Conditions

Reference is made under each of the following sections to the respective PTTW Conditions and is followed by the information required to comply with each Condition.

2.1 Condition 4.1 - Record of All Water Takings

In addition to the requirements imposed by Section 9 of O.Reg. 387/04, and as authorized by Subsection 34(6) of the Ontario Water Resources Act, the Permit Holder shall do the following: maintain a record of all water takings that includes the date, times, rates and total measured amounts of water pumped per day for each day that water is taken under the authorization of this Permit; keep all required records current and available at or near the site of the taking; and produce those records for the inspection of a Provincial Officer immediately upon his or her request. A separate record shall be maintained for each source. The total amounts of water pumped from each well shall be measured using a calibrated flow device that shall be installed on each well prior to the commencement of the water taking.

During 2013, wells PW6 and PW7 were the only wells pumped. Wells PW2 and PW5 are not equipped with pumps and serve only as bedrock observation wells. Water takings from PW6 and PW 7 are measured using totalizing flow meters and recorded electronically. These data have been provided to Banks Groundwater Engineering for the purposes of reporting. The daily pumping records are presented in Table B1, Appendix B. These water takings have been reported to the Ministry of the Environment using the on-line Water Taking Reporting System. Record of this reporting is included in Appendix C. The daily pumping data are presented in Graphs 1 and 2 in Appendix D.

A summary of the annual pumping data is presented below in Table 1. The maximum allowable taking from each well for any day is 785,000 Litres. As shown in Table 1, the maximum amount pumped in one day during 2013 from PW6 was 85,200 Litres and from PW7 was 113,000 Litres, which is much less than the maximum permitted daily taking.

Table 1: Summary of Annual Pumping Data

Year	Maximum Day (Litres)		Minimum Day* (Litres)	
	PW6	PW7	PW6	PW7
2008	61,866	49,400	294	154
2009	61,100	50,900	2,500	3,100
2010	20,900,	118,400	100	6,500
2011	82,700	273,300	100	5,100
2012	136,000	185,100	8,400	7,000
2013	85,200	113,000	10,100	6,800

* Minimum non-zero taking

It has been previously reported that the water pumping and distribution system is controlled in a manner that wells PW6 and PW7 are not pumped simultaneously. This arrangement complies with Condition 3.3 of the PTTW. The wells are pumped on an alternating basis.

2.2 Condition 4.2 - Groundwater Monitoring Program

The Permit Holder shall conduct the following groundwater monitoring program as soon as 50 % occupancy is achieved:

- 1) *Monitor the water levels as follows:*
 - a) *Monthly measurements at the following wells:*
 - i) *On-site overburden wells MW8, MW9, MW10 and MW11*
 - ii) *On-site bedrock wells PW6, PW2 and PW5*
 - iii) *Domestic off-site wells Leachman and Pond (with permission of the owners)*
 - b) *At a frequency of once per hour at the following wells:*
 - i) *On-site bedrock well PW7*
 - ii) *Off-site domestic wells Heuther and Howlett (with permission of the owners)*
- 2) *Establish a 3-month baseline database as a minimum, prior to the water taking.*

2.2.1 Monthly Groundwater Monitoring

During 2013, monthly measurements of groundwater levels were taken and recorded in all of the listed wells, with the exception of the Leachman domestic off-site well. The owner of this domestic well no longer wishes to be included in the monitoring program. The monthly groundwater levels for 2013 are summarized in Table 2. The groundwater level data for these eight wells, from 2007 through 2013, is presented in Graphs 3 to 6 in Appendix D. A complete set of monthly groundwater levels is presented in Table E1, Appendix E.

All monitored wells exhibited similar groundwater level trends during 2013. Higher water levels were observed in March and April and then began to decline in May. The lowest levels were observed in August and September, which is similar to previous years and is typical for the region. Groundwater levels rose through the fall, which is interpreted to be in response to rainfall in September, October and December.

Table 2: 2013 Monthly Groundwater Levels for Overburden, Bedrock and Domestic Wells for Condition 4.2

Date	MW8	MW9	MW10	MW11	PW6	PW2	PW5	Pond
10-Jan	4.91	2.95	1.63	1.89	13.69	6.30	11.21	2.43
18-Feb	4.52	2.84	1.47	1.81	11.71	6.02	9.68	2.27
15-Mar	3.59	2.67	1.18	1.60	13.38	5.93	11.12	1.91
17-Apr	3.53	2.61	1.12	1.74	13.32	5.88	10.66	1.81
15-May	4.34	2.78	1.33	1.89	14.02	6.08	11.21	2.16
11-Jun	4.38	2.65	1.22	1.44	12.84	6.02	10.89	2.04
11-Jul	4.32	2.75	1.32	1.83	13.30	6.09	11.32	2.51
09-Aug	4.56	2.82	1.42	1.90	15.26	6.45	12.68	2.76
09-Sep	4.97	2.90	1.52	1.81	13.90	6.40	11.04	2.38
08-Oct	4.42	2.61	1.30	1.53	12.85	6.20	10.96	2.07
14-Nov	4.18	2.72	1.32	1.84	13.32	6.20	11.27	2.12
12-Dec	4.88	2.95	1.61	1.90	14.19	6.37	11.37	2.28

Note: All readings are metres below top of well casing

A comparison of 2013 groundwater level data to historical data is presented in Table 3, including maximum (highest), minimum (lowest), range, and average values.

Table 3: Summary of Monthly Groundwater Levels - Historical vs. 2013

Well	Historical Groundwater Levels				2013 Groundwater Levels			
	High	Low	Range	Average	High	Low	Range	Average
MW8	3.31	6.00	2.69	4.50	3.53	4.97	1.44	4.38
MW9	2.47	3.41	0.94	2.84	2.61	2.95	0.34	2.77
MW10	1.28	2.24	0.96	1.69	1.12	1.63	0.51	1.37
MW11	1.25	2.20	0.95	1.82	1.44	1.90	0.46	1.77
PW6	12.13	17.34	5.21	14.07	11.71	15.26	3.55	13.48
PW2	5.88	7.97	2.09	6.68	5.88	6.45	0.57	6.16
PW5	9.79	14.86	5.07	11.70	9.68	12.68	3.00	11.12
Pond	1.72	2.82	1.10	2.25	1.81	2.76	0.95	2.23

Note: All readings metres below top of well casing

Groundwater levels during 2013 fluctuated within less of a range than the range of levels observed from 2007 through 2012. The greatest ranges in 2013 were observed in MW8, PW6, and PW5, which has been similar in previous years. There were three new high groundwater levels observed during 2013 (i.e. MW10, PW6, and PW5), but no new low groundwater levels. Groundwater levels in bedrock wells PW6, PW2, and PW5 continue to exhibit a gradual increasing trend over the 2007 to 2013 period, as illustrated in Graphs 4 and 5 in Appendix D.

2.2.2 Hourly Groundwater Monitoring

During 2013, hourly groundwater levels were recorded with data loggers installed in the bedrock production well PW7 and the two off-site domestic wells Heuther and Howlett. Groundwater levels for these three wells recorded over the 2007 to 2013 period are presented in Graphs 7, 8, and 9 respectively in Appendix D. These graphs illustrate temporarily reduced groundwater levels in response to pumping of the respective wells (i.e. drawdown), and also confirm recovery of the levels following each pumping period.

Seasonal trends are exhibited by the highest water levels (i.e. static levels), which are similar to the manual measurements in the other monitored wells. The static groundwater levels in bedrock wells PW7 and Howlett also continue to exhibit a gradual increasing trend over the 2007 through 2013 period, whereas the static groundwater levels in the Heuther well are remaining within the same narrow range, without trending upward. Groundwater levels in these wells during 2013 continued to be within the ranges observed during the previous six years, although appeared to in the higher half of the range in PW7 and Howlett. A comparison of 2013 hourly groundwater level data to historical data (i.e. 2007 to 2012) is presented in Table 4, including maximum (highest), minimum (lowest), range, and average values.

Table 4: Summary of Hourly Groundwater Levels - Historical vs. 2013

Well	2007-2012 Groundwater Levels				2013 Groundwater Levels			
	High	Low	Range	Average	High	Low	Range	Average
PW7	11.33	18.50	7.17	14.29	11.56	16.15	4.59	13.58
Heuther	9.67	29.23	19.56	11.83	10.00	28.79	18.79	11.90
Howlett	6.12	20.67	14.55	9.20	6.39	16.97	10.58	8.77

Note: All readings metres below top of well casing

2.2.3 Baseline Database

The condition of a three-month baseline database was reported in previous annual monitoring reports. Groundwater level monitoring began on-site in April 2007 and occupancy began at the site in August 2007. As noted previously, this residential community comprises 55 building lots and has been considered fully occupied since May 2011.

2.3 Condition 4.3 - Surface Water Monitoring Program

The Permit Holder shall conduct the following surface water monitoring program as soon as 50% occupancy is achieved:

- 1) The Permit Holder shall monitor surface water levels at MP1, MP3, and MP4 on a continuous basis from April 1 to November 30 and manually at a frequency of monthly for December to March for two years.*
- 2) The Permit Holder shall monitor piezometer water levels and hydraulic gradients at MP1, MP3, and MP4 on a continuous basis from April 1 to November 30 and manually at a frequency of monthly for December to March for two years. For the ease of analysis, discussions and interpretations in the annual monitoring report the minimum daily levels and the average hydraulic gradient may be used.*
- 3) The Permit Holder shall measure surface water flows at MP3 and MP4 on a monthly basis.*

2.3.1 Surface Water and Groundwater Monitoring at MP1, MP3, and MP4

Surface water and groundwater levels were recorded with data loggers at the locations of mini-piezometers MP1, MP3, and MP4, from April 1 to November 30, 2013. Water levels were recorded on an hourly basis by each of the six data loggers and also manually on a monthly basis. For the periods January 1 to March 31 and December 1 to 31, 2013, surface water and groundwater levels were only recorded manually on a monthly basis. Frozen conditions were encountered at some locations in February and March. The monthly surface water and groundwater levels recorded at each of the three mini-piezometer locations are presented in Table 5. All monitoring data from 2007 through 2013, for mini-piezometers MP1, MP3, and MP4, is presented in Graphs 10, 11, and 12 respectively in Appendix D.

Table 5: 2013 Monthly Surface Water & Groundwater Levels at MP1, MP3, and MP4 for Condition 4.3

Date	MP1		MP3		MP4	
	SW	GW	SW	GW	SW	GW
10-Jan	1.10	1.10	0.44	0.49	0.74	0.34
18-Feb	frozen	frozen	frozen	frozen	frozen	frozen
15-Mar	frozen	frozen	0.21	0.17	0.55	frozen
17-Apr	0.95	0.95	0.18	0.13	0.55	0.21
15-May	1.05	1.06	0.44	0.38	0.69	0.35
11-Jun	0.78	0.78	0.26	0.22	0.51	0.26
11-Jul	0.83	0.83	0.40	0.37	0.71	0.35
09-Aug	0.88	0.88	0.54	0.53	0.75	0.37
09-Sep	0.87	0.87	0.52	0.53	0.74	0.37
08-Oct	0.75	0.74	0.16	0.16	0.52	0.27
14-Nov	0.84	0.85	0.33	0.31	0.69	0.44
05-Dec	1.07	1.07	0.36	0.36	0.66	0.48

Note: All readings are metres below top of piezometer. The measuring points are the same for each pair of piezometers.

The surface water and groundwater fluctuations observed at each mini-piezometer station reflect seasonal changes during 2013. At MP1 the levels increased in April as Mill Pond levels rose, but declined in early May, increased again in late-May, and remained relatively constant through the summer until they declined in the late-November. At MP3 (in Mill Creek) and MP4 (in Aberfoyle Creek) levels declined from high spring levels through the summer and then increased in October and November. Surface water levels fluctuated over short intervals at both stations, which is interpreted to be in response to precipitation events. Groundwater levels also were interpreted to respond to precipitation events, albeit somewhat less in magnitude than surface water levels.

A comparison of 2013 hourly surface water level, groundwater level, and hydraulic gradient data to historical data (i.e. 2007 to 2012) is presented in Table 6, including maximum (highest), minimum (lowest), range, and average values. The vertical hydraulic gradient between surface water and groundwater levels was calculated using a standard hydrogeologic method.

The data indicates there was little change in values at MP1 and MP3 during 2013 compared to the previous six years, although levels fluctuated in a slightly narrower range. At MP4 the groundwater levels fluctuated within a narrow range similar to 2012, but by comparison the surface water levels fluctuated over a broader range. The vertical hydraulic gradients at MP4 ranged less during 2013, were similar to MP3, but the values remained much higher than at MP1.

The vertical hydraulic gradients at MP1, MP3, and MP4 are illustrated on an hourly basis for the period April 2007 to December 2013 in Graph 13, in Appendix D. The seasonal changes are shown in this graph, with the highest vertical hydraulic gradients of 2013 occurring through the summer months. There is no evidence from these data that pumping of PW6 and PW7 during 2013 had any effect on surface water and groundwater levels at each of the piezometer stations. It is interpreted that the most significant influence on water levels and vertical hydraulic gradients continues to be seasonal precipitation.

Table 6: Summary of Hourly Surface Water & Groundwater Levels, & Hydraulic Gradients - Historical vs. 2013

Well	2007-2012 Levels & Hydraulic Gradients				2013 Levels & Hydraulic Gradients			
	High	Low	Range	Average	High	Low	Range	Average
MP1-SW	0.60	1.14	0.54	0.89	0.70	1.09	0.39	0.88
MP1-GW	0.59	1.40	0.81	0.91	0.71	1.09	0.38	0.89
MP1-HG	0.03	-0.05	0.08	-0.01	0.04	-0.04	0.08	0.00
MP3-SW	-0.07	0.75	0.82	0.50	-0.19	0.65	0.84	0.41
MP3-GW	-0.11	0.92	1.03	0.49	-0.20	0.71	0.91	0.38
MP3-HG	0.16	-0.21	0.37	0.01	0.09	-0.07	0.16	0.02
MP4-SW	0.23	1.08	0.85	0.67	0.26	0.80	0.54	0.67
MP4-GW	-0.03	0.94	0.97	0.26	0.06	0.40	0.34	0.33
MP4-HG	0.38	-0.01	0.39	0.26	0.26	0.11	0.15	0.22

Note: All water level readings metres below top of piezometer casing; a positive vertical hydraulic gradient indicates movement of groundwater is upwards; a negative vertical hydraulic gradient indicates movement of surface water is downwards

2.3.2 Monthly Surface Water Flows at MP3 and MP4

Surface water flows were determined from measurements at culverts adjacent to MP3 and MP4. Mill Creek flows through a culvert passing under Wellington County Road 46 (i.e. Brock Road) up-gradient of MP3. Aberfoyle Creek flows through a culvert passing under Gilmour Road down-gradient of MP4. The monthly flow values for each location are summarized in Table 7.

Table 7: 2013 Monthly Surface Water Flows (m³/sec) at MP3 and MP4 for Condition 4.3

Date	MP3	MP4	Date	MP3	MP4
10-Jan	0.23	0.08	11-Jul	0.29	0.09
18-Feb	0.29	0.10	09-Aug	0.15	0.07
15-Mar	0.58	0.17	09-Sep	0.17	0.08
17-Apr	0.64	0.17	08-Oct	0.69	0.19
15-May	0.23	0.11	14-Nov	0.38	0.11
11-Jun	0.50	0.20	05-Dec	0.35	0.13

A comparison of 2013 monthly surface water flows to historical data (i.e. 2008 to 2012) is presented in Table 8, including maximum (highest), minimum (lowest), range, and average values.

Table 8: Summary of Surface Water Flows - Historical vs. 2013 (m³/sec)

Culvert	2008-2012 Surface Water Flow				2013 Surface Water Flow			
	High	Low	Range	Average	High	Low	Range	Average
MP3	1.02	0.08	0.94	0.36	0.69	0.15	0.54	0.38
MP4	1.29	0.01	1.28	0.16	0.20	0.07	0.13	0.12

The average flows observed at MP3 and MP4 during 2013 compared closely to the historical averages. However, the range in flows was narrower in 2013 at both locations when compared to the previous five years of flow records. This has been observed in previous years and is considered to be due to higher

flows observed during 2008, the first year of flow monitoring. Flows averaged higher than during the drought of the previous summer. There is no evidence from these data that pumping of PW6 and PW7 during 2013 had any effect on surface water flow at these monitoring stations.

2.4 Condition 4.4 - Water Conservation

In order to conserve and sustain the resource and address impacts on natural function during drought conditions, the Permit Holder shall comply with the measures required under each level of the City of Guelph's Outside Water Use By-Law, or any superseding water conservation by-law.

As previously reported, the condominium corporation representing Aberfoyle Meadows has established a water committee that advises residents to adhere to the City of Guelph's Outside Water Use By-Law, or any superseding water conservation by-law.

2.5 Condition 4.5 - Annual Report

Data collected under Conditions 4.2 and 4.3 shall be analyzed, interpreted and summarized in an annual report by a qualified consultant and submitted to the Director by March 31 of each year and shall include the monitoring for the 12-month period ending December 31 of the previous year. The report shall include the record of water taking and documentation of all well interference complaints, if any, and any other water supply activities. The report should provide recommendations on the need for changes to monitoring locations and frequency, pumping patterns and/or need for mitigation. However, the Permit Holder may only request approval for a reduction in the frequency of the monitoring requirements after having collected data for two years after the development has been fully occupied. Any such request shall be supported by the collected data and its interpretation. A copy of the report shall also be submitted to the Township of Puslinch.

2.5.1 Annual Report

The information and analyses presented in the previous sections, this section and the Appendixes fulfil the annual reporting requirements. The following is a summary of observations and analyses that support the conclusion that the Conditions of Permit to Take Water No. 5626-7WLQ3W have been met for 2013.

This residential community comprises 55 building lots and has been considered fully occupied since May 2011. The Permit Holder was therefore required to collect all data required by the Permit until at least May 2013, before approval for a reduction in frequency of the monitoring requirements can be requested. As such, the 2013 monitoring program continued at the required frequencies.

In 2013, all pumping volumes and pumping rates were in compliance with the Permit. The maximum allowable taking from each well for any day is 785,000 Litres. The maximum amount pumped in one day during 2013 from PW6 was 85,200 Litres and from PW7 was 113,000 Litres, which is much less than the maximum permitted daily taking. These wells are pumped on an alternating basis, except during periods of maintenance when one well is taken off-line. During 2013, PW6 was off-line from 26 September to 12 November, and PW7 was off-line from 14 November to 2 December. Water levels measured in these pumped wells indicated recovery to static levels following pumping periods, confirming the water takings are sustainable.

As in previous years, PW2 and PW5 were not pumped and remained as bedrock observation wells. All overburden and bedrock monitored wells exhibited similar groundwater level trends during 2013. Higher water levels were observed in March and April and then began to decline in May. The lowest levels were observed in August and September. Groundwater levels rose through the fall, which is interpreted to be in response to rainfall in September, October and December. The fluctuations observed in the overburden wells are attributed to spring thaw and precipitation events and are not affected by the pumping of PW6 and PW7.

Groundwater levels in the three monitored domestic wells (i.e. Pond, Heather, and Howlett) showed no indication of interference related to pumping of PW6 and PW7. There were no well interference complaints received by the Permit Holder.

Surface water and groundwater level fluctuations measured at MP1, MP3, and MP4 located in Mill Pond, Mill Creek and Aberfoyle Creek respectively, continued to be the result of seasonal fluctuations. No fluctuations can be attributed to the pumping of PW6 and PW7. Similarly, flow measured in Mill and Aberfoyle Creeks varied throughout 2013. However, there is no evidence from the data that pumping of PW6 and PW7 has any effect on surface water flow at these monitoring stations.

2.5.2 Reduction in Manual Monitoring Frequency

On the basis of the observations and analyses presented in this report and the preceding four reports, it is concluded there is no evidence that pumping of PW6 and PW7 has any effects on off-site groundwater levels, surface water levels, and surface water flow at any of the respective monitoring stations.

Therefore, with reference to Condition 4.5 of the PTTW (as underlined on the previous page), it is recommended that the Director approve a reduction in the frequency of manual monitoring from monthly to quarterly (e.g. January, April, July, and October). This would apply to all monitored locations. However, for those stations that are also monitored with data loggers, water levels will continue to be recorded on an hourly basis in the same manner as previous years. It is anticipated that this revised monitoring protocol can be approved prior to April 2014, and as such quarterly manual monitoring would begin in April 2014.

Respectfully submitted,
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