TOWNSHIP OF
PUSLINCH
EST. 1850

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH
April 17, 2019 COUNCIL MEETING

AGENDA

DATE: Wednesday, April 17, 2019
CLOSED MEETING: 6:30 P.M.
REGULAR MEETING: 7:00 P.M.

≠ Denotes resolution prepared

1. Call the Meeting to Order

2. Disclosure of Pecuniary Interest & the General Nature Thereof.

3. CLOSED ITEMS ≠

(a) Confidential Verbal Report from Nina Lecic, Deputy Clerk regarding personal matters about an identifiable individual, including municipal or local board employees with respect to the 2019 Puslinch Volunteer of the Year Award

4. Adoption and Receipt of Minutes of the Previous Meeting.≠

(a) Council Meeting – April 3, 2019
(b) Closed Council Meeting – April 3, 2019

5. Business Arising Out of the Minutes.

6. PUBLIC MEETINGS

1. Puslinch Community Centre Park Master Plan – Phase 1 and Phase 2

*note this Public Information Meeting will be held on Thursday, May 22, 2019 at 7:00 p.m. at the Puslinch Community Centre, 23 Brock Road South Puslinch

7. COMMUNICATIONS

1. Nestle Waters Canada Aberfoyle Site, 2018 Annual Monitoring Report.
    a. Correspondence from Golder Associates dated March 2019.
    b. Correspondence from Harden Environmental dated April 8, 2019.

2. 2018 Groundwater Monitoring Report CBM Puslinch Pit License 17600.
    a. Correspondence from Groundwater Science Corp. dated March 2019.
    b. Correspondence from Harden Environmental dated April 10, 2019.

3. 2018 Annual Monitoring Report Aberfoyle Pit No. 2.
    a. Correspondence by Dufferin Aggregates.
    b. Correspondence from Harden Environmental dated April 10, 2019.

4. 2018 Groundwater Monitoring Summary, CBM Neubauer Pit, Licence No. 625284.
    a. Correspondence by Groundwater Science Corp. dated March 15, 2019.
    b. Correspondence from Harden Environmental dated April 10, 2019.

5. 2018 Groundwater Monitoring Report, Capital Paving Inc, Wellington Pit, License No. 20085.
    a. Correspondence form Capital Paving Inc. dated March 26, 2019.
    b. Correspondence from Harden Environmental dated April 9, 2019.

6. **Intergovernmental Affairs≠**

(a) Various correspondence for review.

8. DELEGATIONS / PRESENTATIONS ≠

7:05 p.m. – Nestle Waters Canada with respect to the 2018 Annual Monitoring Report.

7:15 p.m. – DFA Infrastructure International Inc. and Urban and Environmental Management with respect to FIN-2019-012 Asset Management Plan – Final

9. REPORTS ≠

1. **Puslinch Fire and Rescue Services**

None

2. **Finance Department**

(a) FIN-2019-021 2018 Lease Financing Agreement Summary Report
(b) FIN-2019-012 Asset Management Plan – Final

3. **Administration Department**

(a) ADM-2019-017 Provincial Modernization Grant

4. **Planning and Building**

   (a) Wellington County Report- Our Corridor Community Improvement Plan Amendment
   (b) BLDG-2019-004 Building Department Monthly Update- March 2019
   (c) PD-2019-004 Amending Site Plan Agreement – 2120826 Ontario Ltd. 20 Brock Road North

5. **Roads & Parks Department**

   (a) PW-2019-001 Tender Results for the 2019 Annual Road Rehabilitation

6. **Recreation Department**

   None

7. **Mayor's Updates**

   None

10. NOTICES OF MOTION

None

11. COMMITTEE MINUTES ≠

(a) March 12, 2019 Planning and Development Advisory Committee
(b) March 12, 2019 Committee of Adjustment

12. MUNICIPAL ANNOUNCEMENTS

(a) Presentation to Don Creed, Director of Public Works and Parks regarding his upcoming retirement

13. UNFINISHED BUSINESS

14. BY-LAWS ≠

(a) Being a By-law to provide for the appointment of a Municipal Law Enforcement Officer (Blair Lance) for the Corporation of the Township of Puslinch, and to repeal By-law Number 054-2017.

15. **CONFIRMING BY-LAW** ≠

(a) By-law to confirm the proceedings of Council for the Corporation of the Township of Puslinch.

16. **ADJOURNMENT** ≠

MINUTES

DATE: Wednesday, April 3, 2019
CLOSED MEETING: 11:45 A.M.
REGULAR MEETING: 1:00 P.M.

The April 3, 2019 Regular Council Meeting was held on the above date and called to order at 11:45 a.m. in the Council Chambers, Aberfoyle.

1. ATTENDANCE:

Mayor James Seeley
Councillor Matthew Bulmer
Councillor Jessica Goyda
Councillor Ken Roth
Councillor John Sepulis

STAFF IN ATTENDANCE:

1. Karen Landry, CAO/Clerk
2. Mary Hasan, Director of Finance/Treasurer
3. Don Creed, Director of Public Works and Parks
4. Nina Lecic, Deputy Clerk

OTHERS IN ATTENDANCE

1. Doug Smith
2. Carl Bousfield
3. Barclay Nap
4. Roger Will
5. Kathy White
6. Susan Fielding

2. DISCLOSURE OF PECUNIARY INTEREST & THE GENERAL NATURE THEREOF:

None

3. CLOSED MEETING

Council was in closed session from 11:46 a.m. to 12:56 p.m.
Council recessed from 12:56 p.m. to 1:00 p.m.

Resolution No. 2019-143: Moved by Councillor Goyda and
Seconded by Councillor Sepulis

That Council shall go into closed session under Section 239 of the Municipal Act for the purpose of:

(a) **Confidential Report FIR-2019-004 regarding personal matters about an identifiable individual, including municipal or local board employees; and labour relations or employee negotiations; and advice that is subject to solicitor-client privilege, including communications necessary for that purpose with respect to OMERS.**

(b) **Confidential Verbal Report from Karen Landry, CAO/Clerk regarding personal matters about an identifiable individual, including municipal or local board employees with respect to the Director of Public Works and Parks.**

CARRIED

Resolution No. 2019-144: Moved by Councillor Sepulis and
Seconded by Councillor Goyda

THAT Council moves into open session.

CARRIED

Resolution No. 2019-145: Moved by Councillor Goyda and
Seconded by Councillor Sepulis

That Council receives the:

(a) **Confidential Report FIR-2019-004 regarding personal matters about an identifiable individual, including municipal or local board employees; and labour relations or employee negotiations; and advice that is subject to solicitor-client privilege, including communications necessary for that purpose with respect to OMERS.**

(b) **Confidential Verbal Report from Karen Landry, CAO/Clerk regarding personal matters about an identifiable individual, including municipal or local board employees with respect to the Director of Public Works and Parks.**

CARRIED

4. **ADOPTION OF THE MINUTES:**

(a) Council Meeting, Goal Setting – March 20, 2019
(b) Council Meeting – March 20, 2019
(c) Closed Council Meeting – March 20, 2019

Resolution No. 2019-146: Moved by Councillor Sepulis and
Seconded by Councillor Goyda

That the minutes of the following meetings be adopted as written and distributed:

(a) **Council Meeting, Goal Setting – March 20, 2019**
(b) **Council Meeting – March 20, 2019**
(c) **Closed Council Meeting – March 20, 2019**

CARRIED

5. **BUSINESS ARISING OUT OF THE MINUTES:**

6. **PUBLIC MEETINGS:**

7. **COMMUNICATIONS:**

1. 2019 Ontario Municipal Partnership Fund (OMPF) allocations.
    a. Correspondence from the Ministry of Finance dated March 14, 2019

2. Update on the Ontario Community Infrastructure Fund (OCIF).
    a. Correspondence from the Ministry of Infrastructure dated March 14, 2019.

3. One-time payment in the 2018-19 fiscal year to support small and rural municipalities' efforts.
    a. Correspondence from the Minister of Municipal Affairs and Housing dated March 20, 2019.

4. CBM Aggregates, McMillan Pit (5737) 2018 Water monitoring report
    a. Correspondence from Votorantim Cimentos dated February 22, 2019.
    b. Review of the Monitoring Report by GWS Ecological & Forestry Services Inc. dated March 26, 2019.

7. Intergovernmental Affairs

Resolution No. 2019-147: Moved by Councillor Sepulis and
Seconded by Councillor Goyda

That the Intergovernmental Affairs correspondence items listed on the Council Agenda for the April 3, 2019 Council meeting be received.

CARRIED

8. DELEGATIONS/PRESENTATIONS

1:05 p.m. – Kyle Davis with respect to the Grand River Updated Water Quality Wellhead Protection Areas.

Resolution No. 2019-148: Moved by Councillor Sepulis and
Seconded by Councillor Goyda

That Council receives the presentation by Kyle Davis with respect to the Grand River Updated Water Quality Wellhead Protection Areas.

CARRIED

Councillor Sepulis took over the Chair Position for Mayor Seeley.
Mayor Seeley resumed the Chair Position.

1:25 p.m. – Jana Burns, Wellington County, Economic Development with respect to Puslinch economic Development.

Resolution No. 2019-149: Moved by Councillor Goyda and
Seconded by Councillor Sepulis

That Council receives the presentation by Jana Burns, Wellington County, Economic Development with respect to Puslinch economic Development.

CARRIED

1:35 p.m. – Joseph Hutter with respect to Puslinch Economic Development.

Resolution No. 2019-150: Moved by Councillor Sepulis and
Seconded by Councillor Goyda

That Council receives the presentation by Joseph Hutter with respect to Puslinch Economic Development.

CARRIED

1:45 p.m. – Stantec with respect to the Ministry of Transportation Highway 401 Widening.

Resolution No. 2019-151: Moved by Councillor Goyda and
Seconded by Councillor Sepulis

That Council receives the presentation by the Ministry of Transportation Highway 401 Widening.

CARRIED

2:05 p.m. – Stantec with respect to the Halton North Commercial Vehicle Inspection Facilities.

Resolution No. 2019-152: Moved by Councillor Sepulis and
Seconded by Councillor Goyda

That Council receives the presentation by Stantec with respect to the Halton North Commercial Vehicle Inspection Facilities.

CARRIED

2:25 p.m. – Wellington Federation of Agriculture (WFA) with respect to the Halton North Commercial Vehicle Inspection Facilities.

Resolution No. 2019-153: Moved by Councillor Roth and
Seconded by Councillor Bulmer

That Council receives the Wellington Federation of Agriculture (WFA) with respect to the Halton North Commercial Vehicle Inspection Facilities.

CARRIED

9. REPORTS:

1. **Puslinch Fire and Rescue Services**

None

2. **Finance Department**

None

3. **Administration Department**

(a) ADM-2019-014 Term of Council 2018 – 2022 Goals and Objectives – Final

Resolution No. 2019-154: Moved by Councillor Bulmer and
Seconded by Councillor Roth

THAT Report ADM-2019-012 regarding Term of Council 2018-2022 Goals and Objectives – Final be received.

CARRIED

(b) ADM-2019-016 Proposed Mapping Revisions to the Grand River Source Protection Plan and Associated Assessment Report

Resolution No. 2019-155: Moved by Councillor Roth and
Seconded by Councillor Bulmer

That Report ADM-2019-016 regarding Proposed Mapping Revisions to the Grand River Source Plan and Associated Assessment Report be received for information; and

And that Council hereby supports the proposed revisions to the Grand River Source Protection Plan and associated Assessment Report.

CARRIED

4. **Planning and Building Department**

(a) PD-2019-003 Amending Site Plan Agreement – 2362933 Ontario Ltd. 29 Winer Road

Resolution No. 2019-156: Moved by Councillor Bulmer and
Seconded by Councillor Roth

That Report PD-2019-003 regarding Amending Site Plan Agreement – 2362933 Ontario Ltd. – described as Part Block 4, Plan 847, Township of Puslinch be received; and

That Council pass a By-law to authorize the entering into and the execution of an amending Site Plan Agreement with 2362933 Ontario Ltd.

CARRIED

5. **Roads & Parks Department**

None

6. **Recreation Department**

None

7. **Mayor's Updates**

a. Letter to the Minister of Transportation dated January 27, 2019.

b. Letter to the Minister of Finance and Chair of Cabinet dated January 15, 2019.

10. NOTICE OF MOTION:

None

11. COMMITTEE MINUTES

None

12. MUNICIPAL ANNOUNCEMENTS

(a) Councillor Sepulis provided an overview of the Source Water Protection meeting and notified Council of the Green Legacy Tree Day.
(b) Councillor Bulmer provided an overview of the presentation by the Wellington Federation of Agriculture, the Wellington Farm, Home Safety Meeting, the Source Water Protection meeting and the Clair-Maltby Secondary presentation by the City of Guelph.

Resolution No. 2019-157: Moved by Councillor Bulmer and
Seconded by Councillor Sepulis

Council directed staff to obtain clarification from the City of Guelph with respect to water outflow to adjacent lands and areas following multiple storms.

CARRIED

13. UNFINISHED BUSINESS

14. BY-LAWS:

(a) A by-law to authorize the temporary borrowing of funds to meet current expenditures of the Corporation of the Township of Puslinch during the fiscal year ending December 31, 2019.
(b) Being a by-law to authorize the entering into of an amending site plan agreement with 2362933 Ontario Ltd. – 29 Winer Road.

Resolution No. 2019-158: Moved by Councillor Roth and
Seconded by Councillor Bulmer

That the following By-laws be taken as read three times and finally passed in open Council:

(a) **A by-law to authorize the temporary borrowing of funds to meet current expenditures of the Corporation of the Township of Puslinch during the fiscal year ending December 31, 2019.**
(b) **Being a by-law to authorize the entering into of an amending site plan agreement with 2362933 Ontario Ltd. – 29 Winer Road.**

CARRIED

15. CONFIRMING BY-LAW

(a) By-Law to confirm the proceedings of Council for the Corporation of the Township of Puslinch

Resolution No. 2019-159: Moved by Councillor Bulmer and
Seconded by Councillor Roth

That the following By-law be taken as read three times and finally passed in open Council:

By-Law 023- being a by-law to confirm the proceedings of Council for the Corporation of the Township of Puslinch at its meeting held on the 3rd day of April 2019.

CARRIED

Upon conclusion of regular business, Council took a tour of the Puslinch Historical Society archive room at the Aberfoyle Library.

Mayor Seeley left the meeting at 4:24 p.m.
Councillor Sepulis took over the Chair Position for Mayor Seeley.

16. ADJOURNMENT:

Resolution No. 2019-160: Moved by Councillor Roth and
Seconded by Councillor Bulmer

That Council hereby adjourns at 4:29 p.m.

CARRIED

____
James Seeley, Mayor

____
Karen Landry, CAO/Clerk

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

NOTICE OF PUBLIC MEETING

Puslinch Community Centre Park Master Plan – Phase 1 and Phase 2

You are invited to review and provide comments on a long-term vision for the Puslinch Community Centre Park. A **Public Open House** will be held on **May 22, 2019** at the Puslinch Community Centre to review the proposed plan. A presentation will commence at 7:00 pm.

Your attendance and comments at this meeting are welcome as it is your opportunity to learn more about the Puslinch Community Centre Park Master Plan.

Date: Wednesday May 22, 2019

Time: 7:00 p.m.

Place: Puslinch Community Centre, 23 Brock Road South Puslinch

Additional Information:

On November 26, 2015, a public open house was held at the Optimist Recreation Centre to present the draft concept plans for the Puslinch Community Centre Park to interested residents and stakeholders. The concept plans and display panels were also posted on the Township's website from late November 2015 to January 31, 2016, during which comments were welcomed by the Township. The phasing and implementation plan including all associated costs were presented to Council at its meeting held on June 28, 2017.

If you are unable to attend the session, you may submit comments to the Township no later than **June 7, 2019**. For more information or to submit written comments about the Puslinch Community Centre Park Master Plan, please contact:
Karen Landry CAO/Clerk
Township of Puslinch
Phone: 519-763-1226 ext. 214
E-mail: klandry@puslinch.ca

REPORT

Nestlé Waters Canada Aberfoyle Site

2018 Annual Monitoring Report

Submitted to:

Nestlé Waters Canada
101 Brock Road South
Puslinch, Ontario
N0B 2J0

Submitted by:

Golder Associates Ltd.
210 Sheldon Drive, Cambridge, Ontario, N1T 1A8, Canada
+1 519 620 1222

13-1152-0250 (1000)

March 2019

Distribution List

2 Copies - Nestlé Waters Canada

1 e-copy - MECP

1 e-copy - Puslinch Township

1 e-copy - Golder Associates Ltd.

Key Facts for 2018 Operations at Aberfoyle

Key facts for the 2018 operations at Aberfoyle include:

1) Well TW3-80 continued to operate under the terms of Permit to Take Water 1381-95ATPY. Nestlé submitted an application for renewal of the permit to the Ministry of the Environment, Conservation and Parks (MECP), formerly the Ministry of the Environment and Climate Change (MOECC), in April 2016, prior to the expiration of the permit on July 31, 2016. In accordance with the Ontario Water Resources Act, Section 34.1 (6), Nestlé has continued to legally operate under the existing permit until a decision is made regarding the renewal of the permit.

2) No water was shipped in containers greater than 20 litres in 2018; therefore, per Condition 4.9 of the PTTW, Nestlé was not required to provide information on containerization and bulk shipping.

3) No complaints arising from the taking of water authorized under this PTTW were received in 2018.

4) The total precipitation in 2018 was about 12% below normal and approximately 15% lower than in 2017.

5) The total pumping from TW3-80 in 2018 amounted to approximately 52% of the permitted taking and was 12% lower than the total for 2017. No water was taken from TW2-11 in 2018.

6) The monthly water takings in 2018 from TW3-80 ranged from 36,833,502 L to 75,519,527 L, or from 34% to 68% of the permitted takings. The monthly takings never exceeded 83,700,000 L; therefore, per Condition 4.5 of the PTTW, no data from multi-level piezometers MP6, MP12, MP11 and MW2 were required to be submitted to the MECP during the year.

7) The variations in water levels in TW3-80 were due mainly to short-term changes in the pumping rate and were within the historical range of observed water levels. A rise in water levels at the end of the year corresponded with a decrease in the water taking over the same period. Consistent with data from previous years, in general, the water level trend in TW3-80 corresponds to the overall water taking from the well. Ongoing pumping from TW3-80 has not led to a long-term decline in water levels in the well.

8) Water levels measured within the Lower Bedrock Aquifer in 2018 were within the range measured over the past five years. The water levels in the wells closer to TW3-80 showed a similar trend to the water levels in TW3-80 (i.e., a response to pumping) with no long-term increasing or decreasing trend, while the water levels in the wells further away also have not shown an increasing or decreasing trend over the last five years.

9) Water levels measured in the Upper Bedrock Aquifer in 2018 were within the range measured over the past five years with no long-term increasing or decreasing trends. The spring water levels in 2018 were consistent with the higher water levels observed in the spring of 2014, 2016 and 2017. Water levels in the spring of 2015 did not peak as high as the other years.

10) Water levels measured in overburden monitoring wells in 2018 were within the range measured over the past five years, with no overall increasing or decreasing trend.

11) Water levels measured in the mini-piezometers in 2018 were within the range measured over the past five years with the exception of a few wells, where low water levels were observed during the summer months when dry conditions occurred.

12) Surface water levels in the creeks fluctuate in response to precipitation, snow melt and evapotranspiration with no measurable effects from pumping. The lowest water levels were observed in the creek at the downgradient end of the property (SW2) in 2018 when dry conditions occurred during the summer.

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TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Nestlé Waters Canada (Nestlé) has retained Golder Associates Ltd. (Golder) to conduct the annual monitoring program and report preparation for the Nestlé Aberfoyle Site as required by Amended Permit To Take Water (PTTW) Number 1381-95ATPY issued by the Ministry of the Environment, Conservation and Parks (MECP), formerly the Ministry of the Environment and Climate Change (MOECC). The PTTW is included in Appendix A. The current PTTW was issued on December 19, 2013. The PTTW renewal application was submitted to the MECP in April 2016. The current PTTW expired on July 31, 2016, but in accordance with the Ontario Water Resources Act Section 34.1 (6), Nestlé can continue to legally operate TW3-80 under the terms of the existing PTTW until a decision is made regarding the renewal.

The location of the Aberfoyle Spring/Plant (Site) is shown on Figure 1.1. The PTTW authorizes water taking from two on-Site bedrock wells located on Lot 23, Concession 7, Geographic Township of Puslinch, Wellington County, Ontario. Water from TW3-80 is taken for the purpose of bottling water. Although it has not been used, water from TW2-11 is permitted for taking for miscellaneous purposes such as providing water to the on-Site pond for firefighting purposes.

A summary of the PTTW Conditions and where the information can be found in this report are outlined in Table 1:

Table 1: Permit To Take Water Conditions

Condition Number	Condition Description	Report Section
3.2, 3.3, 3.4	Identifies use, rates, time and total takings allowed.	3.1.1, 4.1, Appendix C
4.1	Maintain a daily record of all water takings including date, volume of water taken and rate at which it was taken.	Appendix C
4.2, 4.3, 4.6	Establish the specified groundwater and surface water monitoring programs including monitoring requirements and monitoring timing.	3.1.2, 3.1.3
4.4	Undertake wetland monitoring and redd surveys and submit results to Director.	Appendix H
4.5	If monthly water takings exceed 83,700,000 L, then multi-level piezometer data for selected wells must be submitted to the Director within 30 days of the end of the calendar month.	4.1
4.7	Notify the Director of monitoring locations that become inaccessible or abandoned and provide a recommendation for replacement.	3.1.2.1, 3.1.3.1, 3.1.4
4.8	Prepare and submit an annual monitoring report to the Director, which presents and interprets the data collected under the conditions of the PTTW.	This report
4.9	Submit details of the bottling operations to the Director.	4.1

Condition Number	Condition Description	Report Section
5.1	Notify the local District Office of any complaint arising from the taking of water and proposed action to rectify the complaint.	4.1
5.2	Supply water to anyone with a water supply (in effect prior to this taking) that has been negatively impacted.	Not applicable

Golder began monitoring at the Site in May 2014. Prior to that, monitoring was performed by Conestoga Rovers and Associates (CRA) and Nestlé. The MECP has requested that the reporting follow the same outline and presentation as previous reports. The reporting of the geologic characterization has been updated to be consistent with the updated interpretation developed by the Ontario Geological Survey (Brunton, 2008, 2009; Brunton and Brintnell, 2011) rather than the previous geologic nomenclature. At some well locations there was insufficient data to update to the new nomenclature. As such, the bedrock has been divided into three units based on both the old and new nomenclature including Upper Bedrock Aquifer, Middle Bedrock Aquitard and Lower Bedrock Aquifer (as described in detail below). Additional reporting is also being prepared separately to satisfy the new hydrogeological study requirements (MECP, 2017) issued since the submission of the application for renewal of the PTTW.

The report is structured as follows:

- Section 1.0: Introduction including site location, history, and construction details for supply well TW3-80.
- Section 2.0: Regional setting including a description of topography, drainage, physiography, geology and hydrogeology.
- Section 3.0: Summary of 2018 field program including a description of field activities conducted in 2018.
- Section 4.0: Monitoring program results including a summary and analysis of the data collected in 2018.
- Section 5.0: Conclusions from the 2018 monitoring program.
- Section 6.0: Recommendations from the 2018 monitoring program.

1.1 Historical Summary

TW3-80 was constructed in April 1980 for a proposed fish farming operation. In December 2000, the Perrier Group of America, a Nestlé Company, purchased the property. Six consecutive PTTWs have been issued for TW3-80 since that time, allowing for water taking for bottling water purposes. Additional investigations have occurred over the years to determine if there have been any negative impacts on the natural environment and ensure that the water taking by Nestlé is sustainable. These additional investigations have been requirements of previous permits and have been completed to the satisfaction of the MECP. No additional studies were required in 2018.

Most recently, PTTW Number 1381-95ATPY was issued in December 2013, which also allows for water taking from TW2-11 for miscellaneous purposes (such as providing water to the on-Site pond for firefighting purposes) but not bottling water. The combined water taking from TW3-80 and TW2-11 is restricted to 3,600,000 L per day.

The Aberfoyle bottling facility is located on a 46.75 hectare parcel owned by Nestlé approximately 5 km southeast of Guelph and 12 km northeast of Cambridge (Figure 1.1). The Aberfoyle facility consists of a bottling plant, warehouse, paved parking and access drives, ponds, and open fields, and is bordered by wooded areas, wetlands and aggregate operations.

1.2 Construction Details for Supply Well TW3-80

The borehole log for TW3-80 is provided in Appendix B. The glacial overburden at the well is 14.6 m thick and consists of a clayey silt till to a depth of 12.2 m below ground surface, and 2.4 m of fine-to-medium sand overlying the bedrock. The well was originally drilled an additional 27.8 m into the bedrock, completed at a depth of 42.4 m below ground surface.

Conestoga Rovers and Associates (CRA, 2014) interpreted the bedrock through which TW3-80 was drilled as consisting of the Guelph Formation dolostone (14.6 to 16.8 m below ground surface) and the Amabel Formation (Eramosa Member and Unsubdivided Member) (16.8 to 42.4 m below ground surface). Changes to the bedrock nomenclature have been made by the Ontario Geological Survey (OGS) (i.e., Brunton, 2008, 2009: Brunton and Brintnell, 2011). Based on the revised nomenclature, TW3-80 is interpreted to have been drilled through the Guelph, Eramosa, and Goat Island Formations and possibly into the Gasport Formation. The stratigraphy at TW3-80 is consistent with that of other wells in the area.

When TW3-80 was initially constructed in 1980, a 305 mm diameter steel casing was installed through the overburden and approximately 0.6 m into the top of rock to a depth of 15.2 m below ground surface and cemented in place (CRA, 2014). The remainder of the well was completed as a 305 mm diameter open hole.

In 1999, the bottom 11.3 m of TW3-80 was sealed with gravel, bentonite grout, and a cement cap so that the well would pump water with more favourable natural water quality from within the Guelph and Goat Island/Gasport Formations. The revised finished depth is now 31.1 m below ground surface.

To comply with Nestlé water well construction standards, a liner was installed in the well in 2002. A 250 mm diameter stainless steel liner was installed inside the 305 mm steel casing and grouted in place to a depth of 28.4 m below ground surface. The revised open interval of TW3-80 is now 28.4 m to 31.1 m below ground surface and only allows pumping from the Goat Island/Gasport Formations. A schematic of the well construction is included on Figure 1.2.

2.0 REGIONAL SETTING

The following sections provide a summary of the regional and local topography, drainage, physiography, and overburden and bedrock geology/hydrogeology for the Site.

2.1 Topography and Drainage

Regional topography is characterized by northeast-southwest trending bands of hummocky terrain (Chapman and Putnam, 1984). Locally, the Nestlé property is located in a relatively flat area between the Paris and Galt Moraines. Surface topography is shown on Figure 2.1. Within a 1 km radius of the Nestlé property, ground surface elevations typically range from 310 to 330 metres above sea level (masl) with the lows occurring along Aberfoyle Creek and Mill Creek. The streambed elevation of the portion of Aberfoyle Creek that traverses Nestlé's property is approximately 310.5 masl (+/- 1 m).

The Site is located within the Mill Creek Subwatershed (Figure 2.1) which forms part of the larger Grand River Watershed. Part of Mill Creek is located north of the Nestlé property and generally flows in a southwesterly direction within the study area. A tributary of Mill Creek, referred to as Aberfoyle Creek, flows through the Site, also in a southwesterly direction and converges with Mill Creek west of the Nestlé property. Aberfoyle Creek is located approximately 150 m to the northwest of TW3-80 at its nearest point. Mill Creek and Aberfoyle Creek are shown on Figure 2.1 along with other surface water and wetland features, which are described below.

As shown on Figure 2.1 several ponds exist, both natural and man-made, within a 1 km radius of the Nestlé property. One such pond, referred to as the Aberfoyle Mill Pond, is located east of the Site and discharges water to Aberfoyle Creek. Some small on-Site ponds exist on the Nestlé property. Most of the other ponds in the area appear to be man-made and are off-stream ponds (i.e., not connected to streams). Some of the ponds are the result of aggregate extraction below the water table.

In addition to the ponds in the area, several wetland areas are also present within a 1 km radius of the Nestlé property (Figure 2.1). Most of these wetlands are part of the Mill Creek Puslinch Wetland Complex and are considered provincially significant wetlands. Wetlands are present within the northwest part of the Nestlé property.

2.2 Physiography

Chapman and Putnam (1984) define this physiographic region as the eastern limb of the Horseshoe Moraines. The existing landforms and most of the surficial soils in the area were created/deposited during the most recent glacial period, specifically the recession of the Lake Ontario ice lobe. During the recession of the Lake Ontario ice lobe, three distinct end moraines were formed in the area: the Paris Moraine, the Galt Moraine, and the Moffat Moraine (Karrow, 1987). The Paris Moraine is situated to the north of the property and the Galt Moraine is situated to the south of the property. These moraines are primarily composed of silty to sandy till and form the major drainage divides for the Mill Creek subwatershed. The Nestlé property is situated mainly within an outwash gravel plain situated between the two moraines (Figure 2.2). The outwash gravel plain was likely formed by glacial meltwater associated with a halt in the ice retreat during the formation of the Galt Moraine.

2.3 Geology and Hydrogeology

The following sections provide a summary of the regional and local geology and hydrogeology. The regional interpretation is based on published mapping and information contained in the Mill Creek Subwatershed Study (CH2M Gore & Storrie, 1996). Detailed geologic information has also been obtained from logging of the stratigraphy by CRA at locations where monitoring wells were installed as part of previous field investigations. The bedrock interpretation has been updated to follow the revised nomenclature of the OGS (Brunton, 2008 and 2009, Brunton and Brintnell, 2011).

2.3.1 Overburden Geology

The overburden ranges in thickness from 15 m in low-lying areas of the subwatershed near Mill Creek and Aberfoyle Creek to 35 m along the crests of the Paris and Galt Moraines (Drift Thickness Map P.535, M.A., Vos, 1968; CH2M Gore & Storrie, 1996).

The surficial overburden geology, as mapped by the OGS is shown on Figure 2.2. The surficial overburden of the area is characterized by the following units:

- Outwash gravel;
- Ice-contact gravel: kames and eskers; and

- Sandy silt till (Wentworth Till).

Regionally, the Paris and Galt Moraines, located north and south of the property, respectively, consist of Wentworth Till. Karrow (1987) describes the till as a buff-coloured, stony, sandy silt till. Located between the moraines are younger outwash gravel deposits and ice-contact gravel deposits. Deposits along parts of Aberfoyle Creek and Mill Creek are mapped as peat and muck (organic deposits). There are no bedrock outcrops within the study area.

The coarse-grained deposits between the moraines generally overlie the Wentworth Till. In some areas, particularly the central part of the Mill Creek subwatershed, the till is not present and the coarse grained deposits are continuous to bedrock. The surficial coarse-grained deposits are thinner and separated from the bedrock by the underlying till in the upper and lower reaches of the Mill Creek subwatershed. Occasional subsurface coarse grained deposits exist at various depths as lenses or discontinuous layers within or between till units (CH2M Gore & Storrie, 1996). A gravel layer is also present immediately above the bedrock in some locations.

Locally, within a 1 km radius of the property, the overburden is typically 10 m to 30 m thick and consists mainly of outwash gravel or ice-contact gravel deposits. As previously discussed, these coarse-grained deposits are situated between the moraines and are elongated in a southwest to northeast direction. The Wentworth Till is mapped as the surficial deposit along the moraines to the southeast (approximately 500 m) and northwest (approximately 2 to 2.5 km) of TW3-80.

2.3.2 Bedrock Geology

The bedrock surface is somewhat irregular, but generally dips to the southwest. The bedrock elevation in the vicinity of the Nestlé property declines from approximately 306 masl northeast of the property (MW10-09) to 293 masl south of the property (MW16-12).

The regional bedrock geology is shown on Figure 2.3. As noted above, the bedrock nomenclature shown on Figure 2.3 has since been revised based on work by the OGS over recent years (Brunton, 2008 and 2009, Brunton and Brintnell, 2011). In general, the previously named Guelph Formation is now split into the Guelph Formation and the Eramosa Formation (Stone Road Member and Reformatory Quarry Member); the previously named Amabel Formation (Eramosa Member) is now the Eramosa Formation (Vinemount Member); and the previously named Amabel Formation (Unsubdivided Member) is split into the Goat Island, Gasport and Irondequoit Formations. The bedrock hydrogeologic units underlying the property, which are relevant to the Nestlé water taking, are composed of limestone, dolostone and shale sequences and are summarized as follows (from oldest to youngest):

- **Cabot Head Formation:** The Cabot Head Formation, readily distinguished by its grey-green colour, is a non-calcareous shale with thin interbeds of sandstone and limestone. Where test data are available in southern Ontario, the hydraulic conductivity of the Cabot Head Formation has been shown to be low. The top of the Cabot Head Formation is interpreted to be the base of the active groundwater flow system.

- **Merritton Formation:** The Merritton Formation consists of a pinkish-brown, finely crystalline dolostone unit with dark shaley partings. This unit is relatively thin where present in the area.

- **Rockway Formation:** The Rockway Formation is a greenish-grey fine crystalline argillaceous dolostone with shaley partings (Brunton, 2008). The thickness of the Formation is fairly consistent and typically less than 2 m.

- **Irondequoit Formation:** This Formation is a thickly to medium-bedded crinoidal grainstone (Brunton, 2008). The unit has a fairly consistent thickness of approximately 3 m throughout the area.

- **Gasport Formation:** The Gasport Formation is a cross-bedded crinoidal grainstone-packstone with sequences of reef mound and coquina (shell bed) lithofacies. This unit has commonly been referred to as the Amabel Formation in previous studies in the area (Turner, 1978). Wells in the vicinity of the Nestlé property are generally not drilled through the entire sequence. In and around the City of Guelph, the Formation generally varies in thickness from about 25 to over 70 m, and the upper sections of the reef mounds, the crinoidal grainstones and the coquina shell beds make this formation highly transmissive, where they are present (Golder, 2011).

- **Goat Island Formation:** The Goat Island Formation consists of two members; the lower Niagara Falls Member and the upper Ancaster Member. Based on the boreholes completed in the area, the Goat Island Formation is estimated to range in thickness from approximately 2 m to 15 m.

    - **Goat Island Formation** – Niagara Falls Member: The Niagara Falls Member is a finely crystalline and cross laminated crinoidal grainstone with small reef mounds.

    - **Goat Island Formation** – Ancaster Member: The Ancaster Member is a chert rich, finely crystalline dolostone that is medium to ash grey in colour.

- **Eramosa Formation:** The Eramosa Formation consists of three members including, from oldest to youngest, the Vinemount Member, the Reformatory Quarry Member and the Stone Road Member.

    - **Eramosa Formation** – Vinemount Member: The Vinemount Member consists of thinly bedded, fine crystalline dolostone with shaley beds that give off a distinctive petroliferous odour when broken (Brunton, 2008). This dark grey to black dolostone unit was commonly identified in water well records as ‘black shale’ and mapped in previous studies in the City of Guelph as the Eramosa Member of the Amabel Formation. The shaley beds of this Formation significantly reduce the vertical permeability across this unit relative to the other Formations. The Vinemount Member ranges in thickness from approximately 4 m to 12 m in the area of the property.

    - **Eramosa Formation** – Reformatory Quarry Member: The Eramosa Formation above the Vinemount Member is described by Brunton (2008) as light brown to cream coloured, pseudonodular, thickly bedded and coarsely crystalline dolostone. This unit is susceptible to karstification due to its uniform fine dolomite crystallinity (Brunton, 2008). This unit also often contains mud-rich and microbial mat- bearing lithofacies that may act as aquitard materials, reducing the vertical permeability across this unit.

    - **Eramosa Formation** – Stone Road Member: This cream coloured coarsely crystalline Upper Eramosa unit is not present in most of the area and can be difficult to distinguish from the Guelph Formation.

- **Guelph Formation:** The Guelph Formation is the upper bedrock unit in the study area and consists of medium to thickly bedded crinoidal grainstones and wackestones and reefal complexes (Brunton, 2008). The Guelph Formation is cream coloured and fossiliferous. The upper 0.3 m to 0.6 m is noted to be highly fractured and weathered. Based on data from borehole drilling, the Guelph Formation is typically less than 5 m thick in the vicinity of the property, which is thin relative to the regional scale thickness.

2.3.3 Hydrogeology

The interpretation and nomenclature for the bedrock formations has recently changed (as indicated above); however, the interpretation of the hydrostratigraphy at the property and surrounding area is relatively unchanged.

This is a simplification of the hydrostratigraphy for conceptual purposes. In reality, portions of the bedrock aquifers can act as aquitards. The hydrostratigraphy consists of the following from surface down:

- Overburden Aquifer/Aquitard;
- Upper Bedrock Aquifer (Guelph Formation, Reformatory Quarry Member of the Eramosa Formation);
- Middle Bedrock Aquitard (Vinemount Member of the Eramosa Formation); and
- Lower Bedrock Aquifer (Goat Island Formation and Gasport Formation).

Two cross-sections (A-A’ and B-B’) through the property are included on Figures 2.4 and 2.5 with the locations shown on Figure 2.2. Hydrogeologic cross-section A-A' is oriented southwest to northeast roughly along Aberfoyle Creek and cross-section B-B’ is oriented north to south through the property, crossing Aberfoyle Creek and including supply well TW3-80.

Based on the hydrostratigraphic interpretation around the property, the thickness of the hydrostratigraphic units is as follows: Overburden Aquifer/Aquitard – 7 to 35 m; Upper Bedrock Aquifer – 2 to 14 m; Middle Bedrock Aquitard – 4 to 12 m; and Lower Bedrock Aquifer – 46 to 58 m. As shown in cross-section A-A’, TW3-80 is completed in the upper part of the Lower Bedrock Aquifer.

2.3.4 Groundwater Flow Under Non-Pumping Conditions

In addition to the pumping tests, there are sometimes brief shutdowns when water levels in the aquifers recover. One such shutdown occurred in October 2010 for 3.4 days. Based on data from this shutdown, CRA (2014) provided an interpretation of the non-pumping conditions in the overburden and bedrock groundwater levels, as discussed below:

- The overburden water table interpretation is presented on Figure 2.6, which indicates that the direction of groundwater flow in the overburden is generally to the southwest, with local components of flow to the west and south toward Aberfoyle Creek. CRA (2014) indicates that this flow configuration is similar to the pattern previously presented for the October 2004 and November 2006 shutdowns.
- The Upper Bedrock Aquifer interpretation is shown on Figure 2.7 with the groundwater flow direction identified in a southwest, south, and southeast direction, which is reported to be similar to the pattern previously presented for the October 2004 and November 2006 shutdowns.
- The Lower Bedrock Aquifer interpretation is shown on Figure 2.8 with the groundwater flow direction to the southwest in the vicinity of supply well TW3-80, which is reported to be similar to the pattern previously presented for the October 2004 and November 2006 shutdowns.

The overburden aquifer is interpreted to be recharged primarily within the northern portion of the Mill Creek subwatershed and the capture zone for TW3-80 is inferred to extend to the north-northeast of the well. Groundwater flows generally south in the direction of TW3-80. The bedrock aquifer extends beyond Aberfoyle to the southwest, and is inferred to discharge to the Grand River in the vicinity of Cambridge.

2.4 Source Water Protection

With the passing of the Clean Water Act (2006), municipalities in Ontario are required to develop source protection plans to protect their municipal sources of drinking water. These plans identify risks to local drinking water sources and develop strategies to reduce or eliminate these risks. Potential and existing risks for a municipal source are identified within wellhead protection areas (WHPA). A WHPA is an area projected to ground surface that reflects the zone in an aquifer where groundwater is flowing to a municipal drinking water source (pumping well). The WHPAs that are nearest the Nestlé Aberfoyle property and well TW3-80 are associated with the City of Guelph wells to the northwest (AquaResource Inc., 2010; Lake Erie Source Protection Committee, 2015) and the Freelton well, southeast and east in the Lake Ontario Basin (Halton-Hamilton Source Protection Region, 2015). The Aberfoyle property and well TW3-80 are located more than 2.6 km from the closest WHPAs.

In addition to protecting water quality, water quantity is also a concern and is considered under Water Quantity Protection Plans. The Water Quantity assessment is completed to ensure that future water needs of a community can be met. It identifies existing water quantity threats and future activities that may limit the supplies for municipal water supplies. Based on the results of modeling conducted for the Tier Three Water Budget Study, the Aberfoyle property has been identified as lying within a Water Quantity Protection Zone (WHPA-Q) for the City of Guelph municipal wells. The WHPA-Q zone for the City of Guelph has been assigned a significant risk level (Matrix Solutions, 2017). The Tier 3 Assessment scenarios predicted that the City's municipal wells can meet current needs. However, the assessment predicted that the City's Queensdale municipal well would be unable to meet future needs under normal climate conditions and during prolonged drought (Matrix Solutions, 2017) which triggers a significant risk level. There is also a high level of uncertainty with the results for the City's Arkell Well 1, which also triggers a significant risk level. It is for these reasons that the City's WHPA-Q is assigned a significant risk level. The Source Protection Committee reviewed all existing water takings within the WHPA-Q to evaluate their contribution to water quantity stress in the area. The study showed that municipal wells have the greatest impact on themselves (i.e., pumping at a municipal well influences the water levels in other municipal wells). TW3-80 was not found to interfere, to any significant degree, with the municipal wells (Matrix, 2018). TW3-80 is estimated to be responsible for 1% of the drawdown at the closest municipal well (Burke Well). With a drawdown in the order of approximately 10.8 m at the Burke Well, pumping from TW3-80 would be responsible for approximately 0.1 m of the drawdown observed at the Burke Well. The Water Quantity assessment was completed using the Guelph Tier 3 Model. Recent work completed as part of the Technical Study in support of the PTTW renewal indicates that a decline of 0.02 m in the average water level at the Burke Well is predicted when pumping at the Nestlé well is increased to the current permitted maximum.

3.0 SUMMARY OF 2018 FIELD PROGRAM

This section describes the field activities performed in 2018 associated with PTTW Number 1381-95ATPY (for TW3-80 and TW2-11).

3.1 Groundwater and Surface Water Monitoring Program

The field activities included completion of a monitoring program including maintaining a record of water taking and measurement of groundwater levels, mini-piezometer levels, surface water levels, flows and temperatures. Monitoring events were conducted during the third week of each month by Golder. The monitoring program includes the following instrumentation:

- Groundwater levels and pumping volumes in 2 production wells;
- Groundwater levels in 38 monitoring wells at 16 sites (11 consisting of multiple monitoring intervals) with monitors in deep bedrock, shallow bedrock, and overburden;
- Groundwater levels in 11 private wells;

- Shallow groundwater levels in 9 mini-piezometers with a total of 18 monitors;
- Surface water levels at 7 stations;
- Stream flows at 2 locations; and
- Stream temperature at 6 locations.

The monitoring locations are shown on Figures 3.1 through 3.3.

3.1.1 Water Taking

Water taking from TW3-80 in 2018 was measured using a Krohne magnetic flow meter that is wired to an Allen Bradley industrial Programmable Logic Controller. The instantaneous flow (USgpm) and cumulative volume pumped (US gallons) were recorded. The flow meter was calibrated on November 5, 2018 by Endress+Hauser.

The daily volumes taken from supply well TW3-80 in 2018 are provided in Appendix C. No water was taken from TW2-11 in 2018.

3.1.2 Groundwater Monitoring Program

Groundwater levels have been measured at various locations for varying periods of time on-Site and off-Site since December 1980. Following the purchase of the Site by the Perrier Group of America, a monitoring program was initiated in December 2000. Modifications to the monitoring program have been made over time as a result of PTTW requirements, well abandonments, physical inaccessibility to wells, and changes in property ownership. In 2018, one owner requested that monitoring be discontinued at their well and a surface water station was destroyed (see Section 3.1.4). Previous wells that have been decommissioned or are no longer part of the monitoring program are shown on Figure 3.4. All of the existing monitoring locations and the decommissioned or unused wells are shown on Figure 3.5.

The monitoring locations for the 2018 groundwater monitoring program are shown on Figures 3.1 and 3.2 and are summarized as follows:

Overburden Monitors

- MW2D-07, MW2E-07, MW4C-07, MW10A-09, TW1-93, TW1-99, MW-S, PCC-S, PCC-I

Bedrock Monitors

Upper Bedrock Aquifer Monitors

- MW2C-07, MW4B-07, MW6B-08, MW7B-08, MW8B-08, MW10B-09, MW14C-11, MW15B-12, MW16B-12, MW17B-12, MW18B-12, MW-D, MW-I, PCC-D, 8 MLL (67-08317), 2 Brock Road North, 58 Brock Road South, 7404 Road 34 (67-07589), Y well

Middle Bedrock Aquitard Monitors

- MW2B-07, MW14B-11, I (67-07389)

Lower Bedrock Aquifer Monitors

- TW3-80 (Production Well), TW2-11, MW2A-07, MW4A-07, MW6A-08, MW7A-08, MW8A-08, MW10C-09, MW10D-09, MW14A-11, MW15A-12, MW16A-12, MW17A-12, MW18A-12, Fireflow, B (67-07383), M1 (67-13755), PW5 Meadows of Aberfoyle (67-1197), 67-08740, W2 (67-13335)

Some private wells are open across multiple bedrock units (for example private wells with a finished depth in the Lower Bedrock Aquifer are typically open across the Upper and Lower Bedrock Aquifers). Wells constructed in this manner have been grouped with the lowermost unit in which they are installed. It should be noted that water levels measured in wells open to multiple aquifer units represent average water levels that are not representative of the levels in any of the individual aquifer units. In addition, these wells may represent a potential pathway for contaminants in the shallow groundwater system to move into the deeper strata. It should be noted that none of the wells that Nestlé owns are open across multiple aquifer units.

Water levels were measured and dataloggers downloaded at all locations during the third week of each month. Where required by the PTTW, dataloggers are used to record water levels at 60-minute intervals. The groundwater levels measured in 2018 are presented in Appendix D.

3.1.2.1 Missing Data

The following table provides a list and description of missing data from the 2018 groundwater monitoring. Transducer dataloggers occasionally stop working and need to be replaced. When a transducer stops working, it is replaced with a new transducer. Transducer data can be missing for up to one month depending on when the failure occurs between monitoring events. In some wells (e.g., PCC), the water level is close to surface and can become frozen in the winter. The issues were temporary and have been resolved.

Table 2: Missing Groundwater Data from the 2018 Monitoring

Monitoring Location	Missing Data	Comment
MW14A-11	Transducer water levels between the November and December monitoring events	Transducer issue (failure)
PCC-S	Manual water level in January and February	Frozen
PCC-D	Manual water level in January, February and March	Frozen

3.1.3 Surface Water Monitoring Program

The surface water monitoring program includes the following components:

- Surface water levels;
- Stream flow;
- Water levels in nested mini-piezometers; and
- Temperature at the sediment-water interface.

The 2018 surface water monitoring locations are shown on Figure 3.3 and summarized below.

Surface Water Levels

Measurement of surface water levels was initiated in December 2001 as part of Nestlé's monthly monitoring program. In 2018, surface water levels were measured at the following locations:

- Aberfoyle Creek:
  - SW1 - located within the upstream part of the Nestlé property;
  - SW2 - located within the downstream part of the Nestlé property; and
  - SW3 - located at Gilmour Road, upstream of the Nestlé property.
- Mill Creek:
  - SW4 - located on Mill Creek at Maple Leaf Lane, upstream of the confluence with Aberfoyle Creek; and
  - SW5 - located on Mill Creek at McLean Road, downstream of the Nestlé property.
- Ponds:
  - SW9 - located in the Dufferin Aggregates owned pond located southeast of the Nestlé property; and
  - SW10 - located in the Dufferin Aggregates owned pond at the entrance to the Nestlé property.

Water levels were measured at all locations during the third week of each month using a water level meter. At SW1 and SW2, dataloggers are used to record water levels at 60-minute intervals, which are also downloaded once a month. The surface water levels for 2018 are presented in Appendix E.

Stream Flow

Measurement of surface water flow was initiated in December 2001 as part of Nestlé's monthly monitoring program. Surface water flow was measured at SW1 (upstream part of Nestlé property) and SW2 (downstream part of Nestlé property) in Aberfoyle Creek during the third week of each month in 2018. Stream flows are measured at SW1 and SW2 to confirm that pumping from TW3-80 does not cause local effect on streams. Stream flow velocities were measured using a Valeport electromagnetic flow meter and the surface water flows were calculated using the cross-sectional area-velocity method. The surface water flow calculations for 2018 are presented in Appendix F.

In addition, the monthly surface water elevations ("stage") and stream flow measurements ("discharge") collected in 2018 were used to update and/or re-establish the stage-discharge relationships (rating curves) at SW1 and SW2. The rating curves were used to infer continuous records of stream flow from the continuous water level measurements at SW1 and SW2.

Mini-Piezometers

Mini-piezometers were initially installed in 2004 with additional mini-piezometers being installed since that time. In 2018, water levels were measured in mini-piezometers at ten locations, each containing a shallow and a deep monitor (see locations on Figure 3.3). For background purposes, one mini-piezometer nest (MP11S-08/D-04) has been installed in the bank, adjacent to a tributary of Aberfoyle Creek upstream of the Nestlé property. Due to concerns with the location of MP11 (see Section 4.3.1), a new mini-piezometer nest (MP1-16) was installed in April 2016 in the main branch of Aberfoyle Creek near SW3 at Gilmour Road. The mini-piezometer nests are listed below. Mini-piezometer nests MP16S/D-08 to MP19S/D-12 are located along Aberfoyle Creek on the Nestlé property. Mini-piezometer nests MP17S/D-11 and MP18S/D-11 are located along Mill Creek downstream of its confluence with Aberfoyle Creek.

- MP11S-08/D-04

- MP16S/D-08
- MP6S-08/D-04
- MP12S/D-04
- MP14S/D-07
- MP8S/D-04
- MP19S/D-12
- MP17S/D-11
- MP18S/D-11

Water levels were measured and dataloggers downloaded at all locations during the third week of each month. Dataloggers are used to record water levels at 60-minute intervals. The water levels measured in 2018 are presented in Appendix E.

Temperature

Measurement of surface water temperature began in 2005. In 2018, surface water temperature was measured at six locations along Aberfoyle Creek. The most upstream location is situated at Brock Road with the remainder of the sites located on the Nestlé property downstream of Brock Road. Beginning upstream and moving downstream, the stream temperature sites are as follows (see locations on Figure 3.3):

- ST6-08
- ST1-05
- ST2-05
- ST3-05
- ST4-05
- ST5-05

The dataloggers are located at the sediment-water interface with temperature data measured and logged at 30-minute intervals using Stowaway Tidbit® dataloggers or HOBO Tidbit MX dataloggers. Two dataloggers are installed at each site. Air temperature is also measured in a shaded area at ST1-05 at 30-minute intervals with a Stowaway Tidbit® datalogger.

C. Portt and Associates Ltd. (2011) conducted a review of the appropriateness of the methodology for the temperature monitoring program. The report was approved by the MOECC in October 2011 and recommendations from the report were implemented by CRA at that time, and continued by Golder since May 2014. The temperature data is analyzed by C. Portt and Associates using ThermoStat software. A report on the surface water temperature is included as Appendix G.

3.1.3.1 Missing Data

The following table provides a list and description of missing data from the 2018 surface water monitoring. Some of the missing data is due to winter conditions. The water levels in the mini-piezometers are close to surface and can become frozen in the winter. Slow moving water can also become frozen in the winter. Transducer dataloggers occasionally stop working and need to be replaced. When a transducer stops working, it is replaced with a new transducer. Transducer data can be missing for up to one month depending on when the failure occurs between monitoring events. The issues were temporary and have been resolved.

Table 3: Missing Surface Water Data from the 2018 Monitoring

Monitoring Location	Missing Data	Comment
MP1S/D-16 (not part of PTTW)	Not missing but frozen	Frozen in January, February (D only), March (D only), April (D only) and November
MP6S-08/D-04	Not missing but frozen	Frozen in January and November (D only)
MP6S-08	Transducer water levels between the June and July monitoring events	Transducer issue (failure)
MP8S/D-04	Not missing but frozen	Frozen in January
MP11S-08/D-04	Not missing but frozen	Frozen in January, March (D only) and November (D only)
MP11S-08	Transducer water levels in March were erroneous	Transducer issue
MP12S/D-04	Not missing but frozen	Frozen in January, March (D only) and November (D only)
MP14S/D-07	Not missing but frozen	Frozen in January, February (D only), March and November (D only)
MP16S/D-08	Not missing but frozen	Frozen in January and November
MP17S/D-11	Not missing but frozen	Frozen in January
MP18S/D-11	Not missing but frozen	Frozen in January and February (D only)
MP19S/D-12	Not missing but frozen	Frozen in January and March
SW1	Not missing but frozen	Frozen in January
SW1	Transducer water levels between the November and December monitoring events	Transducer issue (failure)
SW2	Not missing but frozen	Frozen in January and March
SW2	Transducer water levels between the October and November monitoring events	Transducer issue (failure)

Monitoring Location	Missing Data	Comment
SW4	Not missing but frozen	Frozen in January
SW9	Not missing but frozen	Frozen in January
SW10	Not missing but frozen	Frozen in January, March and November

3.1.4 Notification Regarding Locations Which Become Inaccessible

A list of the wells that have become inaccessible and removed from the monitoring program, along with replacements that were recommended, are provided in the following table.

Table 4: Inaccessible Monitors

Monitoring Location	Reason for Inaccessibility	Recommendation	Documented in Letter to MECP (Appendix J)
SW9	Destroyed in April 2018 when part of pond was filled in	No additional surface water stations to be monitored in place of SW9	April 30, 2018
W2	In August 2018, the owner notified Nestlé that they would no longer like their well monitored	Install a monitoring well on a neighbouring property	August 9, 2018

3.2 Biological Monitoring

Biological monitoring undertaken on the Nestlé Waters Canada Aberfoyle property in 2018 was completed in accordance with the requirements of the PTTW for the site and under the guidance of recommendations provided in the 2017 Biological Monitoring Report (Beacon Environmental and C. Portt and Associates, 2018). Monitoring of terrestrial resources (vegetation and wildlife) was completed by Beacon Environmental and monitoring of aquatic resources (salmonid spawning along reaches of Aberfoyle Creek) was completed by C. Portt and Associates. The findings of the 2018 Biological Monitoring Program are presented in the 2018 Biological Monitoring Program Report (Beacon Environmental and C. Portt and Associates, 2019) which is included in Appendix H.

3.3 Surveying

No surveying needed to be conducted in 2018.

3.4 Precipitation

In 2017, Nestlé benefited from an exchange with the consulting hydrogeologist for Puslinch Township regarding the assessment of precipitation data from stations in the general area of the Aberfoyle facilities (memorandum prepared by Harden Environmental Services Inc. for Puslinch Township, May 12, 2017). It is recognized that there are differences between the amounts of precipitation recorded at the different stations. It is impossible to obtain a perfectly representative estimate of the annual precipitation over the full extent of the area of contribution for the Nestlé Aberfoyle well. What is most important is that adopting a consistent approach from year to year allows an assessment of the differences with respect to long-term average conditions (30-year climate normals). An analysis of precipitation trends was conducted to see if there is a correlation with water level trends. We note that the actual influence on water levels (groundwater) would be due to recharge and not total precipitation, and that recharge is controlled by more than just precipitation. However, in the absence of detailed recharge data in the area, the use of precipitation totals allows for some comparison of long-term trends in water levels, particularly in the shallow monitors (overburden and mini-piezometers). An independent soil water balance analysis has been conducted to estimate the annual average infiltration over the region surrounding TW3-80. The SWB code of the United States Geological Survey has been applied (Westenbroek et al., 2010) with the 11-year record of precipitation data compiled for the Annual Monitoring Report. The results of the analysis suggest that the annual average infiltration is about 20% of the annual precipitation. The findings are summarized in a technical memorandum included in Appendix I.

In 2018, precipitation data were obtained from Environment Canada from the Kitchener/Waterloo (KW) Station. Environment Canada indicates that the KW station is an automated Nav Canada station that reports total daily precipitation over the entire year. When data are missing from the station, the gap is filled in using data from the Roseville or Elora RCS meteorological stations. Precipitation records were also previously obtained from the Waterloo Wellington Station; however, precipitation has not been recorded at the station since April 2017. Environment Canada does not calculate 30-year climate normal for the Kitchener Waterloo Station and as such the 30-year climate normal from the Waterloo Wellington Station continue to be used for comparison.

The following table provides a summary of the annual precipitation. The annual 30-year average (1981-2010) precipitation from the Waterloo Wellington Station (closest station to the KW station with 30-year average data) is 916.5 mm. The total precipitation measured in 2018 was 807.1 mm, which is 11.9% below the average. Declines of more than 10% below average precipitation were observed in 2012, 2015 and 2018. Increases of more than 10% above average precipitation were observed in 2008, 2011 and 2013. Following a couple years of near-normal precipitation, the total precipitation in 2018 was about 12% below average (the total precipitation in 2018 was about 15% lower than in 2017). Annual precipitation is also shown graphically on Figure 3.6 along with the 30-year average.

Table 5: Annual Precipitation

Year	Precipitation (mm)	% Difference from Average
2008	1304.7	42.3
2009	964.9	5.3
2010	833.1	-9.1
2011	1081	17.9
2012	770.6	-15.9
2013	1088.6	18.8

Year	Precipitation (mm)	% Difference from Average
2014	973.8	6.3
2015	795.8	-13.2
2016	931.9	1.7
2017	949.4	3.6
2018	807.1	-11.9
Average (1981-2010)	916.5	

The monthly precipitation for 2018 is included in Table 6. Below-average precipitation was recorded in 9 of the 12 months in 2018.

Table 6: Monthly Precipitation in 2018

Month	Precipitation (mm)	Average (mm)	% Difference from Average
January	59.8	65.2	-8.3
February	78.7	54.9	43.4
March	29.3	61.0	-52.0
April	96.9	74.5	30.1
May	72.3	82.3	-12.2
June	59.4	82.4	-27.9
July	72.0	98.6	-27.0
August	92.3	83.9	10.0
September	61.1	87.8	-30.4
October	54.4	67.4	-19.3
November	71.7	87.1	-17.7
December	59.2	71.2	-16.9

4.0 MONITORING PROGRAM RESULTS

4.1 Water Taking for TW3-80 and TW2-11

Water taking at the Nestlé Aberfoyle Site in 2018 continues to be governed by PTTW 1381-95ATPY, which permits water to be taken from two wells as outlined in Table 7.

Table 7: Permitted Water Takings at Aberfoyle

Source	Maximum Rate	Maximum Number of Hours of Water Taking per Day	Maximum Daily Water Taking	Maximum Number of Days of Water Taking per Year
TW3-80	2,500 L/min	24	3,600,000 L/day	365
TW2-11	475 L/min	24	684,000 L/day	365
Total			3,600,000 L/day	

The daily water taking at TW3-80 ranged from 0 L to 2,808,648 L. The maximum daily taking of 2,808,648 L corresponds to 78% of the maximum permitted taking. The average daily taking was 1,854,648 L/day. The daily water takings for 2018 are tabulated in Table C1 in Appendix C.

The total volume of water taken in 2018 from TW3-80 was 676,946,402 L. The total volume of water taken each year from 2001 to 2018 is presented on Figure 4.1. In 2018, the total volume taken was approximately 52% of the permitted volume. Since 2002, the groundwater taking has ranged from approximately 43% to 67% of the permitted taking. The total pumping from TW3-80 in 2018, was 12% lower than the total reported for 2017 (767,883,336 L).

The monthly water takings in 2018 from TW3-80 ranged from 36,833,502 L or 34% of permitted taking in November to 75,519,527 L or 68% of the permitted taking in July. The monthly water takings for the past 5 years are presented on Figure 4.2. In 2018, the monthly water takings generally increased during the first half of the year, with the peak water taking in July, and then decreased during the remainder of the year. Water takings during the last four months of the year were less than the water takings during the first eight months of the year and some of the lowest over the past five years.

During 2018, the daily takings and instantaneous flow rates were below the limits of the PTTW (i.e., less than 3,600,000 L/day and 2,500 L/min).

The Grand River Low Water Response Team declared a Level 1 Low Water Condition for the entire Grand River Watershed, including Mill Creek, on July 12, 2018. The Level 1 Low Water Condition was removed on September 13, 2018. Nestlé Waters Canada complied with the request by the Grand River Conservation Authority for all water-users in the Grand River watershed to voluntarily limit water takings to 90% of their monthly maximum permitted volume during the Level 1 Condition. Nestlé's water takings were below 80% of the permitted daily amount during the low water condition.

Condition 4.5 of the PTTW indicates that if the monthly amount of water taken exceeds 83,700,000 L, then multi-level piezometer (MP6, MP12, MP11 and MW2) data shall be submitted to the MECP. The monthly threshold of 83,700,000 L represents 75% of the permitted monthly water taking, based on a 31-day month. As shown on Figure

4.2, the monthly water takings in 2018 were less than the 83,700,000 L threshold, and therefore no multi-level piezometer data were submitted to the MECP during the year.

No water was taken from TW2-11 in 2018.

Condition 4.9 of the PTTW requires details of the bottling operations such as location and name of facilities where water is delivered in bulk containers, if bulk water is containerized at the receiving location, the size of the containers into which the water is transferred and total volume of water transported in bulk to each remote facility. Nestlé has indicated that no water was shipped in bulk (container greater than 20 litres) in 2018.

As per Condition 5.1, Nestlé has indicated that no complaints arising from the taking of water authorized under this PTTW were received in 2018.

4.2 Groundwater Monitoring Program

The groundwater levels measured manually in 2018 at the monitoring wells are tabulated in Table D1 in Appendix D. Hydrographs prepared using both manual measurements and transducer data are also provided in Appendix D. The hydrographs include the daily pumping volumes at TW3-80 and daily precipitation as recorded at the Waterloo Wellington or Kitchener Waterloo meteorological stations prior to April 2017 and from the Kitchener Waterloo station after April 2017 (as described in Section 3.4, with missing data filled in from other nearby stations).

4.2.1 TW3-80

Water levels and average daily pumping rates for TW3-80, along with daily precipitation, from 2014 through 2018 are shown on Figure D1a (Appendix D).

Water levels measured in 2018 at TW3-80 range from approximately 299.5 to 312.0 masl (or approximately 16.9 to 4.4 m below ground surface) under pumping and non-pumping conditions, respectively. These variations in water levels are mainly due to changes in the pumping rate and are within the historical range of water levels observed at TW3-80. An analysis of average water levels at TW3-80 versus average pumping at TW3-80 was undertaken to assess how pumping levels are related to pumping rates. A linear regression of the data indicates that pumping rate accounts for approximately 90% of the variation in water levels. A technical memorandum on the analysis is included in Appendix I.

Operation records of TW3-80 indicate that the well is seldom shut-down for significant periods of time and, consequently, there are few non-pumping water levels available. Based on previous shutdowns, CRA (2014) indicates that the non-pumping water levels are approximately 311 to 313 masl or 5.4 to 3.4 m below ground surface. The estimated non-pumping water levels (partially recovered conditions following shutdown of the pump) observed in 2018 range from approximately 308 to 312 masl. The water levels are similar to the non-pumping water levels observed over the past three years (2015 through 2017). It should be noted that non-pumping water levels do not represent “true” conditions that would be observed if there was no pumping at TW3-80. Instead, they represent partially recovered conditions, with the amount of recovery dependent on the average pumping rate before the pumping stopped, how much time has elapsed before pumping resumes and whether there is a background (seasonal) trend in the water levels.

The pumping levels in 2018 range from approximately 299.5 to 305.5 masl. Based on a static water level of 313 masl, the estimated drawdown at the well in 2018 range from approximately 7.5 to 13.5 m. CRA (2014) indicates that the total available drawdown to the top of the pump intake is about 20.7 m (based on a static water elevation of 313 masl and a top of pump intake elevation of approximately 292.3 masl). The drawdown in TW3-80 decreased from September onward when daily pumping was reduced (with some of the highest pumping levels observed over the past five years).

The water taking from TW3-80 in 2018 was slightly lower than the water takings from the previous three years (2015 – 2017) but similar to the water taking in 2014. The water levels in the pumping well follow similar trends over the same period (Figure D1a) with water levels at the end of 2018 similar to those observed at the beginning of 2014. The lower water levels from 2015 through 2017 are due to an increase in pumping over the same time. In general, the water level trend in TW3-80 corresponds to the overall water taking from the well (i.e., lower water levels during periods of higher water takings (e.g., 2007) and higher water levels during periods of lower water takings (e.g., 2011)). This relationship is shown on Figure D1b, which shows average monthly water levels, monthly pumping volumes and monthly precipitation. Overall, the water levels respond to pumping as expected and the on-going groundwater taking at TW3-80 has not led to a long-term declining trend in the TW3-80 levels (i.e., the on-going water taking is sustainable).

4.2.2 Lower Bedrock Aquifer

The regional groundwater potentiometric surface in the Lower Bedrock Aquifer is shown on Figure 4.3. The potentiometric surface was prepared based on the water levels measured during the July 20, 2018 monthly monitoring event. This represents a time when the highest pumping volumes were recorded at TW3-80 and monthly precipitation had been below normal for approximately three months. A review of the potentiometric surface on July 20, 2018, indicates groundwater flow toward TW3-80 from the northeast, north and northwest. The greater hydraulic connection with the area toward MW7-08 is evident in the potentiometric surface under pumping conditions. It is estimated that the water elevation contours resume back to the regional southerly flow pattern approximately 1.5 km south of the Site. It should be noted that a regional scale interpretation of groundwater elevations is being developed as part of the on-going modelling for the technical study report in support of the PTTW renewal application.

Hydrographs for wells completed in the Lower Bedrock Aquifer are included on Figures D2 through D18 in Appendix D. It should be noted that private wells installed in the Lower Bedrock Aquifer are constructed as open hole installations and are therefore also open through the Upper Bedrock Aquifer and the Middle Bedrock Aquitard. The water levels in these wells represent an “average” water level and do not provide a reliable measure of water levels specific for any of the individual aquifer units across which the well is open.

The results of a review of the hydrographs of wells completed in the Lower Bedrock Aquifer, specifically with continuous water level data from dataloggers, are summarized below.

General Summary

- Water levels measured within this aquifer in 2018 are within the range measured over the past five years.
- There are two general long-term trends in the water levels based on distance away from the pumping well. The long-term water level trend in the monitoring wells closer to TW3-80 show higher water levels at the beginning of 2014 and the end of 2018, with lower water levels in the period between. This is consistent with the annual pumping trend over the same five-year period, which recorded lower pumping volumes in 2014 and 2018. The second trend is observed in the monitoring wells further away TW3-80; there is no increasing or decreasing trend over the last five years.
- The lowest water levels typically occur through the summer months when pumping volumes are higher. The summer water levels observed in 2018 are similar to those observed in 2016.

- Water levels in the Lower Bedrock Aquifer are influenced by pumping of TW3-80 over the short-term and long-term. The short-term pumping effects are evident with the water levels fluctuating in response to daily changes in pumping rates. The long-term pumping effects are observed more in the wells closer to TW3-80 where water level changes from year to year correlate with overall annual water taking (i.e., increased water takings result in lower water levels). During lower pumping periods, the water levels recover with no long-term increasing or decreasing trends.

- There may also be some correlation with recharge. During the spring, the water levels in some wells (MW6A-08, MW8A-08, MW10C/D 09, MW15A-12 and MW16A-12) are on a stable trend while pumping is increasing.

Detailed Summary

- The monitoring well closest to TW3-80 in the same aquifer is MW2A-07, located approximately 150 m northwest of TW3-80 by Aberfoyle Creek. In 2018, the difference between the daily high and low water levels at MW2A-07 ranged from 0.1 m to 5.6 m (short-term) with an average difference of 2.0 m, similar to previous years. There was approximately 3 m of fluctuation in the daily high-water levels over the year. For comparison, wells located further away (upgradient - MW6A-08, MW8A-08, MW10C-09 and MW10D-09; downgradient - MW15A-12, MW16A-12 and MW17A-12 (see Figure 3.1 for locations)) showed only minor differences between high and low water levels and approximately 0.5 to 1.2 m of fluctuation over the year. Some of the fluctuation over the year at MW2A-07 is due to pumping variations at TW3-80.

- There appears to be a stronger hydraulic connection between TW3-80 and MW7A-08 (located approximately 1,050 m north of TW3-80) compared to the connection between TW3-80 and MW14A-11 (located approximately 750 m northwest of TW3-80) and TW3-80 and MW18A-12 (located approximately 750 m southwest of TW3-80). This may also indicate that the zone of influence extends further upgradient toward MW7-08 as opposed to downgradient toward MW18-12. This interpreted hydraulic connection is consistent with previous years.

4.2.3 Middle Bedrock Aquitard

Hydrographs for wells completed in the Middle Bedrock Aquitard are included on Figure D19 in Appendix D. This unit is generally considered an aquitard in area. Three wells are monitored within this unit, including one private well (“I”). The two monitoring wells (MW2B-07 and MW14B-11) are sealed within the Middle Bedrock Aquitard but, like other private wells, “I” is constructed as an open hole that is also open to the Upper Bedrock Aquifer. Since private well “I” is completed partially within the upper aquifer, it is not considered a true Middle Bedrock Aquitard monitoring well and is not representative of Middle Bedrock Aquitard conditions.

The results of a review of the hydrographs of wells completed in the Middle Bedrock Aquitard, specifically with continuous water level data from dataloggers, are summarized below:

General Summary

- Water levels measured within this aquitard in 2018 are similar and within the range of water levels measured over the past five years with the exception of some high-water levels at the “I” well in September and October.

- The water levels in MW2B-07 follow a similar trend as the water levels in the Lower Bedrock Aquifer from year to year and respond to pumping at TW3-80. The water levels show a response to pumping and non-pumping. This is consistent with the interpretation that the bottom of the screen is only 2 m above the contact between the Middle Bedrock Aquitard and the Lower Bedrock Aquifer.

- The water levels in MW14B-11 follow a similar trend to the water levels in the Upper Bedrock Aquifer from year to year and show some response to pumping at TW3-80. Furthermore, the fluctuations have a different frequency than those of MW14A-11, suggesting that the water level fluctuations are caused by variations in barometric pressure and not changes in the TW3-80 pumping rate. The well was previously considered to be within the Eramosa Aquitard, but is actually within the Reformatory Quarry Member of the Eramosa Formation which is included as part of the Upper Bedrock Aquifer. [In future annual reports, this well should be considered within the Upper Bedrock Aquifer].
- There is also some correlation with recharge during the spring melt, specifically at MW14B-11. During the spring, the water levels are on a rising trend while pumping is also increasing, indicating that recharge has more of an effect than pumping during this period of time.
- Continuous water level data are not available for “I”, so it is not obvious that the responses to pumping are similar but the absolute water levels suggest that the well may respond as a Lower Bedrock Aquifer monitoring well.

Detailed Summary

- A review of water levels in the closest monitoring well (MW2B-07) to TW3-80, indicates that the difference between the daily high and low water levels at MW2B-07 ranged from 0 m to 4.2 m (short-term) with an average difference of 1.5 m. There was less than 3 m of fluctuation in the daily high-water levels over the year. This is somewhat dampened relative to water levels in the Lower Bedrock Aquifer at this location (MW2A-07) where high to low water levels vary by an average of 2 m and fluctuate over the year by 3 m. For comparison, MW14B-11 (located approximately 750 m northwest of TW3-80) showed only minor difference between high and low water levels and approximately 1 m of fluctuation over the year in 2018. Most of the fluctuation over the year at MW2B-07 is due to pumping variations.

4.2.4 Upper Bedrock Aquifer

The regional groundwater potentiometric surface in the Upper Bedrock Aquifer is shown on Figure 4.4. The potentiometric surface was prepared based on the water levels measured during the July 20, 2018 monthly monitoring event. This represents a time when the highest pumping volumes were recorded at TW3-80 (i.e., during the month of July) and monthly precipitation was below normal. A review of the potentiometric surface on July 20, 2018, indicates groundwater flow toward TW3-80 from the northeast, north and northwest. The greater hydraulic connection with the area toward MW7-08 is evident in the potentiometric surface under pumping conditions.

Hydrographs for wells completed in the Upper Bedrock Aquifer are included on Figures D20 through D30 in Appendix D.

The findings from a review of the hydrographs of wells completed in the Upper Bedrock Aquifer, specifically with continuous water level data from dataloggers, are summarized below.

General Summary

- Water levels measured in the Upper Bedrock Aquifer in 2018 are within the ranges measured over the past five years with high water levels observed in the spring. The high-water levels occurring in the spring are similar to those in the spring of 2014, 2016 and 2017. Water levels generally rose during the first half of the year and then there are two different trends during the second half of the year. The water levels in the monitoring wells upgradient of TW3-80 increased during this time period, which coincides with the decrease in pumping volume. The water levels in the wells downgradient of TW3-80 generally decreased and then stabilized during the during the second half of the year.

- Water levels in the Upper Bedrock Aquifer around the Site show some effects of pumping at TW3-80 (i.e., there is hydraulic connection between the Lower Bedrock and Upper Bedrock aquifers); however, the connection is limited (i.e., less response than in the Lower Bedrock Aquifer). The amount of influence varies based on distance from TW3-80 and existing hydrogeologic conditions (i.e., complexity in the subsurface and changes in permeability). Typically, wells further away from TW3-80 show less effect from pumping, although this is not always the case. The greatest influence from pumping is observed at MW2C-07 and MW7B-08.
- While there is an influence on water levels in the Upper Bedrock Aquifer from pumping TW3-80, there is also a long-term water level trend that is reflective of recharge (i.e., lower water levels during years of below normal precipitation and higher water levels during years of above normal precipitation).
- There are also seasonal influences observed in the water levels in the Upper Bedrock Aquifer. For example, there is a rise in water levels measured in the wells within the Upper Bedrock Aquifer in the spring that is not due to changes in pumping at TW3-80 but due to spring recharge. This indicates that recharge to the aquifer has more of an effect than pumping during this period of time (i.e., the changes in water level are more reflective of the wet spring/dry summer and fall compared to the total pumping). There are also short-term fluctuations in water levels that reflect changes in barometric pressure.

Detailed Summary

- In 2018, the water levels in well MW2C-07 (closest well to TW3-80 in the Upper Bedrock Aquifer) had a difference of 0 m to 1.2 m (short-term) between the daily high and low water levels at and an average difference of 0.4 m, which is less than previous years. This may be due to the difference in well operation (i.e., the wells are now operated on a more continuous basis). There was less than 1 m of fluctuation in the daily high-water levels over the year. This is somewhat dampened relative to water levels in the Lower Bedrock Aquifer at this location (MW2A-07) where the daily high to low water levels vary by an average of 2 m and fluctuate over the year by 3 m.
- Wells located further away from TW3-80 (upgradient – MW6B-08, MW8B-08 and MW10B-09; downgradient – MW15B-12, MW16B-12 and MW17B-12 (see Figure 3.1 for locations)) showed only a minor difference between high and low water levels and less than 1 m of fluctuation over the year, similar to previous years.
- There appears to be a stronger hydraulic connection between TW3-80 and MW7B-08 (located approximately 1,050 m north of TW3-80) compared to the connection between TW3-80 and MW4B-07 (located approximately 330 m northwest of TW3-80). This is also consistent with previous years and points to a complexity in the subsurface.

4.2.5 Overburden

The potentiometric surface of the overburden is also plotted (Figure 4.5) based on water levels measured on July 20, 2018, during the month of highest pumping. A review of the potentiometric surface on July 20, 2018, indicates that groundwater flow is generally in a south to southwest direction with potentially some flow towards Aberfoyle Creek. We note that there is both lateral and vertical flow in the overburden. An interpretation of the lateral flow in the overburden is shown in Figure 4.5, while vertical gradients in the shallow overburden along the creek are discussed below. Shallow groundwater flow directions are more variable locally than the deeper bedrock flow systems as they are more influenced by topographic changes and interactions with surface features.

Hydrographs for wells completed in the overburden are included on Figures D31 through D35 in Appendix D. The intermediate and deep overburden wells are installed in the till, in sand and gravel within or below the till, or deep within the surficial sand and gravel aquifer. Shallow overburden wells are typically installed in the upper portion of the surficial sand gravel.

Findings from a review of the hydrographs of wells completed in the overburden are summarized below.

General Summary

- Water levels measured within the overburden in 2018 are within the ranges measured over the past five years, with no significant overall increasing or decreasing trend. Overall the water levels are slightly higher in 2017 and 2018 following 2016 when a Level 2 Low Water Condition was in effect over the entire Grand River watershed. The water levels in some of the wells are more influenced by total precipitation.
- Water levels in the overburden fluctuated by 0.7 to 1.3 m in 2018. A rise in water levels during the winter was observed. Water levels declined into the summer and then increased again in the fall.
- Water levels in the overburden are affected both by natural events (recharge) and to a lesser degree by pumping at TW3-80. The response to pumping in the overburden is muted compared to the response in Lower Bedrock Aquifer and appears to be less than 0.2 m under daily pumping changes and less than 1 m over the year in nearby monitoring wells (i.e., MW2D/E-07 approximately 150 m northwest of TW3-80).

4.2.6 Vertical Gradients

Vertical gradients between the Lower Bedrock Aquifer and the Upper Bedrock Aquifer are plotted on Figures D36 through D46 in Appendix D; the gradients are inferred from multi-level monitoring wells completed in both units.

Note that a positive gradient is calculated when the water level in the upper aquifer exceeds the level in the lower aquifer. Under these conditions, the mean direction of vertical groundwater flow is downwards.

In general, a dampened response in the Upper Bedrock Aquifer relative to the response in the Lower Bedrock Aquifer is evident based on a review of the graphs for the multi-level monitoring well locations. At locations where the positive gradient increases when pumping increases, this is due to the fact that water levels in the Lower Bedrock Aquifer respond more to pumping than do the water levels in the Upper Bedrock Aquifer.

A description of the gradients at the Site is as follows:

- MW2A/C-07 – positive gradient (potential downward flow) that increases with increased pumping. In October, there is a brief period when the gradient is reversed coinciding with reduced pumping. The positive gradient has been similar over the past four years with a slight increase since 2014;
- MW4A/C-07 – positive gradient (potential downward flow) that increases with increased pumping. Gradients have been similar over the past four years with a slight increase since 2014 due to increased pumping. The gradients at the end of 2018 are similar to those at the beginning of 2014;
- MW6A/B-08 – positive gradient (potential downward flow) that has been relatively consistent since 2015 when annual water takings were similar. Changes in pumping during each year are not evident in the

gradient (i.e., increased pumping during the summer does not result in an increased positive gradient). Note that the increased gradient since the second half of 2016 is due to a temporary drop in the water level at MW6A-08 following purging of the well for sampling;

- MW7A/B-08 – positive gradient (potential downward flow) that increases with increased pumping. The positive gradient increased slightly in 2017 but is similar in 2014, 2015, 2016 and 2018. In the past (2015) there was a reversal of gradient not related to the pumping at TW3-80 (potentially in response to reduced pumping at another source). This other source may also be partially related to the increased gradient observed at MW7-08 in 2017;
- MW8A/B-08 – negative gradient (potential upward flow) that occasionally reverses to a positive gradient (potential downward flow) mainly during the summer. The gradient is similar over the past five years;
- MW10B/C-09 – positive gradient (potential downward flow) that does not change with seasonal pumping fluctuations. The gradient has been consistent over the past four years after a small increase from 2014, which may be related to other water takings in the area;
- MW14A/C-11 – positive gradient (potential downward flow) that increases with increased pumping. The positive gradient is similar over the past five years and decreased slightly during the second half of 2018 when pumping was less;
- MW15A/B-12 – negative gradient (potential upward flow) that does not change with increased pumping;
- MW16A/B-12 – positive gradient (potential downward flow) with minor changes with increased pumping;
- MW17A/B-12 – positive gradient (potential downward flow) that increases with increased pumping. During times of lower pumping the gradient reverses (potential upward flow). During the later part of 2018 when the pumping was reduced, the gradient was mainly negative (potential upward flow); and
- MW18A/B-12 – positive gradient (potential downward flow) that increases with increased pumping. During times of lower pumping the gradient reverses (potential upward flow). During the later part of 2018 when the pumping was reduced, the gradient was consistently negative (potential upward flow);

Most of the area around TW3-80 is characterized by positive gradients (downward flow) in the bedrock. A negative gradient (upward flow) is present at wells further away from TW3-80 (i.e., MW15-12 to the west and MW8-08 to the north). A negative gradient (upward flow) is also present at MW17-12 and MW18-12 when pumping at TW3-80 is lower.

4.3 Surface Water Monitoring Program

The surface water monitoring program includes measurement of mini-piezometer and surface water levels, surface water flow and surface water temperature. The surface water levels measured in 2018 are presented in Appendix E along with hydrographs of the water levels and the surface water flows are tabulated and graphed in Appendix F. The hydrographs also include the daily pumping volumes at TW3-80 and daily precipitation as recorded at the Waterloo Wellington or Kitchener Waterloo meteorological stations (with missing data filled in from other nearby stations).

4.3.1 Mini-Piezometer Water Levels

Hydrographs for the mini-piezometer locations are presented on Figures E1 through E10 in Appendix E with “a” figures including data for the last 5 years (2014 through 2018) and “b” figures including data for the current year (2018).

The findings from a review of the hydrographs for the mini-piezometers are summarized below.

General Summary

- Water levels measured in the mini-piezometers in 2017 are within the ranges measured over the past five years with the exception of MP14S, MP8D, MP17D and MP18S, where low water levels were observed during the summer months. The low water levels in the other mini-piezometers during the summer of 2018 were either at or higher than the low water levels observed during the summer of 2016 when the Level 2 Low Water condition was in effect. In 2018, dry conditions were observed during the summer months.
- The water levels generally increase in the spring, decline through the summer, and then increase in the fall. There were two periods in the spring when the water levels in the mini-piezometers declined which correlate with periods of below normal precipitation. In addition to the seasonal trend, short-term changes (“spikes”) in water level in the shallow groundwater are influenced by precipitation.
- The MP11 mini-piezometer nest located at the Nestlé Gilmour Road property is considered to represent background conditions (i.e., conditions along Aberfoyle Creek that are beyond any influence of pumping TW3-80). However, the water level changes at this location are more subtle or muted than at other locations. This may be due to the fact that the nest is constructed in organic material on the bank beside the stream (as opposed to in the stream similar to the other mini-piezometer nests) and the nest is located on a tributary of Aberfoyle Creek (as opposed to the main branch of Aberfoyle Creek). A new mini-piezometer nest (MP1-16) was installed in Aberfoyle Creek in April 2016, in the general vicinity of the MP11 nest to monitor background conditions upstream of the Site. The location of MP1-16 is more representative of shallow groundwater conditions near the creek than the MP11 nest. In 2018, the casing at MP1-16 was extended so that the mini-piezometer doesn’t flow (when not frozen).

Detailed Summary

- The variation in water levels at MP11 over 2018 was less than 0.2 m. The water levels were relatively stable in 2018 with a slight increase at the end of February followed by a slight decrease through the summer and a slight increase into the fall. These changes in water level are influenced by natural seasonal patterns. The potential for vertical flow at the MP11 nest is consistently upward in 2018, similar to previous years (i.e., as shown in Figure E2a/b, water levels in MP11D-04 exceed those in MP11S-08). For comparison, and based on the data available, the water levels at MP1-16S fluctuated over 0.7 m in 2018. The fluctuation is similar to that observed in the downgradient mini-piezometers. The data collected at MP1-16 indicates that the response at MP11 is more subtle or muted. This is due to the locations of the mini-piezometers (i.e., in main creek versus a tributary) and how they are constructed (i.e., in stream bed versus outside of the stream). Despite the qualitative differences in the responses at MP11 and MP1-16, as shown in Figure E1a/b, the vertical gradient inferred from the data from the MP1-16 nest is consistent with the gradient inferred at MP11.
- There are six mini-piezometer nests situated on the Nestlé property (MP16, MP6, MP12, MP14, MP8, MP19) and two located downstream of the confluence of Aberfoyle Creek and Mill Creek (MP17, MP18). The mini-piezometer nests located upgradient and downgradient of TW3-80 showed fluctuations of approximately 0.5

m to 1.0 m during 2018. Changes in water levels correspond more with natural events rather than changes in pumping in TW3-80 and as such are mainly due to precipitation, snow melt and evaporation. There is some correlation between the increasing water levels at the end of the year and the decreased pumping. However, there is no change in water levels during the significant decrease in pumping in mid-October.

Shallow gradients observed in the mini-piezometers are shown on Figures E11a, b, c, and d. Beginning upstream and moving downstream, the vertical gradients are as follows:

- MP1-16 – strong negative gradient (potential upward flow). There are several short-term decreases in the negative gradient caused by rapidly rising surface water elevations following precipitation events;
- MP11 – strong negative gradient (potential upward flow) with a small decrease in March, from June to October and in December. There are several short-term decreases in the negative gradient caused by rapidly rising surface water elevations following precipitation events;
- MP16 – no gradient to weak positive gradient (potential downward flow) and relatively constant;
- MP6 – weak negative gradient (potential upward flow) to no gradient that occasionally changes to a weak positive gradient (potential downward flow) throughout the year;
- MP12 – no gradient that changes to a weak positive gradient (potential downward flow) from mid-March to mid-May and then to a weak negative gradient (potential upward flow) from mid-October to the end of the year;
- MP14 – strong negative gradient (potential upward flow) during the entire year that decreased slightly through the summer;
- MP8 – weak negative gradient (potential upward flow) with occasional weak positive gradient (potential downward flow) with a strong negative gradient occurring from mid-March to mid-October;
- MP19 – weak negative gradient (potential upward flow) until mid-July and then weak positive gradient (potential downward flow) until mid-November when the gradient changes back to a weak negative gradient to the end of the year;
- MP17 – no gradient that changes to a weak positive gradient (potential downward flow) from June to the end of the year;
- MP18 – weak negative gradient (potential upward flow) during the first half of the year that reverses to a weak positive gradient (potential downward flow) during the second half of the year; and
- The changes in vertical gradients appear to be somewhat similar to the background trend in MP1-16 and MP11.

The water levels in the mini-piezometers on July 20, 2018 are plotted on Figure 4.6 which is during the month of highest pumping. Review of the water levels on July 20, 2018 indicates that there is a strong upward flow at the new station (MP1-16) located upstream of Aberfoyle Mill Pond. There is essentially no gradient at the three piezometers (MP16, MP6, MP12) upgradient of TW3-80 and then a strong negative gradient at MP14 near the middle of the property. There is a weak negative gradient at the downstream end of the property (MP8). Weak positive gradients are observed at the two piezometers (MP17, MP18) located downgradient of the confluence of Aberfoyle Creek and Mill Creek. These gradients are similar to those observed in the past with no measurable influence with well pumping. No long-term changes or trends in the mini-piezometer gradients have been noted during the last five years.

4.3.2 Surface Water Levels

Hydrographs for the surface water level monitoring locations are included on Figures E12 through E18 in Appendix E with “a” figures including data for the last 5 years (2014 through 2018) and “b” figures including data for the current year (2018).

A review of the hydrographs for the surface water level monitoring locations indicates the following:

- Surface water levels in the creeks fluctuate in response to precipitation, snow melt and evapotranspiration with no measurable effects from pumping at the current rates;
- In general, surface water levels at the off-Site stations (SW3, SW4 and SW5) were higher in the winter/spring and lower in the summer and then increased slightly into the fall. There was a decline in water levels at all three stations in March following a period of below normal precipitation. The low water levels observed in the summer of 2018 at SW3 were higher than the low water levels observed in the summer of 2016 (during the Level 2 Low Water Condition) and the low water levels at SW4 and SW5 in 2018 were similar to the low water levels in 2016;
- Surface water levels at the on-Site stations (SW1 and SW2) generally follow a similar trend with higher water levels in the spring followed by lower water levels in the summer and higher water levels again in the fall (although generally lower than those in the spring). The low water levels in the summer of 2018 are similar to the low water levels in the summer of 2016 and higher than those observed in 2014. The low water levels in the summer of 2018 at SW2 are the lowest observed over the past 10 years and are likely related to the below normal precipitation over the same period. “Spikes” in the water levels are related to precipitation events or spring melt. The changes in water levels at SW1 and SW2 are mainly due to natural events (i.e., precipitation, snow melt and evaporation); and
- Water levels at SW9 and SW10 are measured in ponds on the neighbouring property. These ponds may represent water table conditions. SW9 was destroyed in April 2018 when part of the pond was filled in. In general, the water levels in these ponds were declining in 2014 and 2015 followed by a rise in water levels in the spring of 2016 and then a decline into summer. In 2017, the water levels rose in the spring and early summer to the highest levels observed over the current five-year period (2014 through 2018). In 2018, the water levels rose to May and then declined to September and have been relatively stable to the end of the year. It is our understanding that operations at the aggregate pit commenced in 2016 and aggregate washing of the sand and gravel may be occurring. The changes in water levels is likely due to a combination of seasonal changes and potentially to aggregate operations.

The water levels at the surface water stations on July 20, 2018 are included on Figure 4.6, during the month of highest pumping. Review of the water levels on July 20, 2018 indicates that surface water features varied in elevation from approximately 317.3 masl at SW3 to 307.2 masl at SW5 with surface water levels across the Site ranging from 311.3 masl (SW1) to 310.3 masl (SW2).

4.3.3 Surface Water Flow

The monthly stream flow data collected in 2018 are summarized in Appendix F. Stream flow has been measured at these locations since December 2001. SW1 is located along Aberfoyle Creek near the upstream part of the property while SW2 is located along Aberfoyle Creek near the downstream part of the property.

Stage-discharge curves were developed for SW1 and SW2 which show the relationship between surface water elevation (stage) and stream flow (discharge). The stage-discharge relationships at surface water stations SW1 and SW2 were updated and reassessed to account for the 2018 measured water levels and flow rates. Due to changing stream conditions, individual stage-discharge curves sometimes need to be created for individual years or a series of years. This is done because a review of the discrete flow measurement results indicates that they have changed subtly. A new stage-discharge curve was developed to represent continuous flows in 2018 at SW1 and SW2 to provide a better fit of the data. Stage-discharge curves were developed by estimating the level at which zero flow would occur (i.e., y0) at each station. This was estimated using the available low-flow measurements collected over the monitoring period. Historical data were included for comparison and to include measured data over a larger range of stream discharge conditions. Power functions were used to develop a best fit curve for the measured data at each station. Data outliers were evaluated with a lower confidence due to suspected winter conditions or measurement error. The updated stage-discharge curves for SW1 and SW2 are presented on Figures F1 and F2, respectively.

Graphs of stream flow measured at SW1 and SW2, along with pumping rates and precipitation, are presented on Figure F3 in Appendix F with the “a” figure including data for the last 5 years (2014 through 2018) and the “b” figure including data for the current year (2018). The stage-discharge relationship was used to estimate stream flow from the continuous water level elevation data. It should be noted that historically there are a few occasions when flow was estimated at SW1 and SW2 for stream elevations outside of the observed stage-discharge curve relationship (typically flows exceeding approximately 1,200 L/s).

Review of the flow data indicates the following:

- In 2018, stream flow measured (during monthly monitoring) at SW1 ranged from 50.1 L/s (July) to 1,060.6 L/s (February) and at SW2 stream flow ranged from 41.5 L/s (July) to 998.1 L/s (February);
- The trends in surface water flow at SW1 and SW2 over the year are similar. This is consistent with previous years;
- There was variability in the flows at SW2 in late January and early February. The variability in the logger data is most likely caused by ice conditions at the water level logger at the station;
- In 2018, stream flow was higher in the spring following precipitation and melt events and then declined through the summer with less variability in flow. The stream flow rose from October to the end of the year;
- The 2018 measured stream flow at SW1 and SW2 were generally lower during the summer months. Although, the measurements at SW1 and SW2 were similar to each other during this period, the flows at SW2 were slightly below the historic range for this station;
- The calculated flows from the rating curves indicates that flow in the creek was higher at SW2 compared to SW1 at the beginning and end of the year (estimated based on available data). Flow calculated at the stations based on the water levels and rating curve indicates that flow was similar at SW1 and SW2 from mid-July to the beginning of October; and

- A review of the manual measurements indicates that flow at SW2 was slightly less than flow at SW1 in February, June, July and September. Flow measurement error is +/- 15%. Taking into consideration the potential error in measurement, it is possible that the flow in these months may have been lower at SW1 compared to SW2.

It was noted in CRA (2014) that pumping tests conducted in 2004, 2007, and 2010 indicated that surface water flow at SW1 and SW2 was not measurably affected by pumping. The on-going monitoring confirms this conclusion and shows that the stream flows are influenced by precipitation events and fluctuate seasonally.

4.3.4 Surface Water Temperature

Surface water temperature was monitored at six stations across the Nestlé property.

The average daily water and air temperature data for 2014 through 2018 are shown on Figure G1a and for 2018 on Figure G1b. Review of the data indicates the following:

- The seasonal trend in stream temperature levels in 2018 is similar to previous years and relatively stable;
- Average daily ambient air temperature ranged from -19.7ºC to 26.2ºC in 2018;
- Average daily surface water temperature ranged from 0.2ºC to 29.1ºC at the upstream end of the property and from -0.1ºC to 27.3ºC at the downstream end of the property. Surface water temperatures generally decrease, across the Site, moving downstream; and
- Ambient air temperature significantly influences stream temperature as seen by the strong correlation between the two. The correlation is not evident during the winter months when air temperature typically drops below 0ºC and surface water temperature remains relatively constant around 0ºC. It is noted that the air temperature is generally cooler than the water temperature. This is due to location of the air temperature sensor being located in a box in shaded area.

The surface water temperature monitoring results were provided to C. Portt and Associates, and the results were incorporated in their report, which is also included in Appendix G.

The mill pond on Aberfoyle Creek is a major influence on the temperature of the creek and its fish community. During the summer, the water in the mill pond, upstream from Brock Road, becomes warm and, as a consequence, the creek is warm through the Nestlé property. The C. Portt and Associates report concluded that:

> *In 2018, mean summer (June – August) air temperature and water temperatures were high relative to most other years in the period 2007 – 2017. The overall pattern of water temperature suitabilities for the fish species found in the Aberfoyle Branch of Mill Creek from Brock Road downstream through the Nestle property in 2018 are consistent with previous years. Water temperatures during the June 1 – August 31 period are usually too warm for coldwater species such as brook trout and brown trout and too cold for warmwater species such as largemouth bass. The water temperatures during this period are most favourable for species such as common shiner that have intermediate thermal requirements. During the summer, the water in the mill pond upstream from Brock Road becomes warm and, although the creek temperature decreases with distance downstream, it frequently exceeds the ultimate upper incipient lethal temperature for brook trout and brown trout at the furthest downstream temperature monitoring site.*

> *The relationships between air temperature and water temperature were consistent with those observed in previous years.*

4.4 Biological Monitoring Program

The 2018 Biological Monitoring Report (Beacon Environmental and C. Portt and Associates) makes the following conclusions:

In summary, the results of the biological monitoring at the Aberfoyle property to date indicate that there have not been any significant changes to the terrestrial and aquatic monitoring parameters that would suggest altered hydrology. The species richness, abundance, and distribution are generally within the range expected and attributable to natural variation and succession. The subject property continues to support high quality terrestrial and wetland habitats that support a diverse range of native wildlife.

The report also includes recommendations for continued biological monitoring in 2019. Details are included in the report which can be found in Appendix H.

5.0 CONCLUSIONS

The following conclusions are provided based on the results of the 2018 monitoring program.

1) TW3-80 and TW2-11 operated in accordance with the limits outlined in the PTTW. The total volume of water taken in 2018 from TW3-80 was 676,946,402 L or 52% of the permitted volume. No water was taken from TW2-11 in 2018.

2) The daily water taking at TW3-80 ranged from 0 L/day to 2,808,648 L/day. The average daily taking in 2018 was 1,854,648 L/day.

3) The estimated non-pumping water levels in TW3-80, which obtains water from the Lower Bedrock Aquifer, ranged from approximately 308 to 312 masl in 2018 and the lower water levels, or estimated pumping levels, ranged from approximately 299.5 to 305.5 masl. The drawdown at the well ranged from approximately 13.5 m to 7.5 m in 2018. Historical and current records indicate that long-term water levels generally correlate with the annual pumping volumes (i.e., higher water levels during years of lower pumping and lower water levels during years of higher pumping).

4) The trends of water level variations within the Lower Bedrock Aquifer are stable with nearby monitoring wells in the Lower Bedrock Aquifer fluctuating in response to variations in pumping at TW3-80. The groundwater taking from TW3-80 has not led to a long-term declining trend in the aquifer water levels. Average water levels in the aquifer during the end of 2018 were similar to those observed during 2014, years during which the total volumes pumped by TW3-80 were almost identical.

5) The Middle Bedrock Aquitard limits the effect of pumping on overlying units (indicating semi-confined conditions). Unacceptable impacts (i.e., long-term declining trends) to the Upper Bedrock Aquifer and overburden aquifer have not been identified. In addition, no private well interference complaints were received in 2018. The water levels in the Upper Bedrock Aquifer and overburden aquifer show seasonal trends that are reflective of spring melt and precipitation. In 2018, the below normal precipitation during the summer is evident in the water level trends in the Upper Bedrock and Overburden Aquifers.

6) Surface water levels fluctuate in response to precipitation, snow melt and evapotranspiration.

7) The 2018 water taking from TW3-80 is sustainable.

6.0 RECOMMENDATIONS

The following recommendations are provided based on the results of the 2018 monitoring program:

1) The data from mini-piezometer MP11 suggest that this location does not serve the purpose of monitoring background conditions (i.e., conditions along Aberfoyle Creek that are beyond any influence of pumping TW3-80). The MP11 nest is constructed in organic material on the bank beside the stream and not in the stream, and is located on a tributary of Aberfoyle Creek rather than in the main branch of the creek. It is recommended that monitoring at MP11 be discontinued. MP1-16 is an appropriate alternative monitoring location.

2) Monitoring of the private wells (as outlined below) should be replaced with monitoring at dedicated monitoring wells. The monitoring program has been on-going since 2000 with more detailed monitoring occurring since 2008 and no impacts to private wells or the surrounding aquifer have been noted. In addition, the monitoring data from these private wells are often influenced by pumping at the private well itself. Nestlé is in the process of installing monitoring wells on various properties to replace the private wells used for monitoring. The following changes to the monitoring program should be discussed with the MECP during the permit renewal process:

    a. Discontinue monitoring at M1 and W2, which are wells completed in the Lower Bedrock Aquifer. Note that the owner of W2 has requested that the well not be included in the Nestlé monitoring program. Monitoring of the Lower Bedrock Aquifer should be completed at the proposed new well to be constructed at the northeast corner of the Nestlé property to replace the private wells.

    b. Discontinue monitoring at 8 Maple Leaf Lane, Private Well "I" (50 Brock Road), 58 Brock Road and MOE WWR #67-08740. Monitoring of the Upper and Lower Bedrock Aquifers should be completed at the proposed multi-level monitoring well to be constructed by the Aberfoyle School to replace the private wells.

    c. Discontinue monitoring at MOE WWR #67-07589, Private Well "B" and 2 Brock Road. Monitoring of the Upper and Lower Bedrock Aquifers should be completed at the proposed multi-level monitoring well to be constructed behind the Township Office to replace the private wells.

3) SW9 should be removed from the monitoring program since it has been destroyed when part of the pond was filled in and SW10 provides suitable coverage for monitoring surface water in the area.

4) Nestlé would like to decommission the Fireflow well. Upon approval by the MECP, the Fireflow well would be decommissioned following regulated abandonment procedures, so that the well could not act as a potential pathway to the aquifer. A surface water pond on the Nestlé property is used for fire suppression. A review of the monitoring network and data indicates that TW2-11 provides similar water level response to the Fireflow well and is close enough that it could replace the Fireflow well for monitoring purposes. TW2-11 is an appropriate monitoring location as Nestlé has indicated that they will no longer require a water taking from

TW2-11. The Fireflow well should then be removed from the PTTW (provided TW2-11 is removed from the PTTW as a source well and kept on as a monitoring point).

5) The remaining groundwater and surface water monitoring program should continue as is.

6) The PTTW should be updated with the following administrative changes when the PTTW is renewed:

    a. MW1A-04 should be removed from continuous monitoring of groundwater levels at bedrock wells as it has been decommissioned and replaced with MW10B-09, which is in the permit.

    b. Private well “J” should be removed from monthly monitoring of groundwater levels in bedrock and replaced with Private well “I” as previously indicated by CRA or both should be removed if dedicated monitoring wells are to replace the private wells.

    c. MP17S/D-12 and MP18S/D-12 should be renamed MP17S/D-11 and MP18S/D-11.

    d. MW-I should be removed from the list of continuous monitoring overburden wells and added to the list of continuous monitoring bedrock wells.

Signature Page

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John Piersol, M.Sc., P.Geo.
Senior Hydrogeologist, Associate

GRP/JAP/KM/ll

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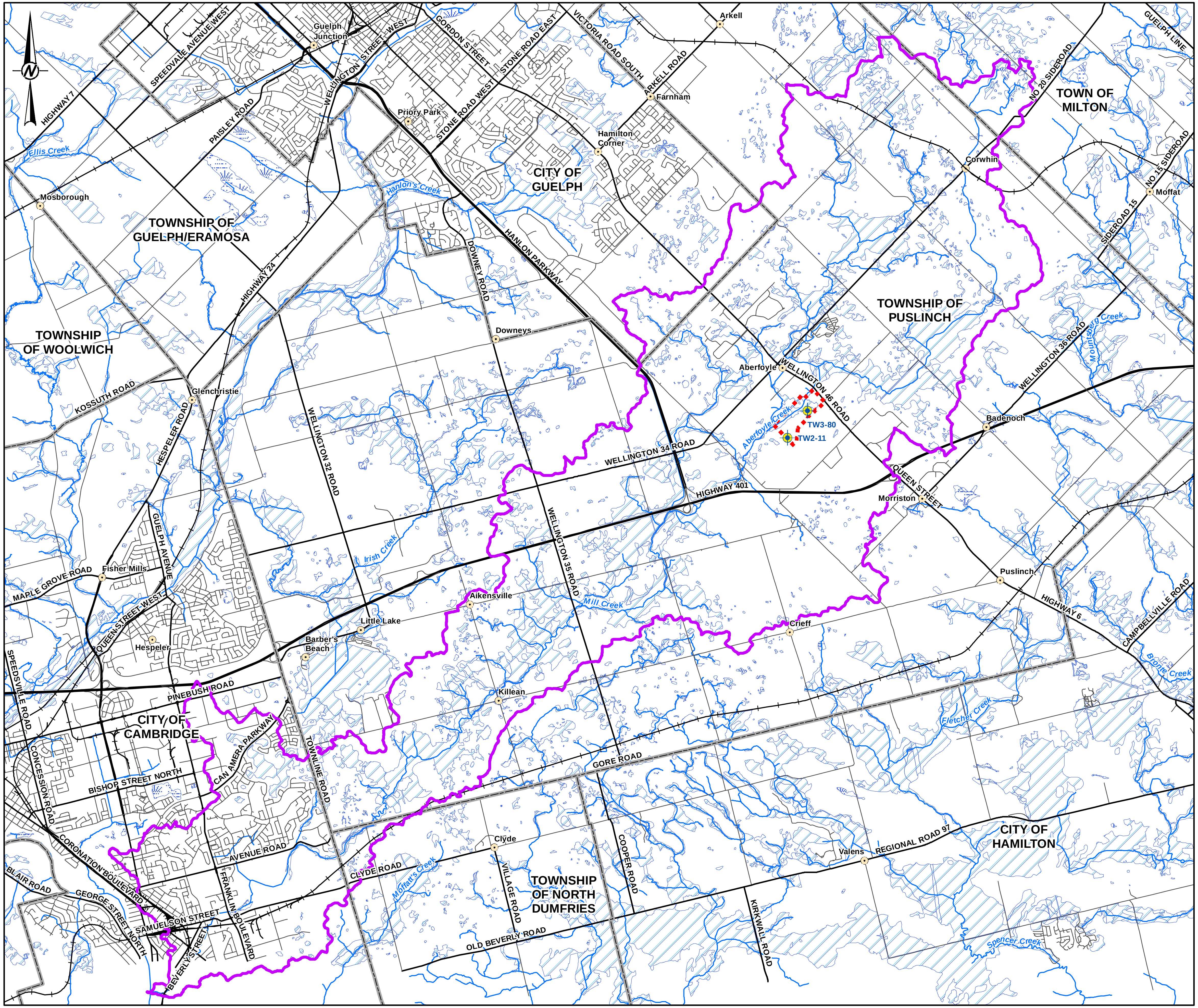
FIGURES



LEGEND

⊕	Nestle Production Well
⊙	City / Town
—	Main Road /Highway
—	Local Road
┼	Railway
—	Watercourse
🟦	Waterbody
▨	Wetland
▨	Provincially Significant Wetland
▭	Municipal Boundary
▭	Property Boundary
▭	Mill Creek Sub-Watershed

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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
SITE LOCATION

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-21
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
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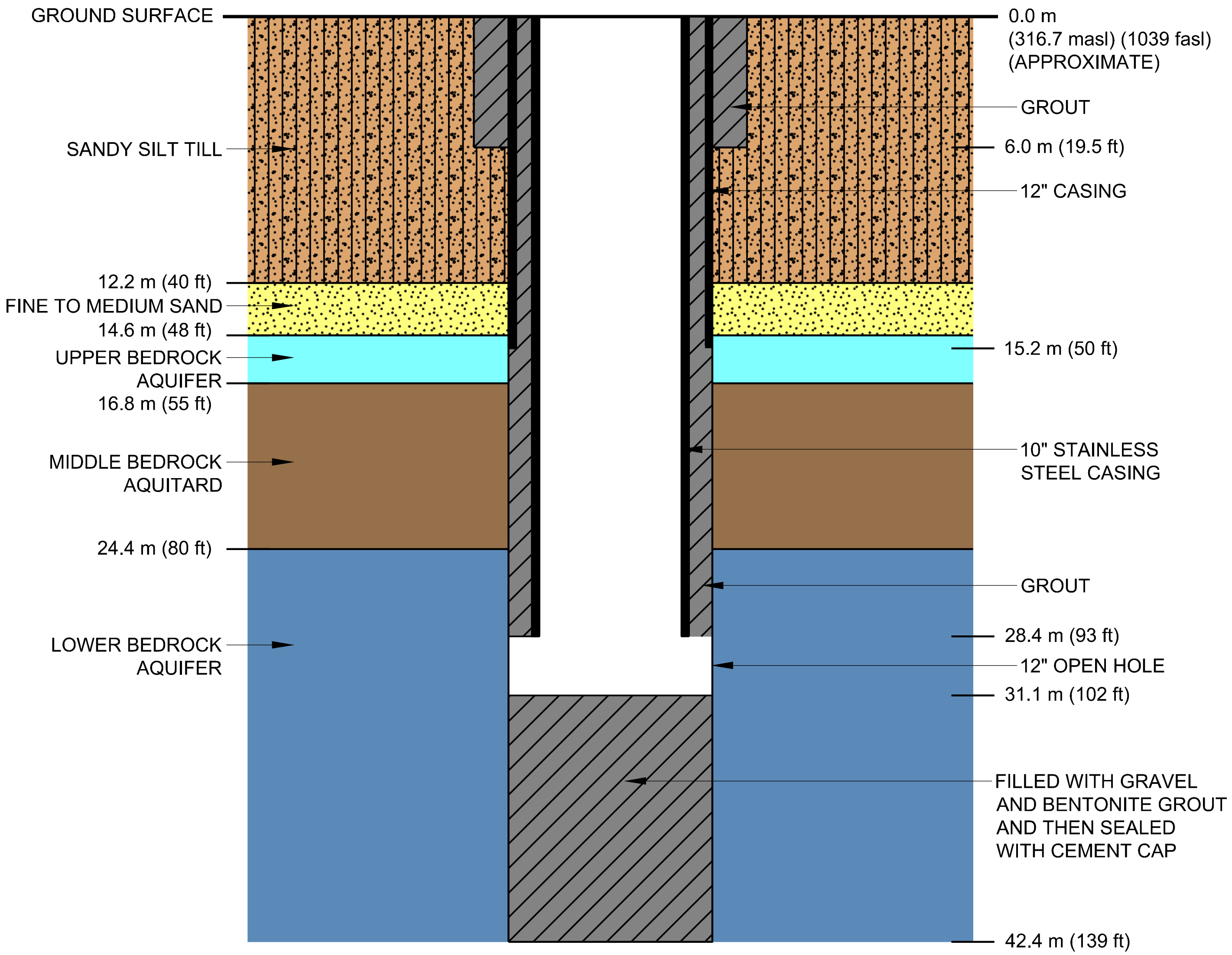

CLIENT	PROJECT
NESTLE WATERS CANADA	2018 ANNUAL REPORT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-22
PREPARED	SW
DESIGN	MR
REVIEW	GP
APPROVED	GP

TITLE
ABERFOYLE TW3-80 SCHEMATIC

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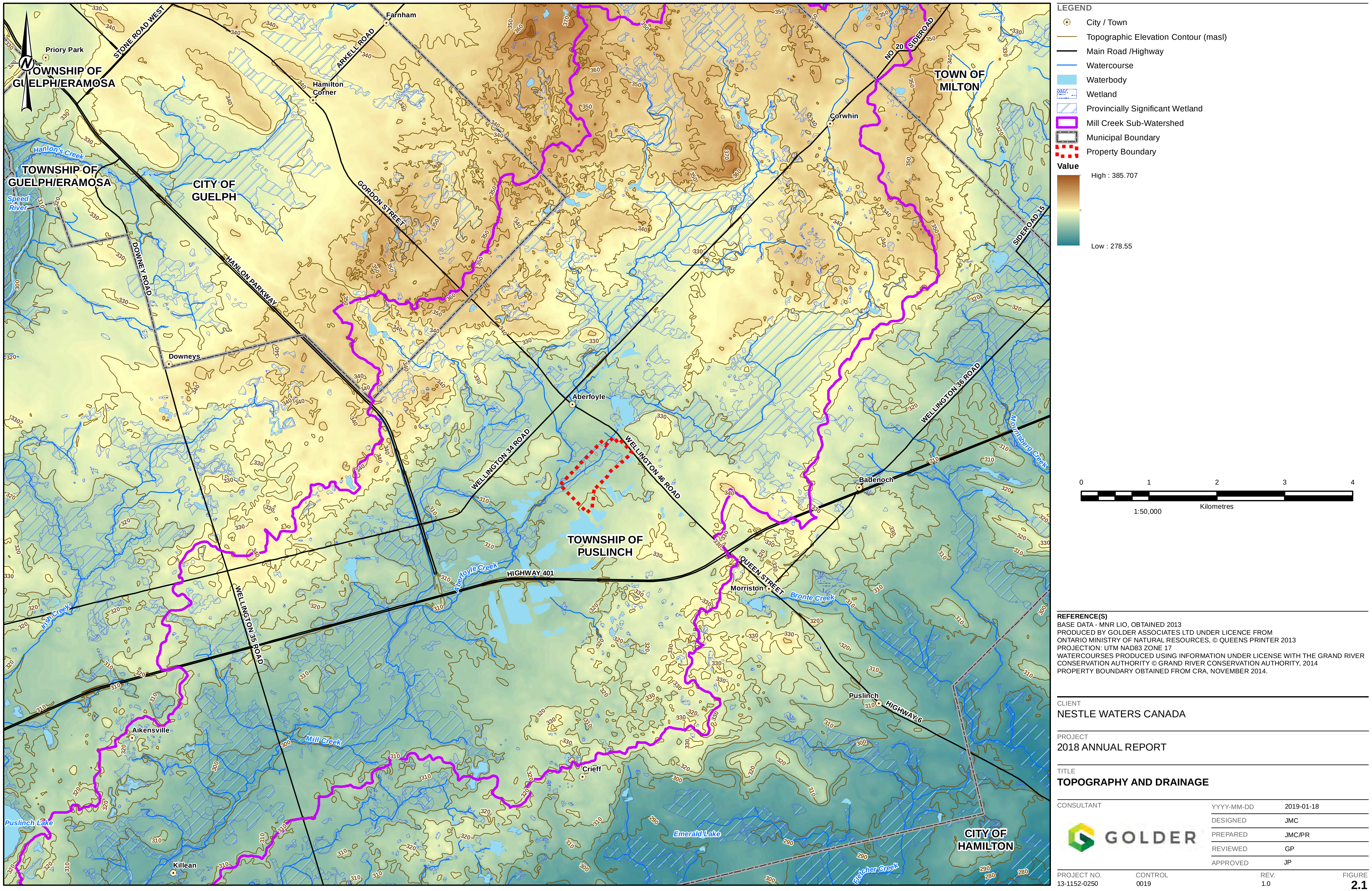

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CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
TOPOGRAPHY AND DRAINAGE

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
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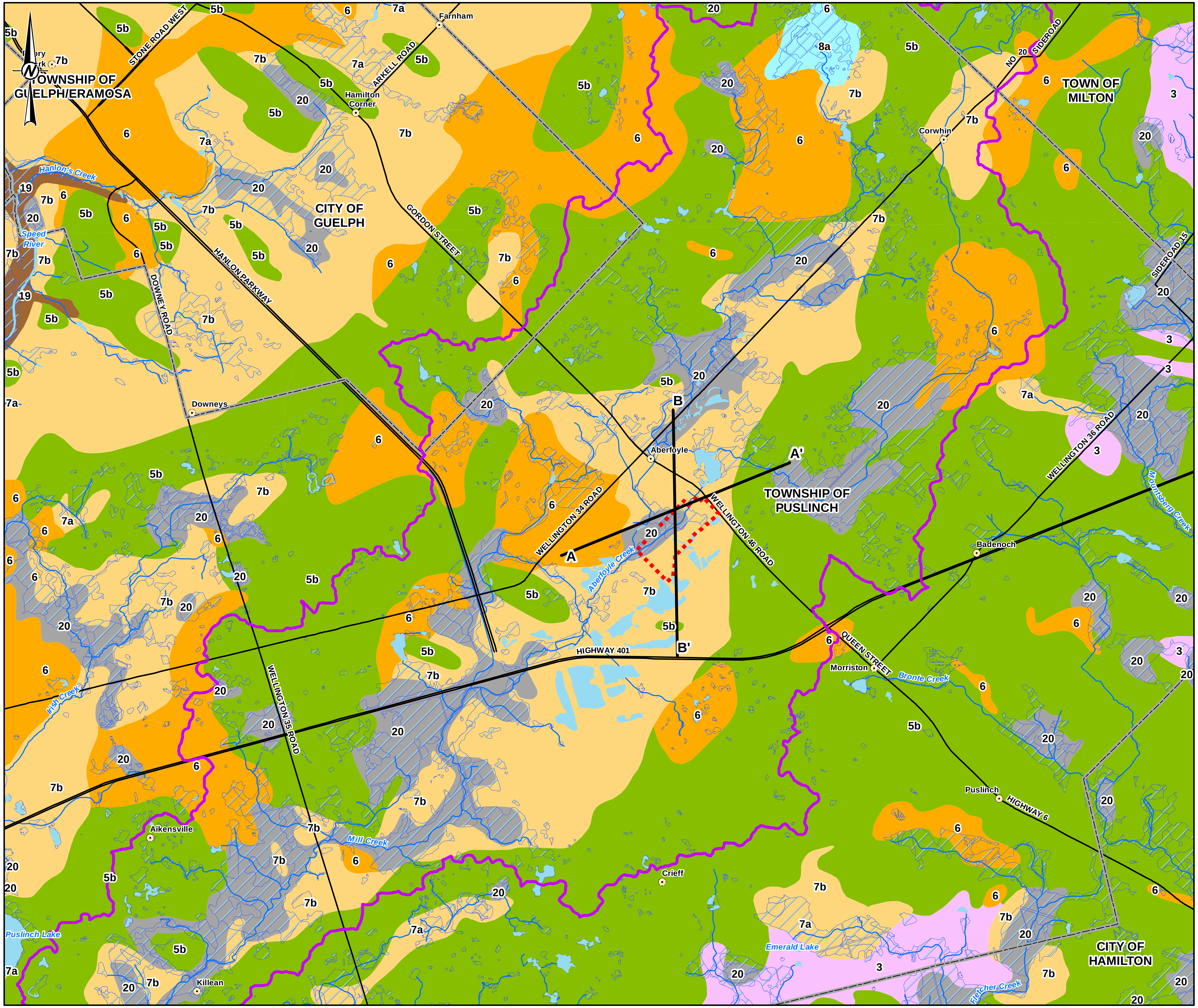

LEGEND

- ⊙ City / Town
- ━ Cross-Section Location
- ─ Main Road /Highway
- ─ Watercourse
- ▨ Waterbody
- ▨ Wetland
- ▨ Provincially Significant Wetland
- ▭ Mill Creek Sub-Watershed
- ▭ Municipal Boundary
- ▭ Property Boundary
- ▨ 3: Paleozoic bedrock
- 🟩 5b: Stone-poor, carbonate-derived silty to sandy till
- 🟧 6: Ice-contact stratified deposits
- ▨ 7a: Sandy deposits
- ▨ 7b: Gravelly deposits
- ▨ 8a: Massive-well laminated
- 🟫 19: Modern alluvial deposits
- ▨ 20: Organic deposits

0 1 2 3 4

1:50,000

Kilometres

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CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
REGIONAL QUATERNARY GEOLOGY

CONSULTANT

GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC
REVIEWED	GP
APPROVED	JP

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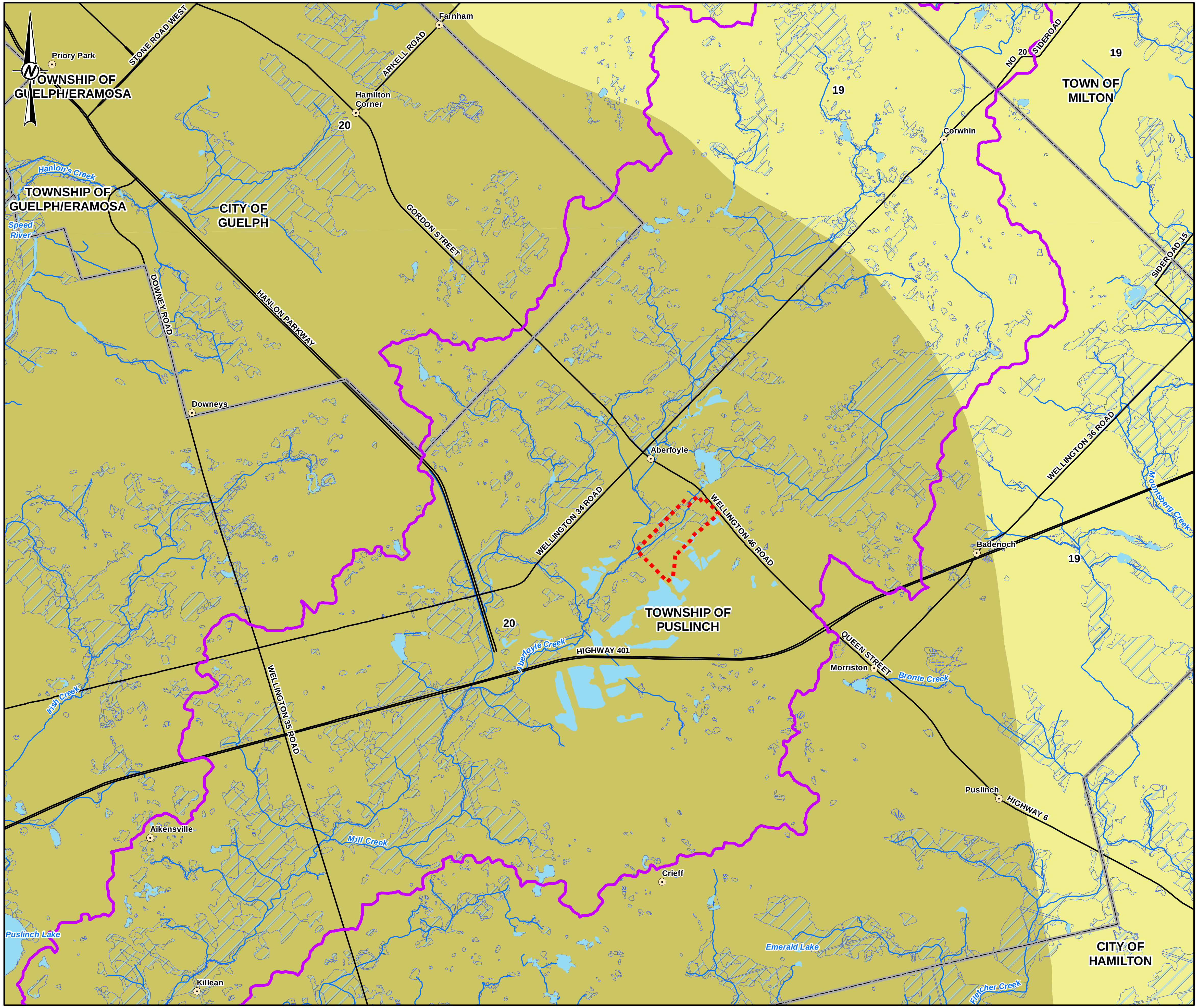

LEGEND

- ⊙ City / Town
- — Main Road /Highway
- — Watercourse
- ▨ Waterbody
- ▨ Wetland
- ▨ Provincially Significant Wetland
- ☐ Mill Creek Sub-Watershed
- ☐ Municipal Boundary
- ☐ Property Boundary
- ▨ 20: Guelph - dolostone; thick-bedded, crinoidal, locally biohermal; locally bituminous (Eramosa Mb)
- ▨ 19: Amabel - dolostone, limestone, argillaceous dolostone; locally cherty; locally bituminous (Eramosa Mb)

0 1 2 3 4
Kilometres
1:50,000

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CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
REGIONAL BEDROCK GEOLOGY

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

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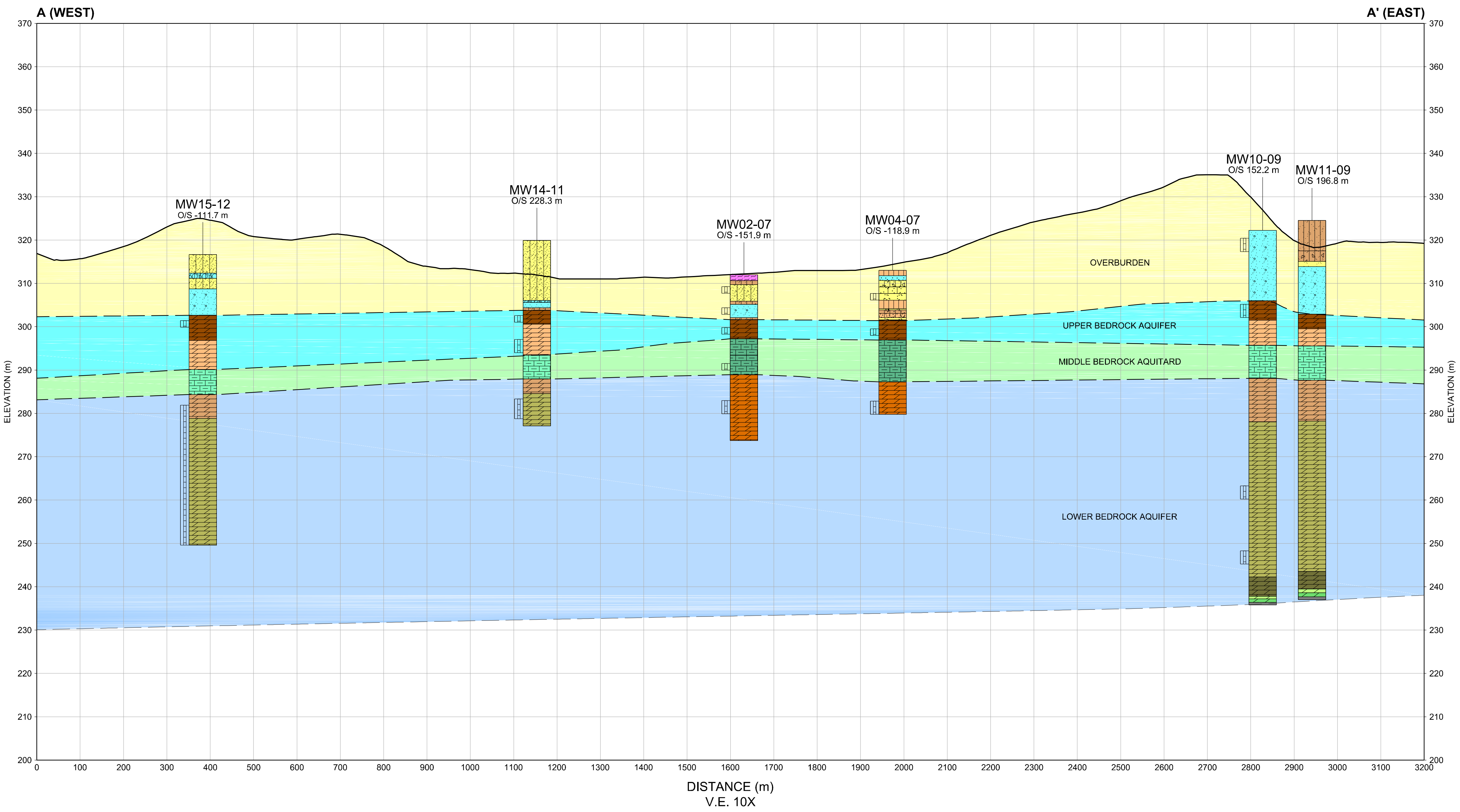

LEGEND

OVERBURDEN

- ▨ SAND
- ▨ SILTY SAND
- ▨ SILTY SAND TILL
- ▨ SANDY SILT
- ▨ SANDY SILT TILL
- ▨ SILT
- ▨ SILT TILL
- ▨ TOPSOIL
- ▨ SAND AND GRAVEL
- ▨ GRAVEL AND SILT

BEDROCK (OLD)

- ▨ GUELPH
- ▨ ERAMOSA
- ▨ AMABEL
- ▨ BEDROCK

BEDROCK (NEW)

- ▨ GUELPH
- ▨ REFORMATORY QUARRY
- ▨ VINEMOUNT
- ▨ GOAT ISLAND
- ▨ GASPORT
- ▨ IRONDEQUOIT
- ▨ ROCKWAY
- ▨ MERRITTON
- ▨ CABOT HEAD

0 25 50
1:1,000 VERTICAL METRES

0 250 500
1:10,000 HORIZONTAL METRES

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
CROSS SECTION A - A'

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-23
DESIGNED	
PREPARED	SW
REVIEWED	GP
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
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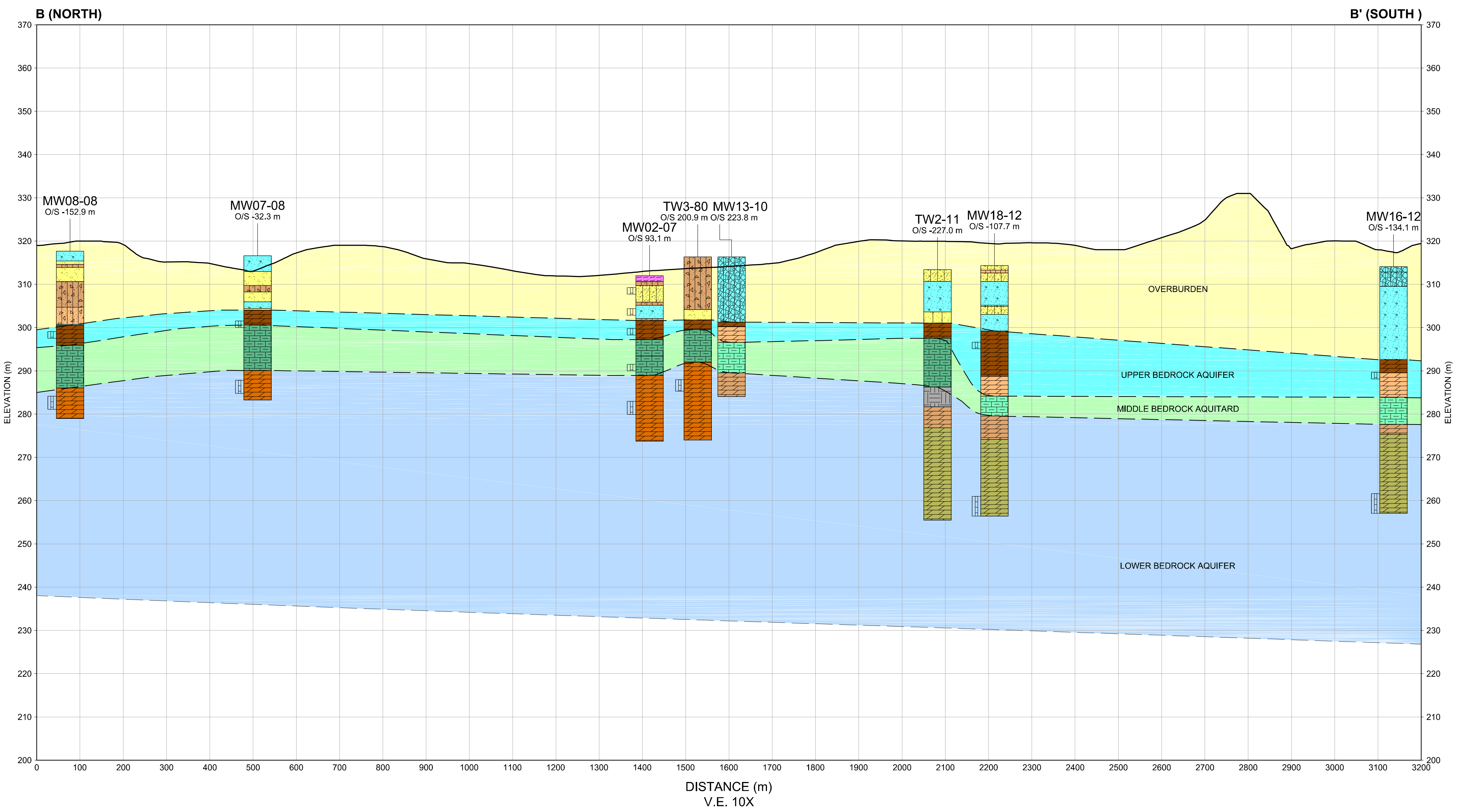


LEGEND

OVERBURDEN

- ▨ SAND
- ▨ SILTY SAND
- ▨ SILTY SAND TILL
- ▨ SANDY SILT
- ▨ SANDY SILT TILL
- ▨ SILT
- ▨ SILT TILL
- ▨ TOPSOIL
- ▨ SAND AND GRAVEL
- ▨ GRAVEL AND SILT

BEDROCK (OLD)

- ▨ GUELPH
- ▨ ERAMOSA
- ▨ AMABEL
- ▨ BEDROCK

BEDROCK (NEW)

- ▨ GUELPH
- ▨ REFORMATORY QUARRY
- ▨ VINEMOUNT
- ▨ GOAT ISLAND
- ▨ GASPORT
- ▨ IRONDEQUOIT
- ▨ ROCKWAY
- ▨ MERRITTON
- ▨ CABOT HEAD

0 25 50
1:1,000 VERTICAL METRES

0 250 500
1:10,000 HORIZONTAL METRES

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
CROSS SECTION B-B'

CONSULTANT

GOLDER

YYYY-MM-DD	2019-01-23
DESIGNED	
PREPARED	SW
REVIEWED	GP
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
13-1152-0250	1000	A	2.5

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

⊕	Production Well
⊕	Monitoring Well (Bedrock)
⊕	Monitoring Well (Overburden)
●	Private Well (Bedrock)
▲	Piezometer
■	Surface Water Station
■	Surface Water Temperature Station
—	Water Level Elevation Contour (Oct. 12, 2010)
—	Watercourse
▪▪▪	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)
BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
WATERCOURSES PRODUCED USING INFORMATION UNDER LICENSE WITH THE GRAND RIVER
CONSERVATION AUTHORITY © GRAND RIVER CONSERVATION AUTHORITY, 2014
PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
OVERBURDEN AND SURFACE WATER ELEVATIONS (NON-PUMPING CONDITION OCTOBER 2010)

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

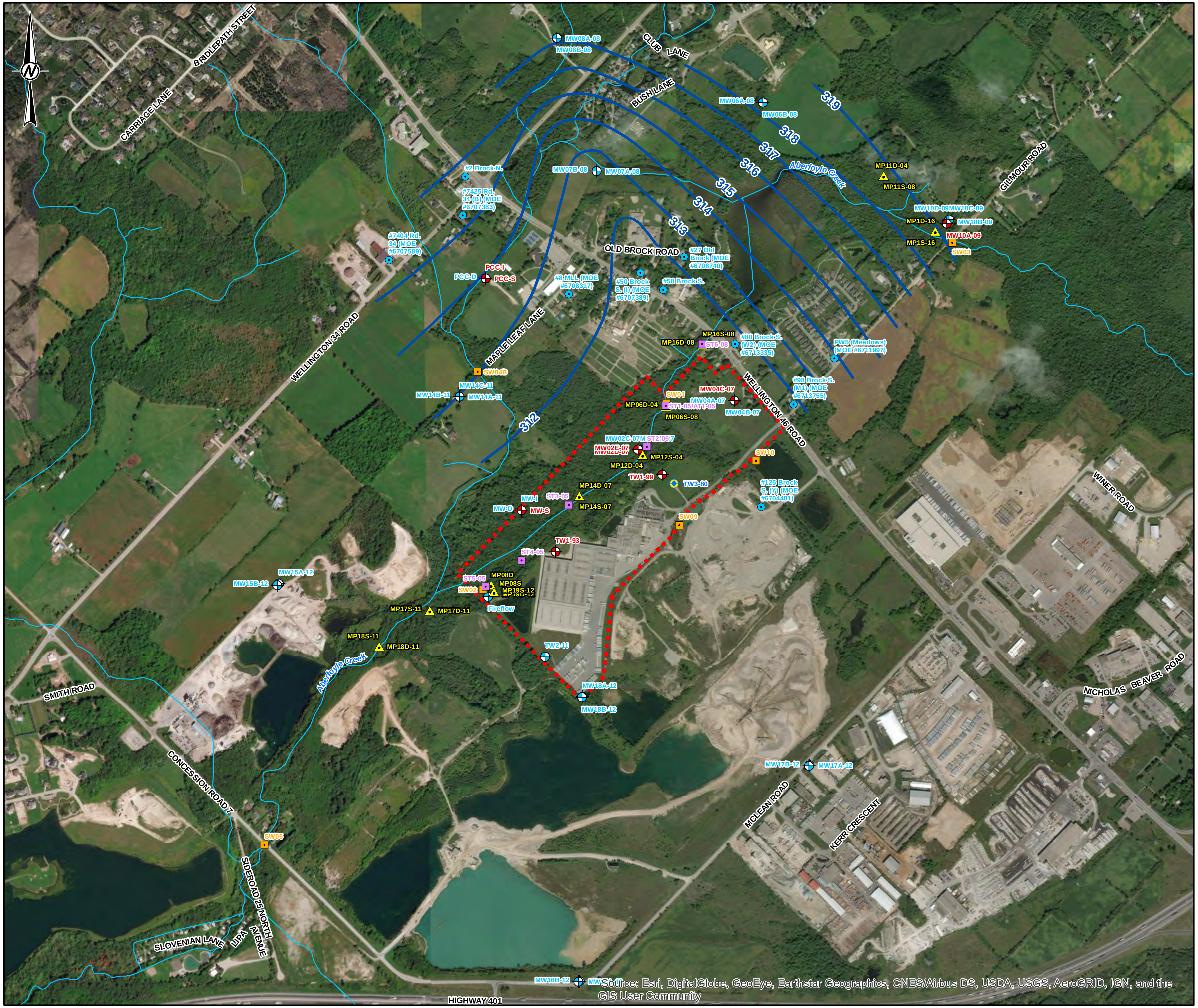
PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**2.6**

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0019_2018_Annual_Report\1311520250-0019-CH-0008.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

25mm

0



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

⊕	Monitoring Well (Bedrock)
⊕	Monitoring Well (Overburden)
⊕	Production Well
⊙	Private Well (Bedrock)
▲	Piezometer
■	Surface Water Station
■	Surface Water Temperature Station
—	Water Level Elevation Contour (Oct. 12, 2010)
—	Watercourse
▪▪▪	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
WATERCOURSES PRODUCED USING INFORMATION UNDER LICENSE WITH THE GRAND RIVER CONSERVATION AUTHORITY © GRAND RIVER CONSERVATION AUTHORITY, 2014
PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
POTENTIOMETRIC SURFACE OF UPPER BEDROCK AQUIFER (NON-PUMPING CONDITION OCTOBER 2010)

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-21
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**2.7**

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0019_2018_Annual_Report\1311520250-0019-CH-0009.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

0 25mm

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

⊕	Production Well
⊕	Monitoring Well (Bedrock)
⊕	Monitoring Well (Overburden)
⊙	Private Well (Bedrock)
▲	Piezometer
🟧	Surface Water Station
🟪	Surface Water Temperature Station
—	Water Level Elevation Contour (Oct. 12, 2010)
—	Watercourse
▪▪▪	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
WATERCOURSES PRODUCED USING INFORMATION UNDER LICENSE WITH THE GRAND RIVER
CONSERVATION AUTHORITY © GRAND RIVER CONSERVATION AUTHORITY, 2014
PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
POTENTIOMETRIC SURFACE OF LOWER BEDROCK AQUIFER (NON-PUMPING CONDITION OCTOBER 2010)

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**2.8**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

25mm

0

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0019_2018_Annual_Report\1311520250-0019-CH-0010.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

⊕	Production Well
⊕	Monitoring Well (Bedrock)
●	Private Well (Bedrock)
—	Watercourse
▨	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
2018 BEDROCK MONITORING LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**3.1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
25mm
0

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0019_2018_Annual_Report\1311520250-0019-CH-0011.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

⊕	Production Well
⊕	Monitoring Well (Overburden)
—	Watercourse
▨	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
2018 OVERBURDEN MONITORING LOCATIONS

CONSULTANT

GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	3.2

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0019_2018_Annual_Report\1311520250-0019-CH-0012.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

25mm

0

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

⊕	Production Well
▲	Piezometer
■	Surface Water Station
■	Surface Water Temperature Station
—	Watercourse
▪▪▪	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
2018 SURFACE WATER MONITORING LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**3.3**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm 0

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0019_2018_Annual_Report\1311520250-0019-CH-0013.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

Production Well

Well Status as of December 2018

Decommissioned

Watercourse

Property Boundary

0 100 200 300 400 500

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
UNUSED OR DECOMMISSIONED WELLS

CONSULTANT

GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**3.4**

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0019_2018_Annual_Report\1311520250-0019-CH-0014.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
25mm
0

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

⊕ Production Well
⊕ Monitoring Well (Bedrock)
⊕ Monitoring Well (Overburden)
● Private Well (Bedrock)
▲ Piezometer
🟧 Surface Water Station
🟪 Surface Water Temperature Station

Well Status as of December 2018

⊕ Decommissioned
— Watercourse
▪▪▪ Property Boundary

0 200 400 600 800
1:12,500 METERS

REFERENCE(S)
BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
WELL LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	3.5

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0019_2018_Annual_Report\1311520250-0019-CH-0015.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
25mm
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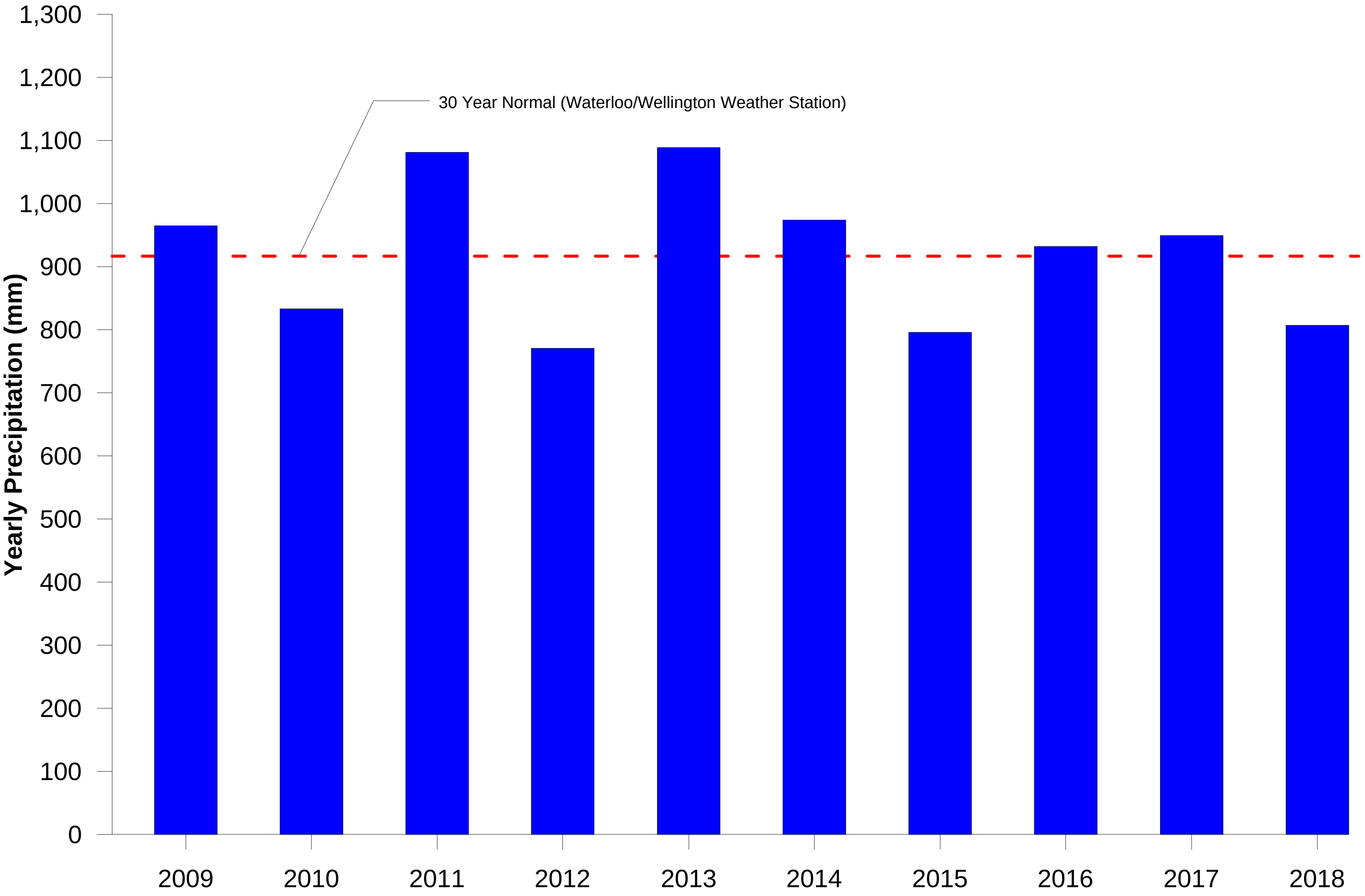


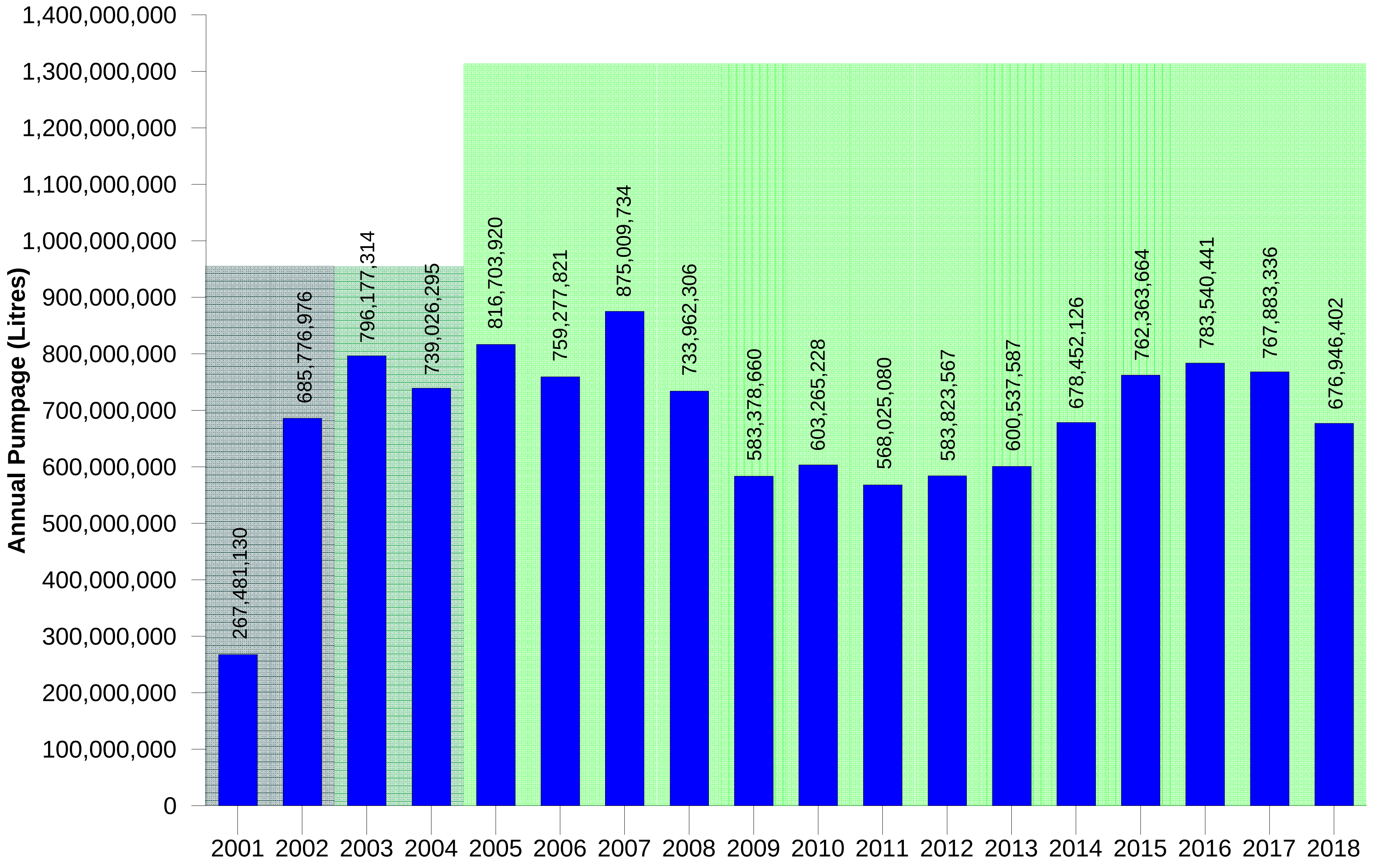
GOLDER

DATE	DECEMBER 2018
DESIGN	KS
REVIEW	GP
APPROVED	GP

PROJECT
NESTLE WATERS CANADA
Guelph, Ontario

TITLE
HISTORICAL YEARLY PRECIPITATION (2009 TO 2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	3.6



🟦 Annual Recorded Water Taking
▨ Annual Permitted Taking 2001 to 2002
▨ Annual Permitted Taking 2003 to 2004
🟩 Annual Permitted Taking 2005 to 2018

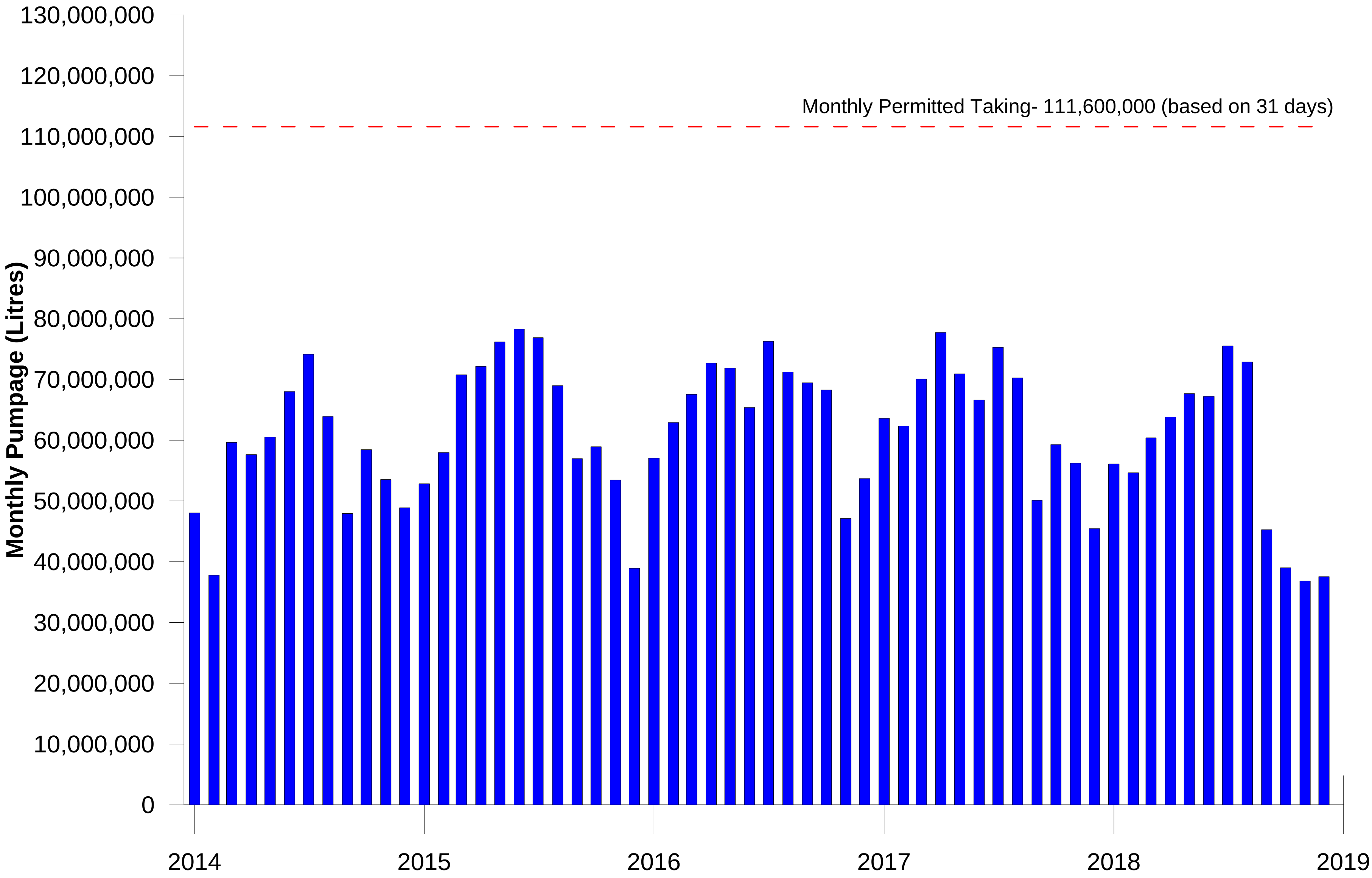
GOLDER

DATE	DECEMBER 2018
DESIGN	KS
REVIEW	GP
APPROVED	GP

PROJECT
NESTLE WATERS CANADA
Guelph, Ontario

TITLE
TW3-80 ANNUAL WATER TAKING (2001 TO 2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	4.1



PROJECT

NESTLE WATERS CANADA
Guelph, Ontario

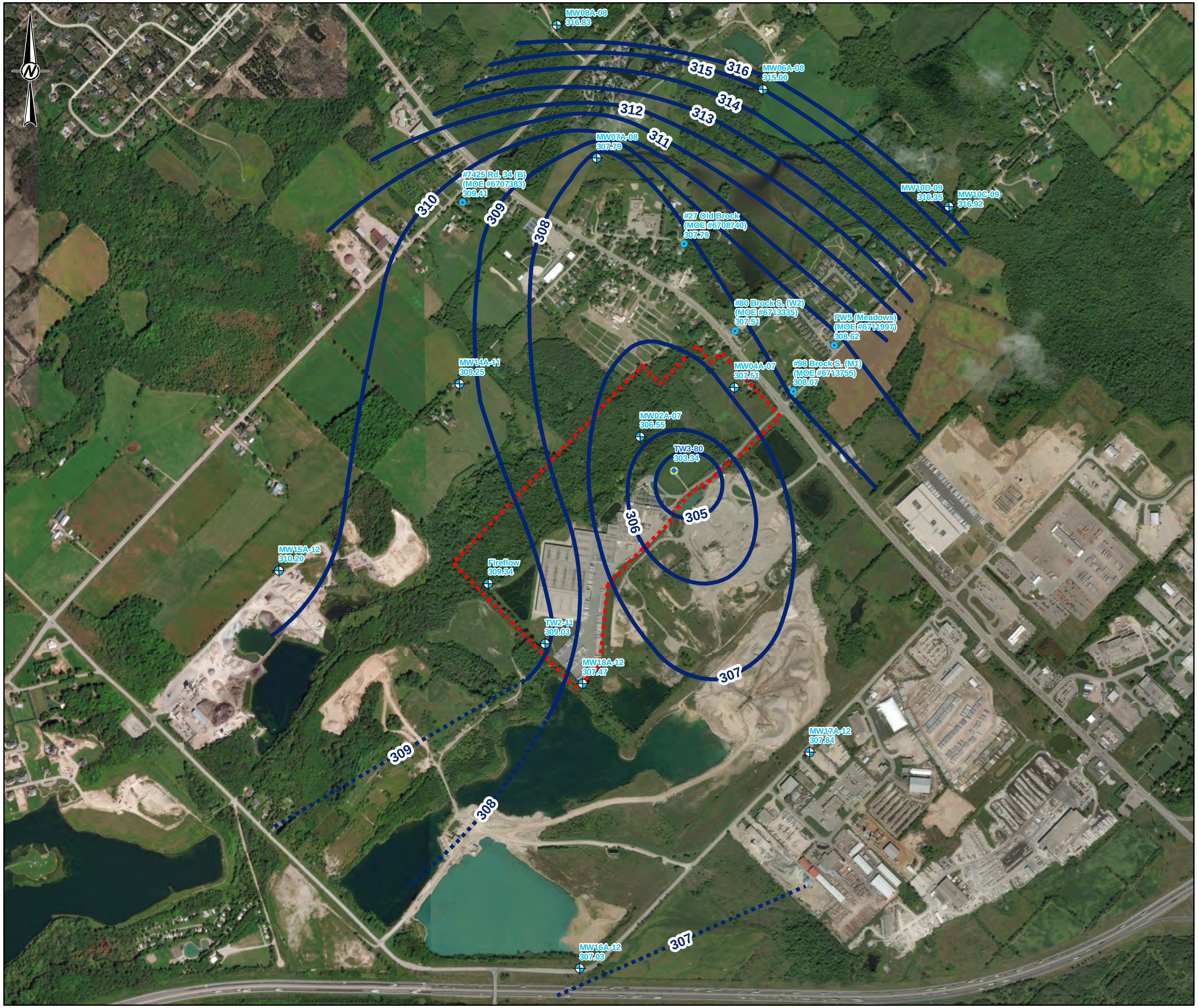
TITLE

TW3-80 MONTHLY WATER TAKING (2014 TO 2018)
2018 ANNUAL MONITORING REPORT

GOLDER

DATE	DECEMBER 2018
DESIGN	KS
REVIEW	GP
APPROVED	GP

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	4.2



LEGEND

⊕	Production Well
⊕	Monitoring Well (Bedrock)
⊙	Private Well (Bedrock)
—	Watercourse
311.5	Water Level Elevation (July 20, 2018)
—	Water Elevation Contour (masl)
▪▪▪	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
POTENTIOMETRIC SURFACE OF LOWER BEDROCK AQUIFER (JULY 2018)

CONSULTANT

GOLDER

YYYY-MM-DD	2019-01-29
DESIGNED	JMC
PREPARED	PR
REVIEWED	GP
APPROVED	JP

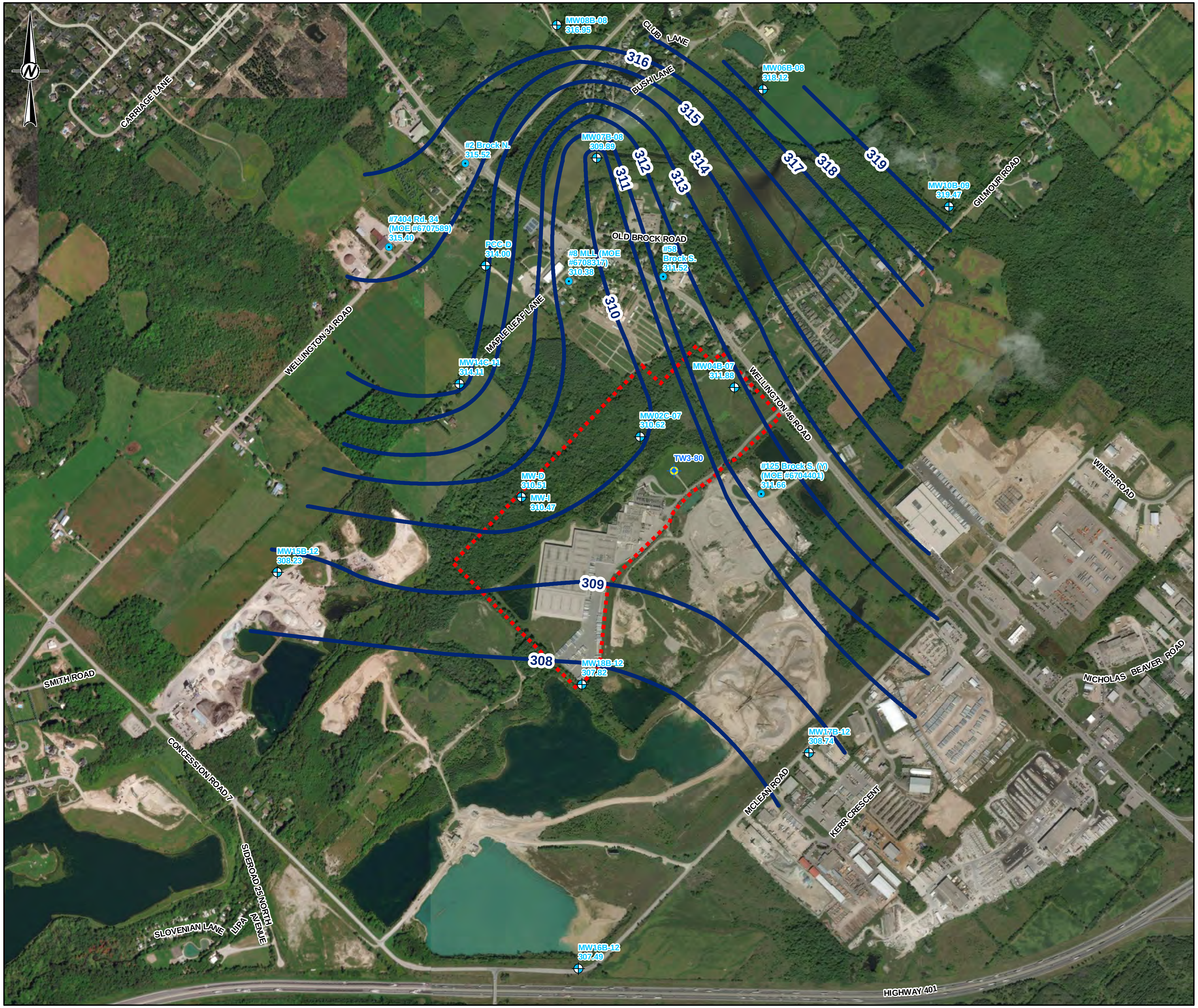
PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**4.3**

S:\Clients\Nestle\Aberfoyle\99 PROJ\1311520250 Monitoring\40 PROD\0019 2018 Annual Report\1311520250-0019-CH-0016.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

25mm

0



LEGEND

⊕	Production Well
⊕	Monitoring Well (Bedrock)
●	Private Well (Bedrock)
—	Watercourse
311.5	Water Level Elevation (July 20, 2018)
—	Water Elevation Contour (masl)
▨	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
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PROJECTION: UTM NAD83 ZONE 17
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
POTENTIOMETRIC SURFACE OF UPPER BEDROCK AQUIFER (JULY 2018)

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**4.4**

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0013_2017_Annual_Report_Final\1311520250-0013-CH-0018.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
25mm
0

LEGEND

⊕	Production Well
⊕	Monitoring Well (Overburden)
―	Watercourse
311.4	Water Level Elevation (July 20, 2018)
━	Water Elevation Contour (masl)
▨	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
POTENTIOMETRIC SURFACE OF OVERBURDEN (JULY 2018)

CONSULTANT

GOLDER

YYYY-MM-DD	2019-01-29
DESIGNED	JMC
PREPARED	PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**4.5**

25mm

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

0

S:\Clients\Nestle\Aberfoyle\99_PROJ\1311520250_Monitoring\40_PROD\0013_2017_Annual_Report_Final\1311520250-0013-CH-0019.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

⊕	Production Well
▲	Piezometer
■	Surface Water Station
—	Watercourse
311.5	Water Level Elevation (July 20, 2018)
▪▪▪	Property Boundary

0 200 400 600 800 1,000

1:12,500 METERS

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
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PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
SURFACE WATER ELEVATIONS

CONSULTANT

GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	**4.6**

APPENDIX A

Permit To Take Water Number 1381-95ATPY

Ministry of the Environment
West-Central Region
Technical Support Section
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820
Tel: (905) 521-7640

Ministère de l'Environnement
Direction régionale du Centre-Ouest
Secteur du Soutien Technique
12e étage
119 rue King W
Hamilton ON L8P 4Y7
Télécopieur: (905)521-7820
Tél:(905) 521-7640

December 19, 2013

Nestle Canada Inc.
101 Brock Road S.
Puslinch, Ontario
N1H 6H9

Dear Sir/Madam:

RE: Lot 23, Concession 7
Geographic Township of Puslinch
City of Guelph
Wellington County
Permit Number 1381-95ATPY

Please find attached a Permit to Take Water which authorizes the withdrawal of water in accordance with the application for this Permit to Take Water, dated December 3, 2012 and signed by Don DeMarco.

This Permit expires on July 31, 2016. Authorized rates and amounts are indicated on Table A. This Permit cancels and replaces Permit Number 1763-8FXR29, issued on April 29, 2011.

Ontario Regulation 387/04 (Water Taking) requires all water takers to report daily water taking amounts to the Water Taking Reporting System (WTRS) electronic database: http://www.ene.gov.on.ca/envision/water/pttw.htm . Daily water taking must be reported on a calendar year basis. If no water is taken, then a "no taking" report must be entered. Please consult the Regulation and Section 4 of this Permit for monitoring requirements.

If you have questions about reporting requirements, please call the WTRS Help Desk at 416-235-6322 (toll free: 1-877-344-2011) or by email, WTRSHelpdesk@ontario.ca . It is preferred that you submit your data directly and electronically to the WTRS. Where this is impracticable, please use the Water Taking Submission Form *(included as Appendix C of the Technical Bulletin: Permit To Take Water (PTTW)-Monitoring and Reporting of Water Takings),* which can be downloaded from the above website, and fax your completed forms to 416-235-6549 or mail them to: Water User Reporting Section, 125 Resources Rd. Toronto, ON M9P 3V6.

Please also note Condition 1.4 specifically indicates that this Permit is not transferable to another party. Any queries regarding a change in owner/operator should be made to the Permit to Take Water Evaluator at the above address.

Take notice that in issuing this Permit, terms and conditions pertaining to the taking of water and to the results of the taking have been imposed. The terms and conditions have been designed to allow for the development of water resources, while providing reasonable protection to existing water uses and users.

Yours truly,

Carl Slater

Carl Slater
Director, Section 34, Ontario Water Resources Act
West Central Region

File Storage Number: AP28 PUNE

Ministry of the Environment
Ministère de l'Environnement

AMENDED PERMIT TO TAKE WATER

Ground Water
NUMBER 1381-95ATPY

Pursuant to Section 34 of the Ontario Water Resources Act, R.S.O. 1990 this Permit To Take Water is hereby issued to:

Nestle Canada Inc.
101 Brock Road S.
Puslinch, Ontario N1H 6H9

For the water taking from: Two bedrock wells (TW3-80 and TW2-11)

Located at: Lot 23, Concession 7, Geographic Township of Puslinch
Guelph, County of Wellington

For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:

DEFINITIONS

(a) "Director" means any person appointed in writing as a Director pursuant to section 5 of the OWRA for the purposes of section 34, OWRA.

(b) "Provincial Officer" means any person designated in writing by the Minister as a Provincial Officer pursuant to section 5 of the OWRA.

(c) "Ministry" means Ontario Ministry of the Environment.

(d) "District Office" means the Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 1381-95ATPY including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means Nestle Canada Inc..

(g) "OWRA " means the *Ontario Water Resources Act*, R.S.O. 1990, c. O. 40, as amended.

You are hereby notified that this Permit is issued subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. Compliance with Permit

1.1 Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, dated December 3, 2012 and signed by Don DeMarco, and all Schedules included in this Permit.

1.2 The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.

1.3 Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.

1.4 This Permit is not transferable to another person.

1.5 This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.

1.6 The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.

1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

2. General Conditions and Interpretation

2.1 Inspections
The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the OWRA, the *Environmental Protection Act*, R.S.O. 1990, the *Pesticides Act*, R.S.O. 1990, or the *Safe Drinking Water Act,* S. O. 2002.

2.2 Other Approvals
The issuance of, and compliance with this Permit, does not:

(a) relieve the Permit Holder or any other person from any obligation to comply with any other applicable legal requirements, including the provisions of the *Ontario Water Resources Act*, and the *Environmental Protection Act*, and any regulations made thereunder; or

(b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority to require certain steps be taken or to require the Permit Holder to furnish any further information related to this Permit.

2.3 Information
The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

(a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

2.4 Rights of Action
The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

2.5 Severability
The requirements of this Permit are severable. If any requirements of this Permit, or the application of any requirements of this Permit to any circumstance, is held invalid or unenforceable, the application of such requirements to other circumstances and the remainder of this Permit shall not be affected thereby.

2.6 Conflicts
Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

3. Water Takings Authorized by This Permit

3.1 **Expiry**

This Permit expires on **July 31, 2016**. No water shall be taken under authority of this Permit after the expiry date.

3.2 Amounts of Taking Permitted
The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

Table A

	Source Name / Description:	Source: Type:	Taking Specific Purpose:	Taking Major Category:	Max. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	Well TW3-80	Well Drilled	Bottled Water	Commercial	2,500	24	3,600,000	365	17 569053 4812797
2	Well TW2-11	Well Drilled	Other - Miscellaneous	Miscellaneous	475	24	684,000	365	17 568638 4812238
						Total Taking:	3,600,000		

3.3 For greater certainty, Source Name Well TW2-11 in Table A shall not be used for bottled water and shall be used for miscellaneous purposes such as providing water to the on site pond for fire fighting purposes.

3.4 For greater certainty, the total amount of water taken for the combination of sources in Table A shall not exceed 3,600,000 litres per day.

4. Monitoring

4.1 Under section 9 of O. Reg. 387/04, and as authorized by subsection 34(6) of the *Ontario Water Resources Act* , the Permit Holder shall, on each day water is taken under the authorization of this Permit, record the date, the volume of water taken on that date and the rate at which it was taken. The daily volume of water taken shall be measured by a flow meter or calculated in accordance with the method described in the application for this Permit, or as otherwise accepted by the Director. A separate record shall be maintained for each source. The Permit Holder shall keep all records required by this condition current and available at or near the site of the taking and shall produce the records immediately for inspection by a Provincial Officer upon his or her request. The Permit Holder, unless otherwise required by the Director, shall submit, on or before March 31st in every year, the records required by this condition to the ministry's Water Taking Reporting System.

4.2 The Permit Holder shall establish the following groundwater monitoring program for the duration of the Permit:

Bedrock Wells

(i) Continuous monitoring of groundwater levels in the following wells:

- TW3-80 (67-07290)
- MW2A/B/C-07
- MW4A/B-07
- Fireflow (67-14195)
- MW-D (67-11936)
- MW1A-04
- PCC-D (67-11650)
- MW10B/C/D-09
- MW6A/B-08

- MW7A/B-08
- MW8A/B-08
- TW2-11
- MW14A/B/C-11
- MW15A/B-12
- MW16A/B-12
- MW17A/B-12
- MW18A/B-12

(ii) Monthly monitoring of groundwater levels at the following private wells (if the owner permits):

- Private well MOE WWR #67-08740
- Private well at 2 Brock Road
- Private well MOE WWR #67-07589
- Private well MOE WWR #67-08317 also known as 8 Maple Lane Well
- Private well at 58 Brock Road
- Private well "B"
- Private well "M1"
- Private well "Y" MOE WWR #67-09669
- Private well "J"
- Meadows of Aberfoyle well #PW5 (67-1197)
- Private Well "W2" (67-13335)

Overburden Wells

(iii) Continuous monitoring of groundwater levels in the following wells:

- TW1-93 (67-11283)
- TW1-99 (67-12929)
- MW-S/I
- PCC S/I
- MW2D/E-07
- MW4C-07
- MW10A-09

4.3 The Permit Holder shall establish the following surface water monitoring program for the duration of the Permit:

Surface Water Levels

(i) Continuous monitoring of water levels at the following locations:

- SW1
- SW2

(ii) Monthly monitoring of water levels at the following locations:

- SW3
- SW4
- SW5
- SW9
- SW10

Stream Flow

(iii) Monthly monitoring of flow, encompassing a range of flow conditions, and the development of a stage-discharge curve at the following surface water locations:

- SW1
- SW2

Multi-level Piezometers

(iv) Continuous monitoring of multi-level piezometers at the following locations:

- MP16S/D-08
- MP6S-08/D -04
- MP12S/D-04
- MP14S/D-07
- MP8S/D-04
- MP11S-08/D-04
- MP17S/D-12
- MP18S/D-12
- MP19S/D-12

Temperature

(v) Continuous monitoring of temperature at the sediment-water interface at the following locations:

- ST6-08
- ST1-05/AT-01
- ST2-05
- ST3-05
- ST4-05
- ST5-05

4.4 The Permit Holder shall undertake wetland monitoring and redd surveys as recommended in "2010 Biological Monitoring Program Final Report" by C. Portt and Associates dated January 28, 2011. Results from the wetland and redd surveys shall be submitted to the Director as a part of the annual monitoring report required under Condition 4.8.

4.5 The Permit Holder shall determine the total amount of water taken for each calendar month. If the monthly amount exceeds 83,700,000 L, the Permit Holder shall submit multi-level piezometer data in a letter report to the Director within 30 days of the end of the calendar month for the following monitoring locations:

- MP6S-08/D-04
- MP12S/D-04
- MP11S-08/D-04
- MW2-D/E

4.6 Continuous monitoring shall be datalogged at 60 minute intervals and downloaded monthly, however, the daily minimum water levels can be used to evaluate the water level variation with respect to pumping to improve the data handling and presentation. Monthly groundwater monitoring shall be conducted in the same week each calendar month.

4.7 The Permit Holder shall identify to the Director in writing, within 15 days of any monthly monitoring event, any monitoring locations identified in Conditions 4.2 and 4.3 which become inaccessible and/or abandoned along with a recommendation for replacement monitoring locations. Upon approval of the Director the monitoring program shall be appropriately modified.

4.8 The Permit Holder shall submit to the Director, an annual monitoring report which present and interprets the monitoring data to be collected under the Terms and Conditions of this Permit. This report shall be prepared, signed and stamped by a licensed professional geoscientist or a licensed professional engineer specializing in hydrogeology who shall take responsibility for its accuracy. Surface water impact assessment shall be conducted by a qualified surface water scientist who shall co-sign the report as responsibility for the accuracy of the surface water portion. The report shall be submitted to the Director by March 31 of each calendar year and include monitoring data for the 12 month period ending December 31 of the previous year.

4.9 The Permit Holder shall submit to the Director as part of the annual monitoring report, details of the bottling operations involved with water taking under this Permit to Take Water to indicate compliance with OWRA Section 34.3. These details shall include:

- Location and name of the facilities to which water is delivered in bulk containers greater than 20 L from this source,
- If the bulk water is containerized at the receiving location,
- The size of container(s) into which the water is transferred at the receiving location, and
- Total volume of the water transported in bulk in each calendar year to each remote facility.

5. Impacts of the Water Taking

5.1 Notification

The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

5.2 For Groundwater Takings

If the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.

2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.

3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written notice served upon me, the Environmental Review Tribunal and the Environmental Commissioner, ***Environmental Bill of Rights****, R.S.O. 1993, Chapter 28, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 101 of the Ontario Water Resources Act, as amended provides that the Notice requiring a hearing shall state:*

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
7. The name of the Director;
8. The municipality within which the works are located;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5
Fax: (416) 314-4506
Email:
ERTTribunalsecretary@ontario.ca

AND

The Environmental Commissioner
1075 Bay Street
6th Floor, Suite 605
Toronto, Ontario M5S 2W5

AND

The Director, Section 34
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7
Fax: (905)521-7820

Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal:

by telephone at (416) 314-4600 ***by fax at (416) 314-4506*** ***by e-mail at www.ert.gov.on.ca***

This instrument is subject to Section 38 of the **Environmental Bill of Rights** *that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek to appeal for 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry, you can determine when the leave to appeal period ends.*

This Permit cancels and replaces Permit Number 1763-8FXR29, issued on 2011/04/29.

Dated at Hamilton this 19th day of December, 2013.

Carl Slater

Carl Slater
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990

Schedule A

This Schedule “A” forms part of Permit To Take Water 1381-95ATPY, dated December 19, 2013.

Ministry of the Environment and Climate Change
West Central Region

119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7640
Fax: 905 521-7820

Ministère de l'Environnement et de l'Action en matière de changement climatique
Direction régionale du Centre-Ouest

119 rue King Ouest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél. : 905 521-7640
Téléc. : 905 521-7820

Ontario

February 5, 2015

Nestle Canada Inc.
101 Brock Road S.
Puslinch, Ontario
N1H 6H9

Attention: Ms. Andreanne Simard

Dear Ms. Simard:

RE: Request for short term pumping rate change for well sanitization
Permit to Take Water 1381-95ATPY

NOTICE

Pursuant to s. 100, Ontario Water Resources Act, R.S.O. 1990, c. O.40 as amended, I am issuing notice that, as Director of Section 34 of the Ontario Water Resources Act, I am exercising my discretion to amend Permit to Take Water 1381-95ATPY condition 3.5. All other terms and conditions of Permit to Take Water 1381-95ATPY shall continue in force.

In an email dated November 27, 2014, Ms. Simard, requested the sanitation Notice issued on December 20, 2013 be applicable for all years remaining on the permit.

This Notice supersedes the Notice issued December 20, 2013. Condition 3.5 is hereby revoked and replaced as follows:

3.5 Notwithstanding Table A, the maximum pumping of water extracted from Source TW3-80 may be increased to 2575 litres per minute (680 U.S. gallons per minute) annually, or as needed, for the sole purpose of sanitization of the well. The maximum amount of water taken shall not exceed 3,600,000 litres/day.

This Notice now forms part of the current permit and must be attached to the original Permit to Take Water, if available. If the original is no longer available, this letter must be kept attached to a certified copy of the Permit to Take Water.

Any change in circumstances related to this permit should be reported promptly to a Director.

It is your responsibility to ensure that any person taking water under the authority of this permit is familiar with and complies with the terms and conditions.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written notice served upon me, the Environmental Review Tribunal and the Environmental Commissioner, ***Environmental Bill of Rights,*** *R.S.O. 1993, Chapter 28, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 101 of the Ontario Water Resources Act, as amended provides that the Notice requiring a hearing shall state:*

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
7. The name of the Director;
8. The municipality within which the works are located;

This notice must be served upon:

The Secretary *Environmental Review Tribunal* *2300 Yonge Street, Suite 1700* *Toronto, Ontario M4P 1E4*	*AND*	*The Director, Section 34* *Ministry of the Environment* *12th Floor* *119 King St W* *Hamilton ON L8P 4Y7* *Fax: (905)521-7820*

Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal:

by telephone at (416) 314-4600 ***by fax at (416) 314-4506*** ***by e-mail at www.ert.gov.on.ca***

Yours truly,

Daniel

Dan Dobrin

Director, Section 34, Ontario Water Resources Act
West Central Region

File Storage Number: AP28 PUNE

APPENDIX B

TW3-80 Borehole Log

Attachment 2

Project Name: ABERFOYLE FISHERIES
Job No. 979-653
Client: CUSTOM AGGREGATE
Borehole Type: 12" Ø Cable Tool
Location: Pit No. 1, Aberfoyle

Borehole No. TW3-80
Date Completed April 14/80
Geologist/Engineer A.V.N.
Elevation 1040.90, top of casing

Profile			Sample			Penetration Test Blows/Foot	Piezometer or Standpipe Installation
Depth (Elev.)	Stratigraphy	Description & Remarks	Number	Type	Blows/Foot	20 40 60 80	
0		(316.7 m amsl)					
(1039)		Brown clayey-silt till containing some sand and small gravel (304.5 m amsl)					
40							12" Ø steel casing to rock grouted to 20' from surface
45		fine - medium sand (303.0 m amsl)					
48		fine sand matrix w/sand and gravel (302.1 m amsl)					
		Eramosa member of the Guelph formation * Black dolomite slightly crystalline solid (292.3 m amsl)					12" Ø Drive shoe seated into rock
80 (959)		Saw Wiarton formation of the Amabel Group light - medium grey dolomite slightly crystalline fractured water bearing zone (274.3 m amsl)					12" Ø Open hole in rock
139 (900)		N.B. Static level, 11.42 ft. below top of casing on April 15/80 ELEV. = 1029.48					

FIGURE 2.3

* Based on driller's log, Guelph Fm. interpreted to occur from El. 302.1 to 299.9 m amsl.
Eramosa from 299.9 to 292.3 m amsl.

Conestoga - Rovers & Associates

Ministry of the Environment
Ontario

Tw #3/80

The Ontario Water Resources Act

WATER WELL RECORD

19/80

MOE # 67-07290

Wellington	Puslinch	Con 7	23, 2
Elliott, Mr. John	R.R. #3, Guelph, Ontario.		11 Apr. 80

LOG OF OVERBURDEN AND BEDROCK MATERIALS

Brown	Clay	Stones		0	20
Brown	" sand	Gravels		20	47
M. Br.		Rock		47	55
D. Br.		Rock		55	75
Black		Rock		75	85
M. Br.		Rock		85	95
Grey & Br.		Rock		95	135
D. Grey		Rock		135	139
	Tw #3/80	Total Depth			139

12" shoe

WATER RECORD

55	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
93	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
130'	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

CASING & OPEN HOLE RECORD

12"	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	.250	0	48
12	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☒ OPEN HOLE		48	139
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

PLUGGING & SEALING RECORD

102	118	Cement
118	130	Bentonite Grout
130	139	Limestone Gravel

PUMPING TEST

☒ PUMP ☐ BAILER

1200 GPM

24 HOURS

11' 6"

50 FEET

☒ RECOVERY

11'6"

☒ CLEAR ☐ CLOUDY

☐ SHALLOW ☒ DEEP

100 FEET

1200 GPM

FINAL STATUS OF WELL

☒ WATER SUPPLY
☐ OBSERVATION WELL
☐ TEST HOLE
☐ RECHARGE WELL
☐ ABANDONED, INSUFFICIENT SUPPLY
☐ ABANDONED, POOR QUALITY
☐ UNFINISHED

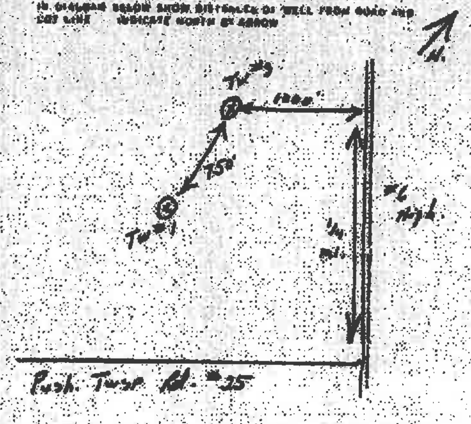
WATER USE

☐ DOMESTIC
☐ STOCK
☐ IRRIGATION
☐ INDUSTRIAL
☐ OTHER
☒ COMMERCIAL
☐ MUNICIPAL
☐ PUBLIC SUPPLY
☐ COOLING OR AIR CONDITIONING
☐ NOT USED

METHOD OF DRILLING

☒ CABLE TOOL
☐ ROTARY (CONVENTIONAL)
☐ ROTARY (REVERSE)
☐ ROTARY (AIR)
☐ AIR PERCUSSION
☐ BORING
☐ DIAMOND
☐ JETTING
☐ DRIVING

LOCATION OF WELL



CONTRACTOR

Graham Well Drilling Ltd.	2336
Guelph, Ont.	
J. Hawkins 22w	
	30 Apr. 80

OFFICE USE ONLY

CONTRACTOR'S COPY

APPENDIX C

TW3-80 Water Taking

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Jan-18	181,993	127	688,918	481
2-Jan-18	459,074	322	1,737,782	1,218
3-Jan-18	523,126	371	1,980,246	1,403
4-Jan-18	513,205	356	1,942,689	1,349
5-Jan-18	611,752	422	2,315,733	1,596
6-Jan-18	533,505	366	2,019,536	1,387
7-Jan-18	450,242	313	1,704,352	1,185
8-Jan-18	387,960	263	1,468,586	996
9-Jan-18	462,373	320	1,750,273	1,211
10-Jan-18	354,393	248	1,341,521	939
11-Jan-18	437,120	305	1,654,680	1,155
12-Jan-18	620,456	431	2,348,680	1,632
13-Jan-18	246,997	170	934,984	645
14-Jan-18	305,035	213	1,154,683	807
15-Jan-18	405,353	282	1,534,426	1,068
16-Jan-18	558,438	388	2,113,917	1,468
17-Jan-18	490,459	346	1,856,588	1,311
18-Jan-18	569,223	399	2,154,743	1,509
19-Jan-18	589,986	409	2,233,338	1,548
20-Jan-18	601,456	418	2,276,756	1,584
21-Jan-18	497,213	347	1,882,154	1,314
22-Jan-18	591,387	410	2,238,643	1,553
23-Jan-18	553,172	385	2,093,984	1,457
24-Jan-18	543,717	377	2,058,193	1,425
25-Jan-18	503,412	353	1,905,619	1,336
26-Jan-18	578,977	403	2,191,665	1,524
27-Jan-18	551,358	386	2,087,117	1,461
28-Jan-18	504,099	333	1,908,223	1,261
29-Jan-18	293,923	205	1,112,621	776
30-Jan-18	448,028	312	1,695,970	1,183
31-Jan-18	456,245	318	1,727,075	1,205

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Feb-18	555,507	387	2,102,823	1,466
2-Feb-18	495,442	348	1,875,451	1,317
3-Feb-18	542,749	379	2,054,529	1,434
4-Feb-18	497,336	347	1,882,621	1,314
5-Feb-18	478,677	334	1,811,990	1,265
6-Feb-18	556,196	389	2,105,428	1,472
7-Feb-18	592,883	414	2,244,305	1,568
8-Feb-18	563,413	393	2,132,750	1,488
9-Feb-18	529,592	370	2,004,722	1,400
10-Feb-18	555,562	388	2,103,030	1,469
11-Feb-18	565,332	395	2,140,014	1,495
12-Feb-18	497,591	347	1,883,585	1,315
13-Feb-18	538,183	376	2,037,245	1,422
14-Feb-18	432,670	302	1,637,833	1,143
15-Feb-18	433,992	303	1,642,838	1,146
16-Feb-18	369,996	259	1,400,586	980
17-Feb-18	431,765	301	1,634,408	1,138
18-Feb-18	514,014	354	1,945,752	1,341
19-Feb-18	468,077	322	1,771,864	1,217
20-Feb-18	502,420	350	1,901,865	1,327
21-Feb-18	440,651	307	1,668,046	1,162
22-Feb-18	551,779	384	2,088,711	1,452
23-Feb-18	472,988	330	1,790,455	1,250
24-Feb-18	576,721	400	2,183,124	1,514
25-Feb-18	576,814	400	2,183,477	1,514
26-Feb-18	533,527	372	2,019,619	1,407
27-Feb-18	573,610	398	2,171,349	1,507
28-Feb-18	588,014	411	2,225,873	1,554

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Mar-18	510,561	356	1,932,682	1,348
2-Mar-18	539,576	377	2,042,518	1,425
3-Mar-18	587,906	412	2,225,466	1,558
4-Mar-18	206,512	218	781,732	827
5-Mar-18	475,825	332	1,801,191	1,258
6-Mar-18	525,390	367	1,988,817	1,389
7-Mar-18	470,751	329	1,781,985	1,247
8-Mar-18	547,311	382	2,071,797	1,447
9-Mar-18	561,956	392	2,127,233	1,485
10-Mar-18	547,833	400	2,073,771	1,513
11-Mar-18	501,081	350	1,896,798	1,326
12-Mar-18	400,581	279	1,516,364	1,055
13-Mar-18	421,371	295	1,595,061	1,115
14-Mar-18	395,880	277	1,498,567	1,050
15-Mar-18	518,957	362	1,964,464	1,372
16-Mar-18	403,871	282	1,528,818	1,067
17-Mar-18	543,581	379	2,057,675	1,436
18-Mar-18	466,183	326	1,764,694	1,233
19-Mar-18	578,254	404	2,188,930	1,529
20-Mar-18	594,726	414	2,251,281	1,566
21-Mar-18	487,722	341	1,846,229	1,292
22-Mar-18	533,970	373	2,021,297	1,413
23-Mar-18	587,526	409	2,224,028	1,549
24-Mar-18	523,374	366	1,981,184	1,386
25-Mar-18	544,640	381	2,061,687	1,441
26-Mar-18	563,389	394	2,132,657	1,490
27-Mar-18	611,295	428	2,314,001	1,621
28-Mar-18	591,719	411	2,239,898	1,556
29-Mar-18	570,546	396	2,159,751	1,500
30-Mar-18	578,304	402	2,189,118	1,522
31-Mar-18	567,807	396	2,149,384	1,500

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Apr-18	617,792	431	2,338,594	1,632
2-Apr-18	576,415	408	2,181,966	1,545
3-Apr-18	670,363	469	2,537,600	1,776
4-Apr-18	648,302	451	2,454,089	1,706
5-Apr-18	722,332	500	2,734,322	1,893
6-Apr-18	659,384	458	2,496,039	1,733
7-Apr-18	613,942	427	2,324,021	1,615
8-Apr-18	590,459	414	2,235,128	1,566
9-Apr-18	616,153	429	2,332,393	1,624
10-Apr-18	659,287	458	2,495,671	1,733
11-Apr-18	605,489	420	2,292,025	1,588
12-Apr-18	571,703	400	2,164,129	1,515
13-Apr-18	639,172	445	2,419,526	1,684
14-Apr-18	129,152	89	488,893	336
15-Apr-18	161,955	114	613,068	433
16-Apr-18	568,302	398	2,151,257	1,505
17-Apr-18	664,616	460	2,515,845	1,742
18-Apr-18	656,025	454	2,483,323	1,720
19-Apr-18	694,914	482	2,630,533	1,823
20-Apr-18	680,180	472	2,574,759	1,786
21-Apr-18	686,390	477	2,598,268	1,804
22-Apr-18	671,214	466	2,540,820	1,765
23-Apr-18	547,572	381	2,072,785	1,442
24-Apr-18	620,475	430	2,348,753	1,629
25-Apr-18	583,594	403	2,209,142	1,527
26-Apr-18	422,478	301	1,599,251	1,139
27-Apr-18	430,097	299	1,628,094	1,132
28-Apr-18	416,419	290	1,576,316	1,098
29-Apr-18	385,762	267	1,460,268	1,009
30-Apr-18	342,419	241	1,296,196	912

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-May-18	512,748	358	1,940,960	1,356
2-May-18	600,016	421	2,271,308	1,592
3-May-18	648,039	450	2,453,093	1,705
4-May-18	701,657	493	2,656,060	1,866
5-May-18	712,860	501	2,698,468	1,895
6-May-18	741,967	520	2,808,648	1,969
7-May-18	526,931	369	1,994,650	1,396
8-May-18	701,125	492	2,654,045	1,863
9-May-18	632,923	443	2,395,872	1,677
10-May-18	661,832	464	2,505,306	1,757
11-May-18	621,695	435	2,353,371	1,646
12-May-18	543,097	379	2,055,846	1,434
13-May-18	592,969	415	2,244,630	1,569
14-May-18	630,166	442	2,385,437	1,672
15-May-18	599,089	419	2,267,798	1,585
16-May-18	594,763	416	2,251,422	1,574
17-May-18	607,422	423	2,299,342	1,601
18-May-18	517,815	360	1,960,144	1,364
19-May-18	558,003	392	2,112,272	1,484
20-May-18	548,194	383	2,075,139	1,451
21-May-18	441,093	308	1,669,719	1,165
22-May-18	545,637	380	2,065,458	1,439
23-May-18	652,378	459	2,469,519	1,739
24-May-18	588,902	410	2,229,235	1,554
25-May-18	367,651	239	1,391,709	903
26-May-18	488,621	340	1,849,631	1,289
27-May-18	486,098	337	1,840,079	1,276
28-May-18	526,945	370	1,994,703	1,401
29-May-18	530,227	361	2,007,125	1,368
30-May-18	529,128	369	2,002,965	1,397
31-May-18	469,385	327	1,776,815	1,239

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Jun-18	515,466	357	1,951,251	1,351
2-Jun-18	454,259	317	1,719,557	1,201
3-Jun-18	518,913	363	1,964,299	1,375
4-Jun-18	507,165	353	1,919,828	1,336
5-Jun-18	610,471	425	2,310,882	1,610
6-Jun-18	581,071	404	2,199,592	1,531
7-Jun-18	630,855	439	2,388,046	1,663
8-Jun-18	625,414	436	2,367,447	1,649
9-Jun-18	550,469	383	2,083,752	1,452
10-Jun-18	687,461	476	2,602,323	1,803
11-Jun-18	580,712	404	2,198,231	1,530
12-Jun-18	476,636	330	1,804,261	1,249
13-Jun-18	516,541	359	1,955,320	1,360
14-Jun-18	562,283	391	2,128,470	1,482
15-Jun-18	627,832	435	2,376,602	1,648
16-Jun-18	672,196	468	2,544,537	1,771
17-Jun-18	561,456	391	2,125,341	1,482
18-Jun-18	555,252	386	2,101,858	1,462
19-Jun-18	593,987	413	2,248,484	1,562
20-Jun-18	576,759	401	2,183,270	1,516
21-Jun-18	596,669	415	2,258,638	1,569
22-Jun-18	633,825	440	2,399,288	1,665
23-Jun-18	672,780	466	2,546,748	1,764
24-Jun-18	681,534	473	2,579,886	1,789
25-Jun-18	683,366	475	2,586,821	1,798
26-Jun-18	683,936	474	2,588,980	1,793
27-Jun-18	558,674	387	2,114,810	1,464
28-Jun-18	659,265	456	2,495,589	1,726
29-Jun-18	577,232	402	2,185,059	1,520
30-Jun-18	605,410	421	2,291,724	1,594

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Jul-18	686,078	475	2,597,088	1,800
2-Jul-18	578,318	401	2,189,170	1,517
3-Jul-18	593,961	416	2,248,387	1,575
4-Jul-18	673,355	468	2,548,924	1,772
5-Jul-18	566,756	395	2,145,402	1,495
6-Jul-18	615,184	427	2,328,724	1,615
7-Jul-18	651,274	452	2,465,338	1,712
8-Jul-18	719,574	496	2,723,881	1,878
9-Jul-18	640,503	445	2,424,567	1,683
10-Jul-18	659,409	455	2,496,133	1,723
11-Jul-18	699,722	489	2,648,736	1,851
12-Jul-18	699,897	490	2,649,395	1,854
13-Jul-18	680,807	473	2,577,132	1,791
14-Jul-18	686,244	483	2,597,715	1,829
15-Jul-18	642,204	446	2,431,006	1,687
16-Jul-18	581,534	406	2,201,343	1,539
17-Jul-18	630,218	433	2,385,632	1,640
18-Jul-18	646,254	452	2,446,337	1,711
19-Jul-18	552,809	387	2,092,610	1,464
20-Jul-18	666,393	467	2,522,572	1,767
21-Jul-18	687,982	481	2,604,295	1,819
22-Jul-18	719,330	504	2,722,958	1,909
23-Jul-18	605,999	424	2,293,953	1,606
24-Jul-18	609,099	425	2,305,689	1,610
25-Jul-18	630,204	443	2,385,581	1,675
26-Jul-18	646,551	452	2,447,462	1,712
27-Jul-18	541,994	379	2,051,668	1,435
28-Jul-18	630,832	442	2,387,956	1,674
29-Jul-18	684,209	480	2,590,012	1,816
30-Jul-18	643,566	449	2,436,160	1,699
31-Jul-18	679,900	478	2,573,701	1,810

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	**Volume** (US gpd)	**Average Flow Rate Over Time Taken** (US gpm)	**Volume** (L/day)	**Average Flow Rate Over Time Taken** (L/min)
1-Aug-18	673,041	471	2,547,738	1,784
2-Aug-18	659,776	463	2,497,524	1,751
3-Aug-18	626,129	438	2,370,154	1,658
4-Aug-18	666,419	466	2,522,668	1,765
5-Aug-18	622,834	438	2,357,681	1,657
6-Aug-18	616,148	428	2,332,374	1,621
7-Aug-18	629,109	442	2,381,436	1,674
8-Aug-18	419,491	292	1,587,944	1,106
9-Aug-18	595,496	416	2,254,198	1,575
10-Aug-18	584,640	407	2,213,104	1,542
11-Aug-18	547,250	381	2,071,564	1,441
12-Aug-18	549,722	382	2,080,923	1,447
13-Aug-18	583,067	408	2,207,146	1,545
14-Aug-18	687,945	482	2,604,155	1,823
15-Aug-18	698,559	490	2,644,331	1,856
16-Aug-18	572,643	400	2,167,689	1,516
17-Aug-18	624,092	433	2,362,442	1,641
18-Aug-18	678,342	470	2,567,802	1,780
19-Aug-18	713,271	494	2,700,024	1,868
20-Aug-18	625,914	437	2,369,340	1,656
21-Aug-18	543,795	379	2,058,487	1,436
22-Aug-18	652,684	457	2,470,675	1,730
23-Aug-18	616,326	432	2,333,047	1,634
24-Aug-18	661,879	463	2,505,483	1,754
25-Aug-18	664,050	465	2,513,701	1,762
26-Aug-18	657,088	460	2,487,347	1,742
27-Aug-18	592,126	413	2,241,438	1,564
28-Aug-18	589,237	412	2,230,504	1,561
29-Aug-18	649,386	454	2,458,192	1,720
30-Aug-18	593,286	416	2,245,830	1,575
31-Aug-18	656,668	460	2,485,757	1,742

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Sep-18	656,282	459	2,484,296	1,736
2-Sep-18	690,211	484	2,612,733	1,832
3-Sep-18	580,638	407	2,197,952	1,541
4-Sep-18	407,779	282	1,543,612	1,069
5-Sep-18	451,068	315	1,707,477	1,193
6-Sep-18	552,364	386	2,090,922	1,461
7-Sep-18	488,431	341	1,848,910	1,291
8-Sep-18	478,729	330	1,812,185	1,250
9-Sep-18	501,557	352	1,898,599	1,333
10-Sep-18	454,132	317	1,719,074	1,199
11-Sep-18	372,286	258	1,409,253	978
12-Sep-18	471,396	326	1,784,427	1,232
13-Sep-18	334,204	234	1,265,097	886
14-Sep-18	376,096	261	1,423,678	987
15-Sep-18	332,089	231	1,257,092	876
16-Sep-18	328,620	231	1,243,961	876
17-Sep-18	427,992	298	1,620,125	1,129
18-Sep-18	397,195	276	1,503,547	1,044
19-Sep-18	446,008	315	1,688,324	1,192
20-Sep-18	386,892	270	1,464,546	1,022
21-Sep-18	239,321	165	905,929	626
22-Sep-18	265,837	186	1,006,300	702
23-Sep-18	278,989	197	1,056,086	744
24-Sep-18	411,165	285	1,556,429	1,081
25-Sep-18	374,804	262	1,418,787	993
26-Sep-18	280,447	195	1,061,605	738
27-Sep-18	285,680	199	1,081,414	753
28-Sep-18	252,749	179	956,760	676
29-Sep-18	217,734	150	824,213	569
30-Sep-18	219,882	154	832,343	581

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Oct-18	179,673	126	680,137	477
2-Oct-18	245,602	171	929,704	649
3-Oct-18	443,437	311	1,678,590	1,179
4-Oct-18	484,612	336	1,834,456	1,273
5-Oct-18	387,129	271	1,465,443	1,027
6-Oct-18	525,344	366	1,988,641	1,384
7-Oct-18	544,726	382	2,062,011	1,444
8-Oct-18	389,173	269	1,473,179	1,020
9-Oct-18	433,724	304	1,641,824	1,151
10-Oct-18	385,746	267	1,460,207	1,009
11-Oct-18	522,161	366	1,976,594	1,385
12-Oct-18	413,906	288	1,566,804	1,090
13-Oct-18	532,211	371	2,014,636	1,403
14-Oct-18	462,279	321	1,749,915	1,215
15-Oct-18	243,486	168	921,695	636
16-Oct-18	117	1	444	4
17-Oct-18	105,048	78	397,650	295
18-Oct-18	0	1	0	4
19-Oct-18	258,462	182	978,384	689
20-Oct-18	34,082	25	129,012	93
21-Oct-18	54,160	39	205,018	146
22-Oct-18	431,329	300	1,632,756	1,137
23-Oct-18	425,930	299	1,612,320	1,133
24-Oct-18	454,816	315	1,721,665	1,193
25-Oct-18	383,673	267	1,452,360	1,009
26-Oct-18	351,707	244	1,331,356	925
27-Oct-18	331,230	232	1,253,842	878
28-Oct-18	239,498	167	906,598	631
29-Oct-18	280,936	195	1,063,456	739
30-Oct-18	345,747	241	1,308,793	911
31-Oct-18	418,424	289	1,583,907	1,095

TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Nov-18	340,636	236	1,289,447	893
2-Nov-18	244,637	171	926,050	649
3-Nov-18	348,750	242	1,320,161	915
4-Nov-18	326,722	215	1,236,779	815
5-Nov-18	347,213	241	1,314,343	911
6-Nov-18	371,119	257	1,404,836	972
7-Nov-18	283,582	199	1,073,473	752
8-Nov-18	314,724	217	1,191,358	820
9-Nov-18	314,658	221	1,191,108	837
10-Nov-18	275,927	192	1,044,496	729
11-Nov-18	340,969	237	1,290,706	895
12-Nov-18	370,345	256	1,401,908	968
13-Nov-18	413,539	289	1,565,416	1,094
14-Nov-18	407,825	284	1,543,784	1,075
15-Nov-18	220,307	152	833,954	574
16-Nov-18	245,424	172	929,031	652
17-Nov-18	290,705	202	1,100,437	765
18-Nov-18	283,213	196	1,072,078	742
19-Nov-18	269,627	188	1,020,649	711
20-Nov-18	308,865	215	1,169,181	813
21-Nov-18	332,611	231	1,259,068	874
22-Nov-18	292,610	203	1,107,651	768
23-Nov-18	257,434	178	974,493	675
24-Nov-18	327,502	228	1,239,731	865
25-Nov-18	295,804	205	1,119,740	778
26-Nov-18	352,518	245	1,334,424	928
27-Nov-18	360,378	250	1,364,177	946
28-Nov-18	389,427	271	1,474,140	1,025
29-Nov-18	464,246	326	1,757,363	1,233
30-Nov-18	339,071	236	1,283,521	892

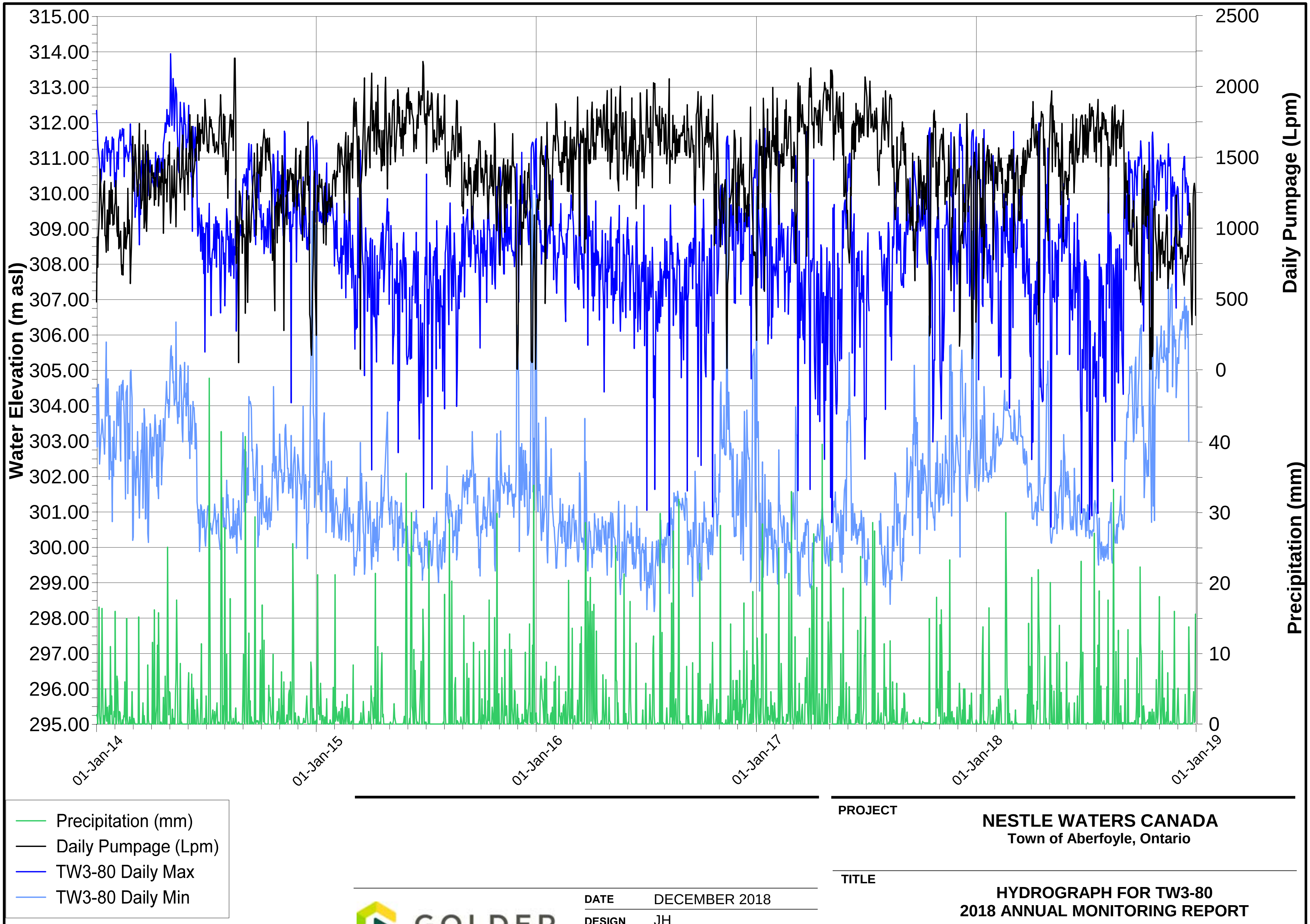
TABLE C1
TW3-80 DAILY WATER TAKING
NESTLE WATERS CANADA
ABERFOYLE, ONTARIO

Date	Volume (US gpd)	Average Flow Rate Over Time Taken (US gpm)	Volume (L/day)	Average Flow Rate Over Time Taken (L/min)
1-Dec-18	336,578	233	1,274,085	884
2-Dec-18	331,381	230	1,254,412	871
3-Dec-18	329,094	230	1,245,756	872
4-Dec-18	358,449	259	1,356,876	979
5-Dec-18	346,297	235	1,310,876	889
6-Dec-18	298,009	207	1,128,088	783
7-Dec-18	318,980	222	1,207,471	839
8-Dec-18	329,071	228	1,245,667	864
9-Dec-18	328,178	226	1,242,288	855
10-Dec-18	261,353	183	989,328	693
11-Dec-18	252,623	175	956,282	664
12-Dec-18	227,262	158	860,278	597
13-Dec-18	259,264	181	981,421	684
14-Dec-18	310,053	214	1,173,679	809
15-Dec-18	279,616	196	1,058,461	741
16-Dec-18	294,816	204	1,116,000	773
17-Dec-18	291,613	203	1,103,875	767
18-Dec-18	334,156	232	1,264,916	877
19-Dec-18	302,351	210	1,144,522	795
20-Dec-18	416,022	289	1,574,814	1,094
21-Dec-18	410,933	311	1,555,551	1,176
22-Dec-18	418,577	291	1,584,484	1,102
23-Dec-18	311,917	216	1,180,734	819
24-Dec-18	165,648	115	627,044	434
25-Dec-18	119,162	84	451,078	317
26-Dec-18	210,125	147	795,408	558
27-Dec-18	463,777	322	1,755,585	1,220
28-Dec-18	491,782	342	1,861,596	1,293
29-Dec-18	500,257	348	1,893,680	1,317
30-Dec-18	478,548	332	1,811,499	1,258
31-Dec-18	147,418	101	558,039	383

Notes:
1. All volumes measured with a flow meter and recorded on a datalogger.

APPENDIX D

Groundwater Level Monitoring



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

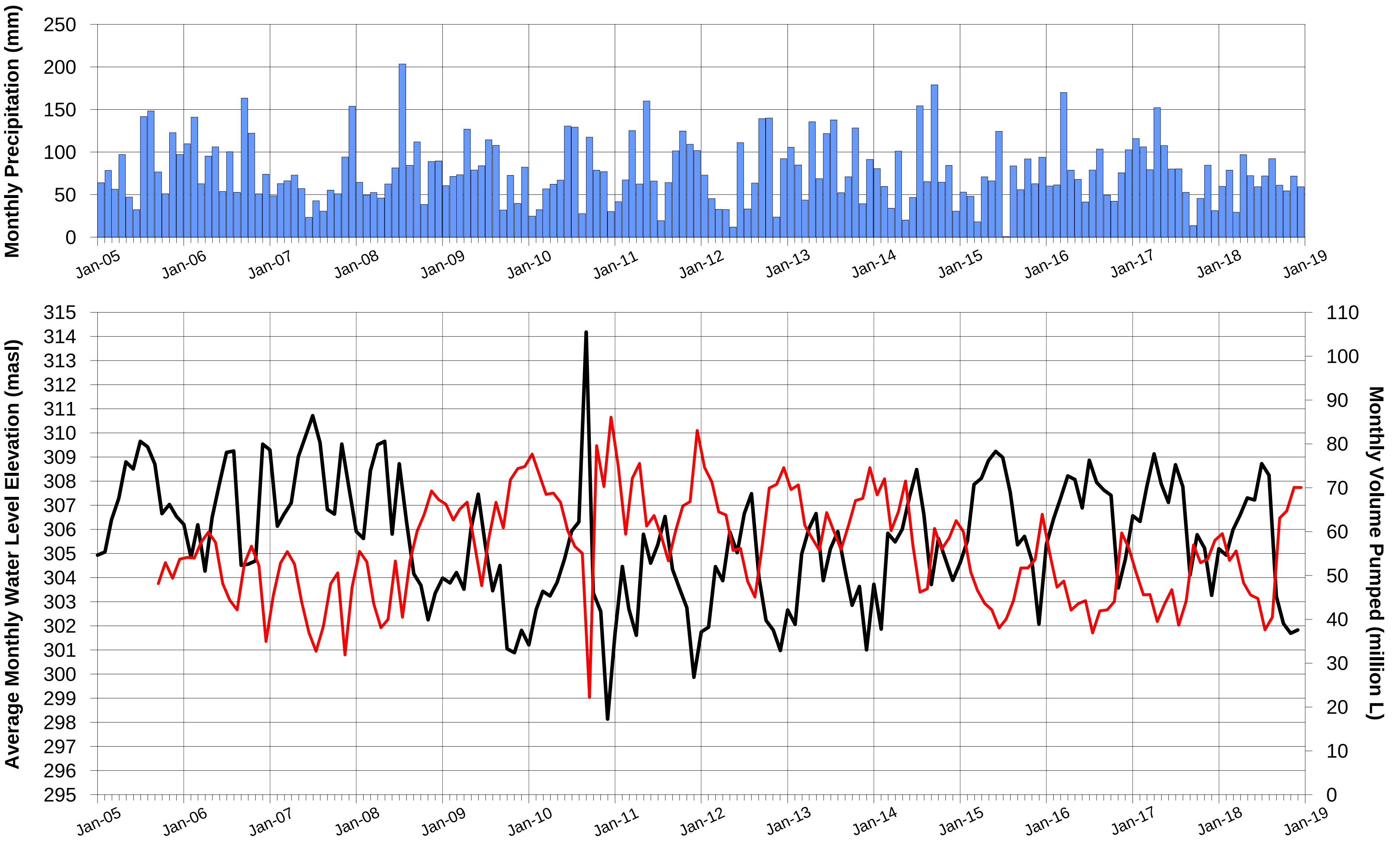
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

HYDROGRAPH FOR TW3-80
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D1a



DATE	December 2018
DESIGN	KJ
REVIEW	GP
APPROVED	GP

GOLDER

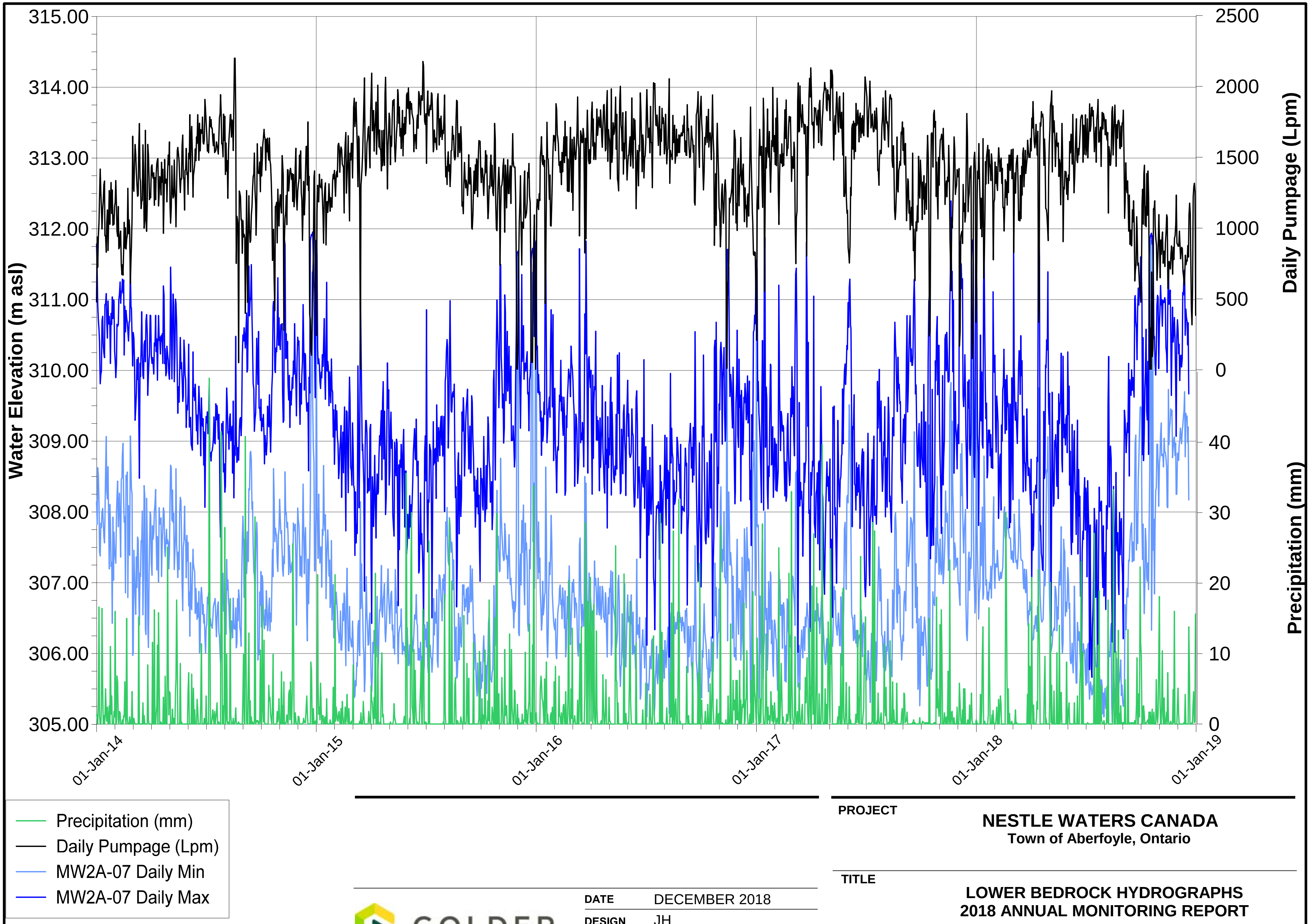
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

AVERAGE MONTHLY WATER LEVELS TW3-80
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D1b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

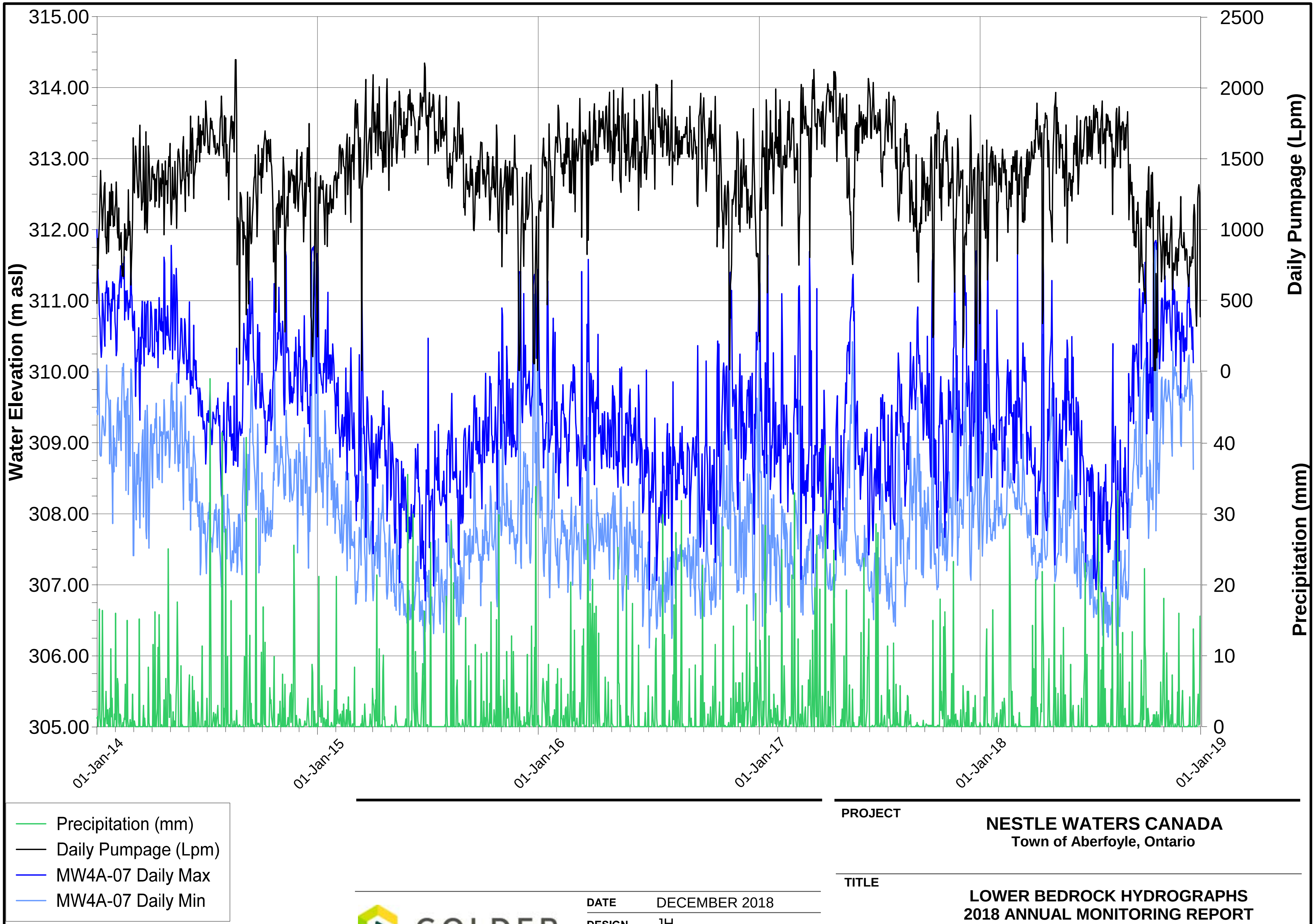
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D2



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

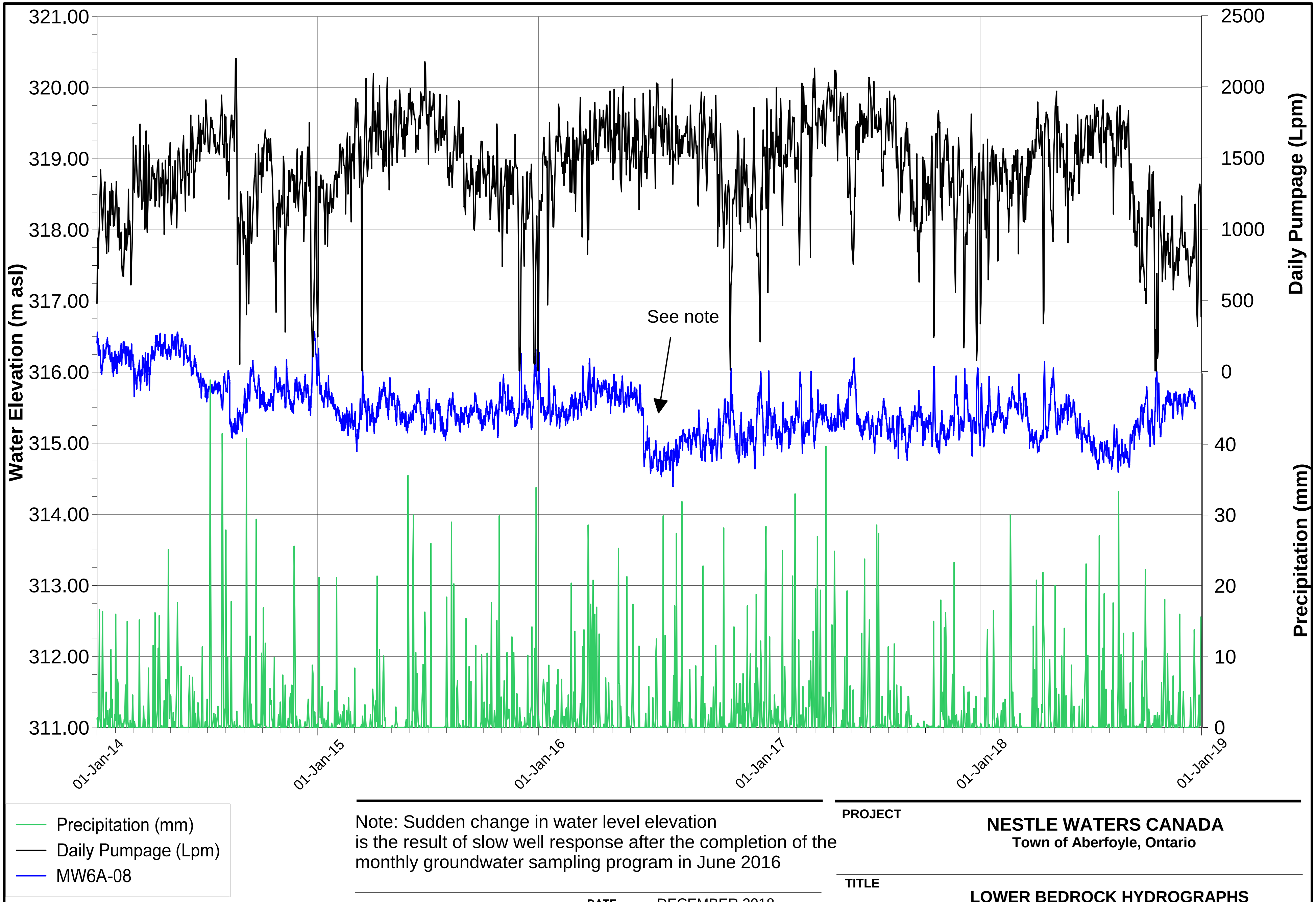
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D3



Note: Sudden change in water level elevation is the result of slow well response after the completion of the monthly groundwater sampling program in June 2016

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT

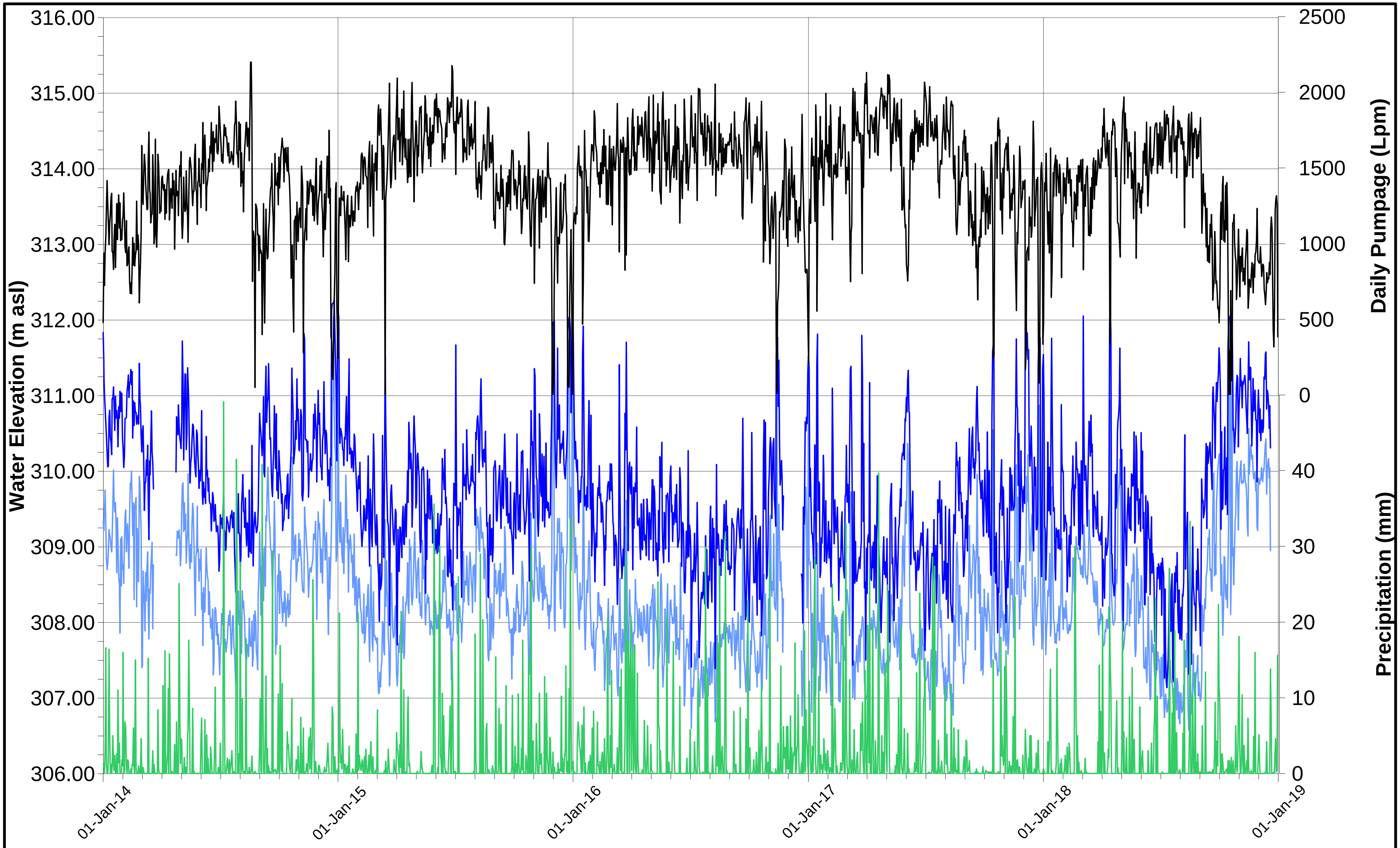
NESTLE WATERS CANADA

Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D4



🟩	Precipitation (mm)
―	Daily Pumpage (Lpm)
―	MW7A-08 Daily Max
―	MW7A-08 Daily Min

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

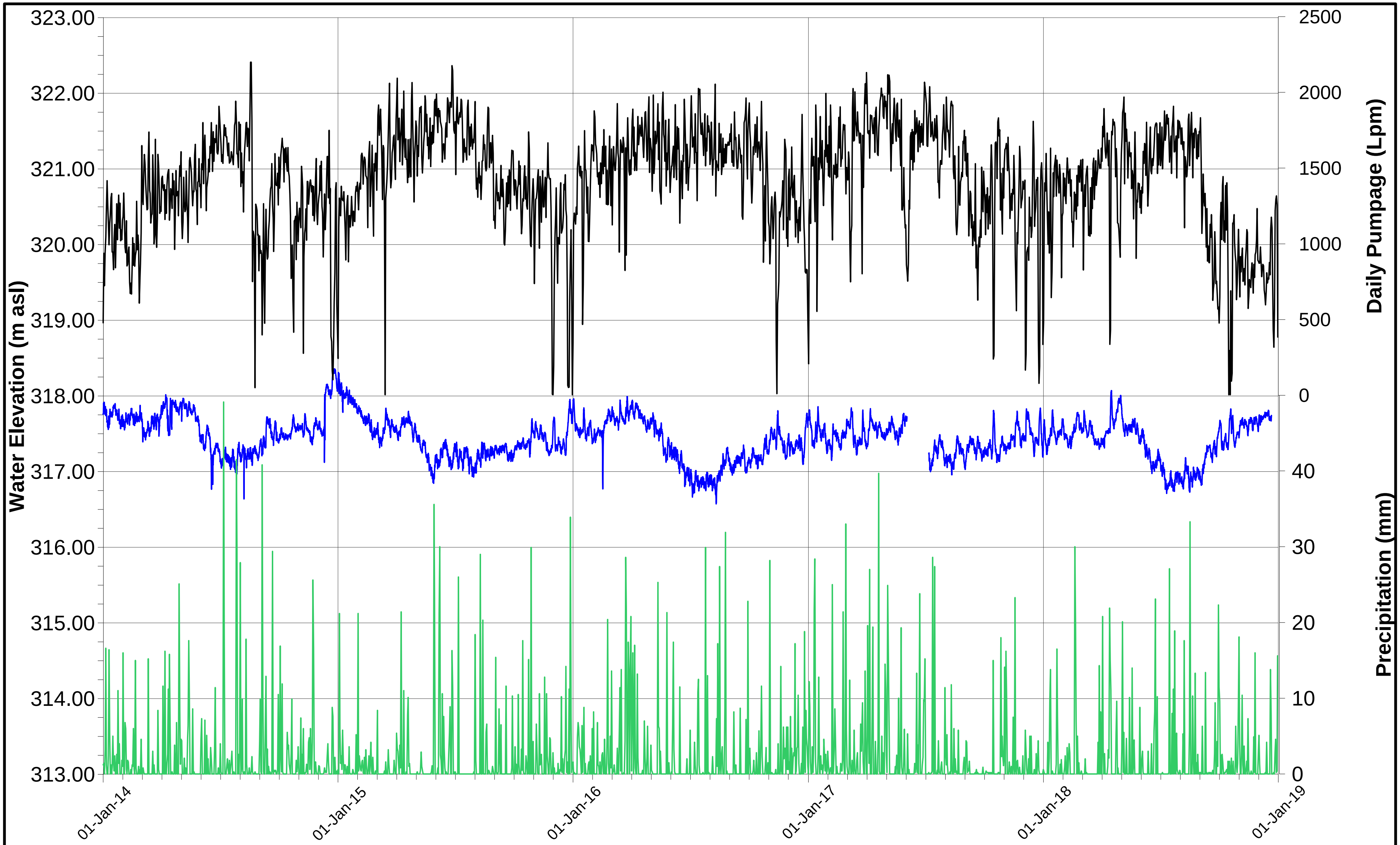
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D5



PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

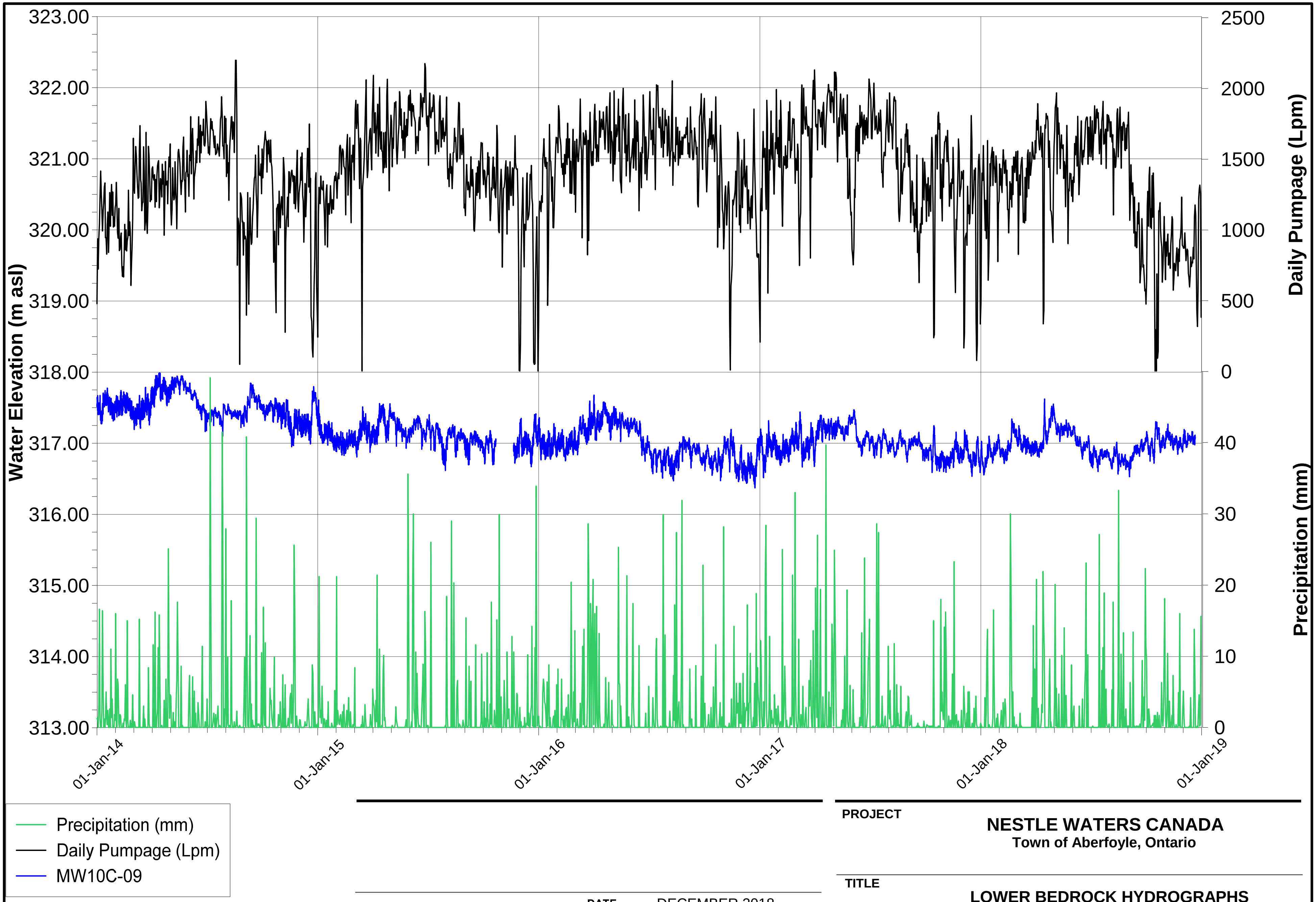
TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D6



DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

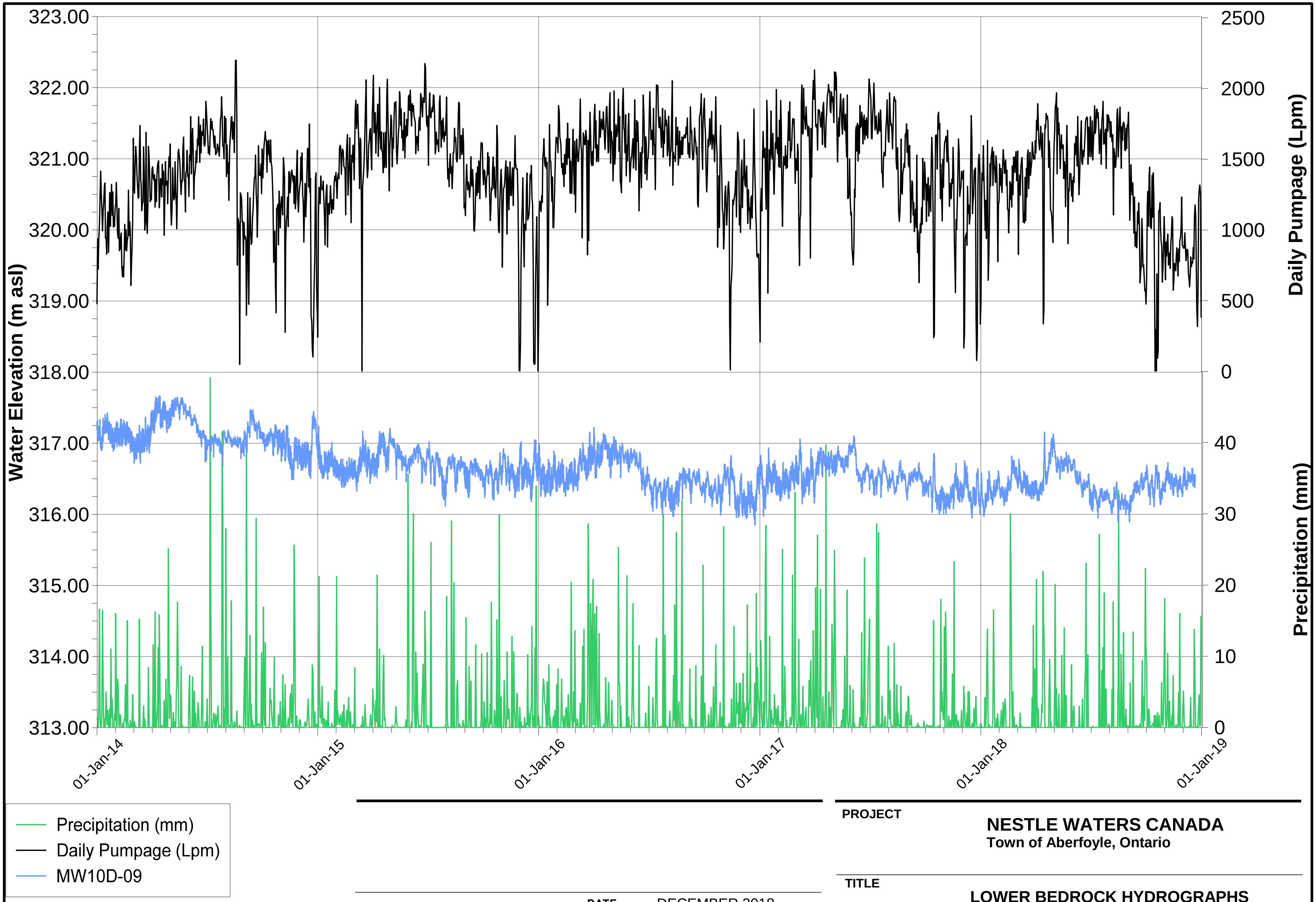
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D7



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

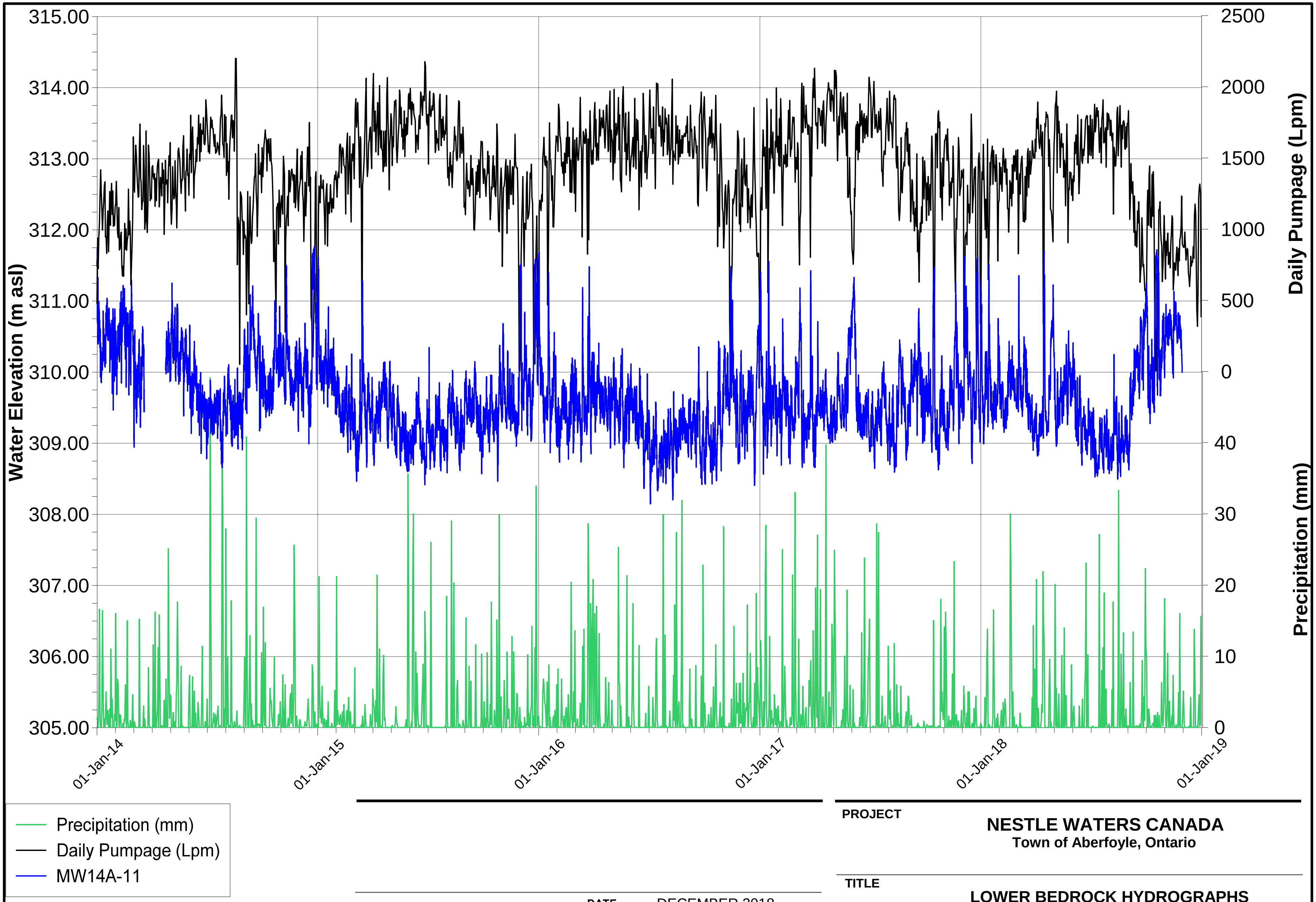
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D8



GOLDER

DATE DECEMBER 2018
DESIGN JH
REVIEW GP
APPROVED GP

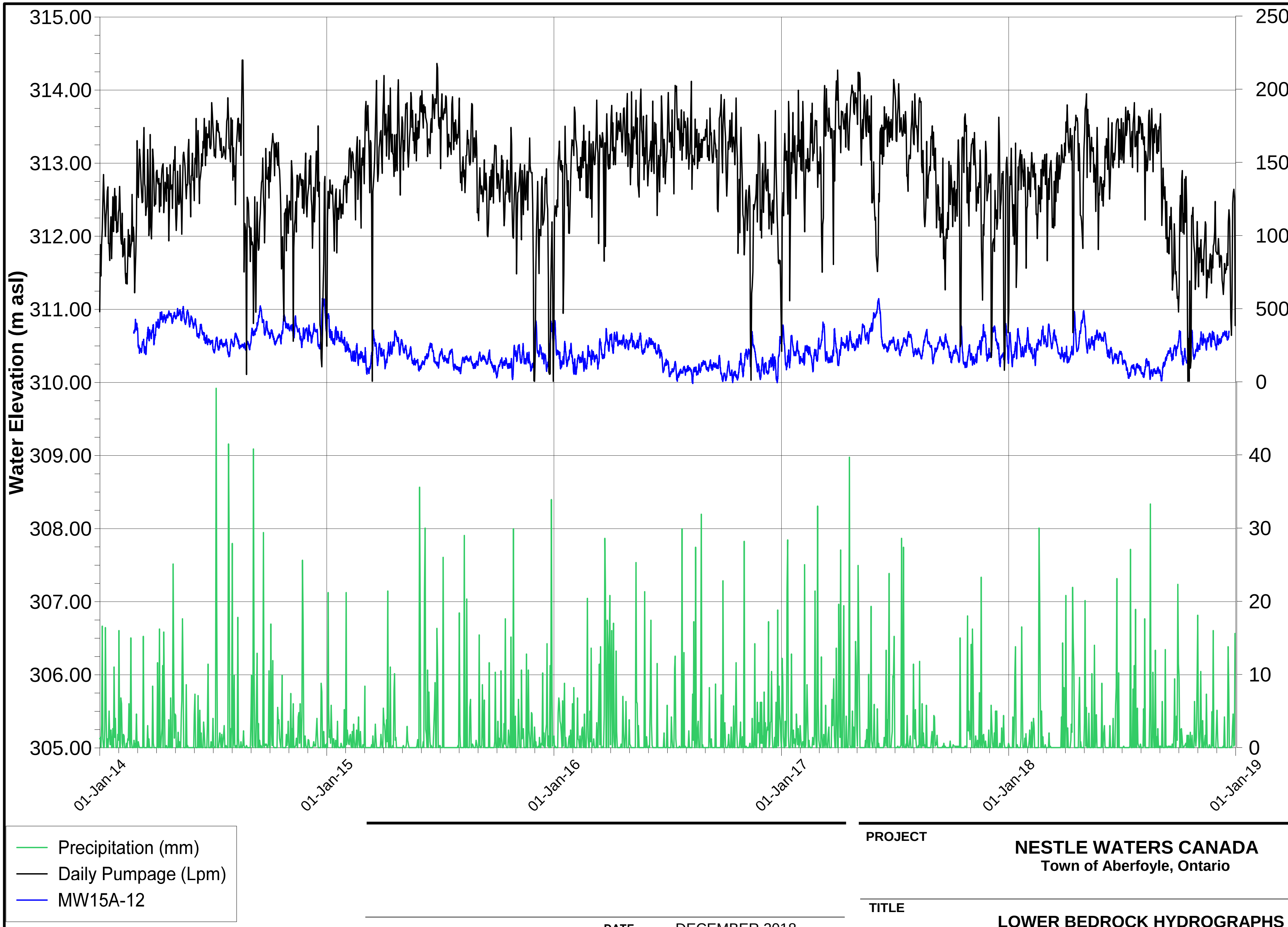
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO. 13-1152-0250 (1000)
REV A
FIGURE D9



PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

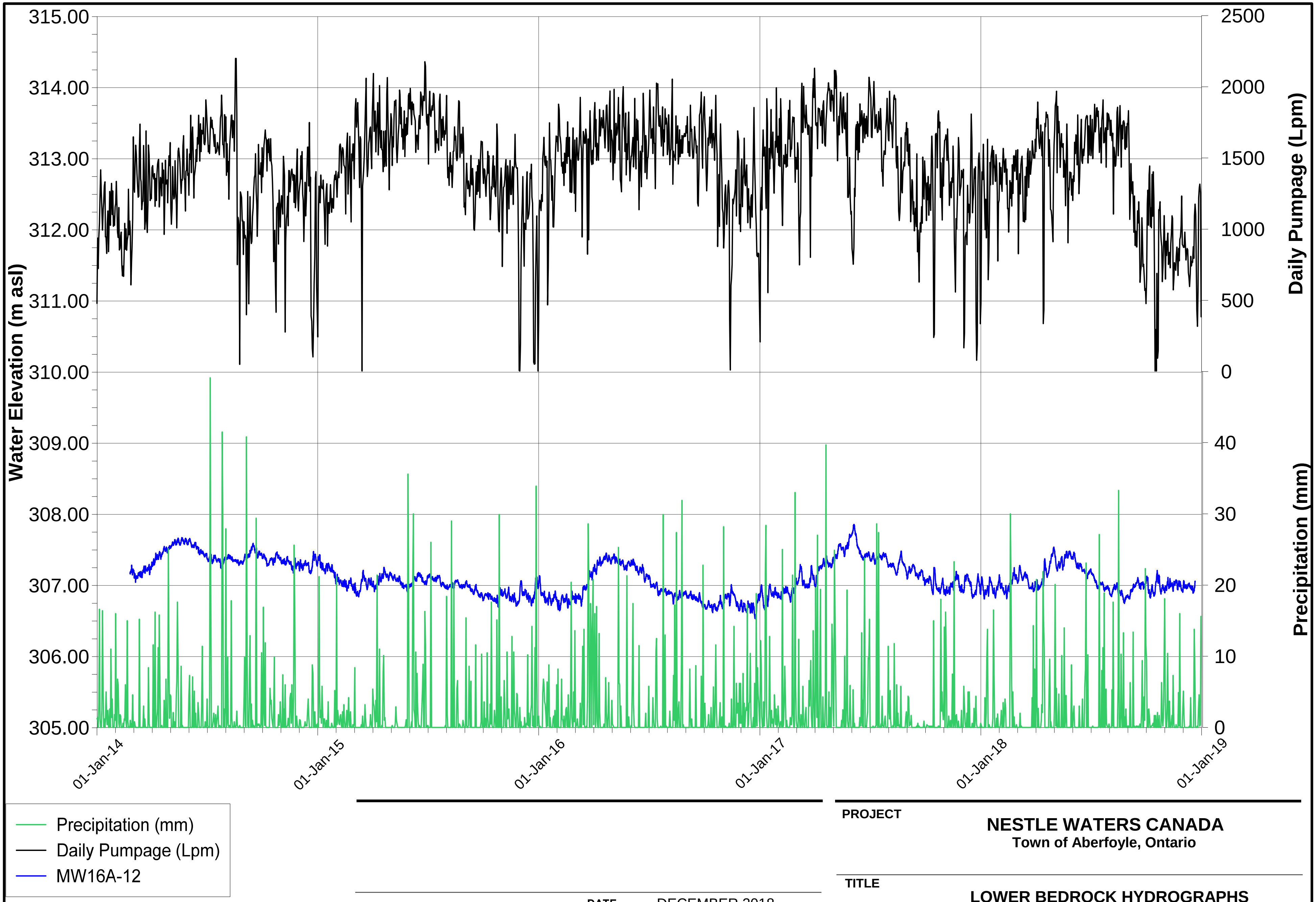
TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D10



DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

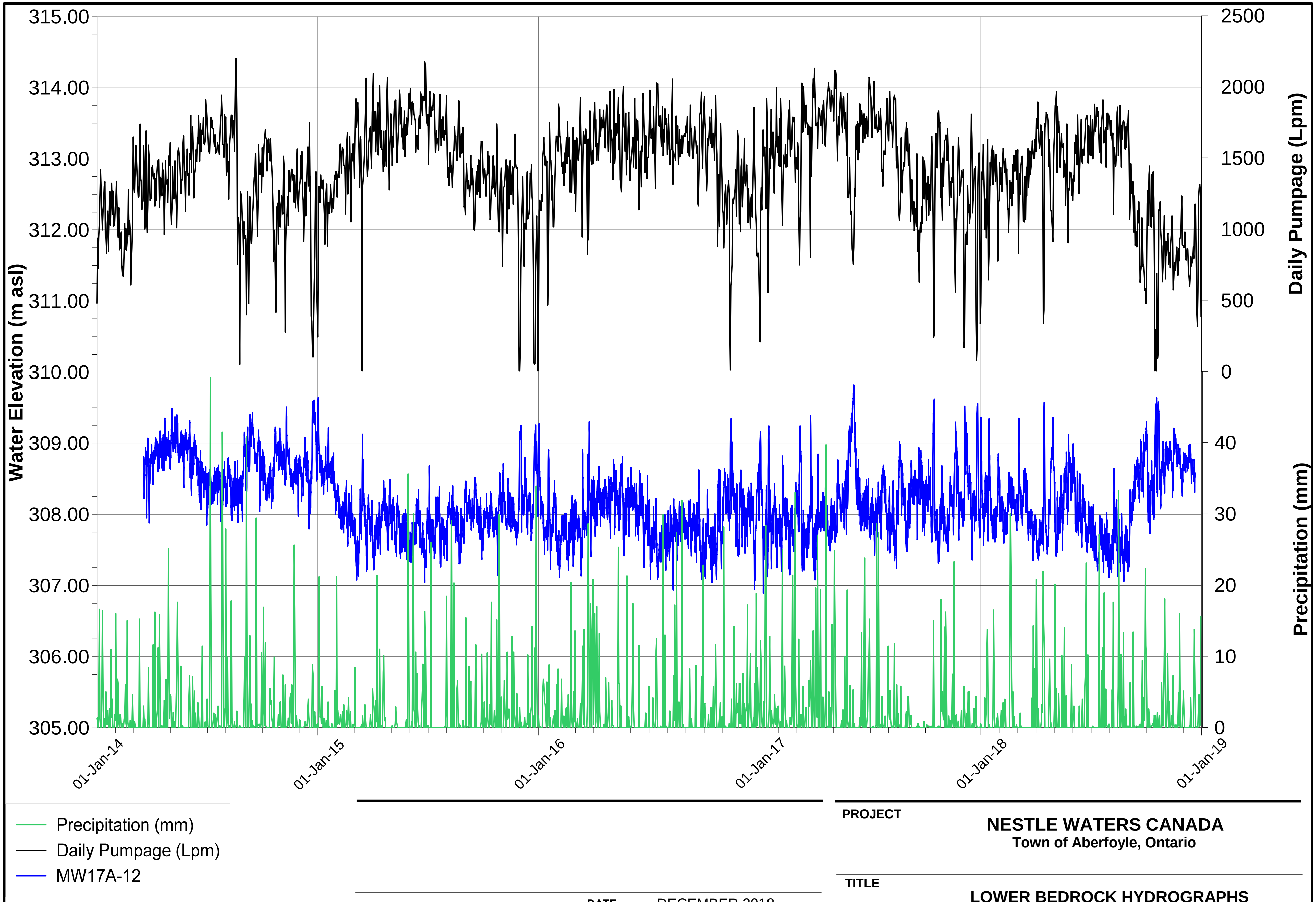
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D11



DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

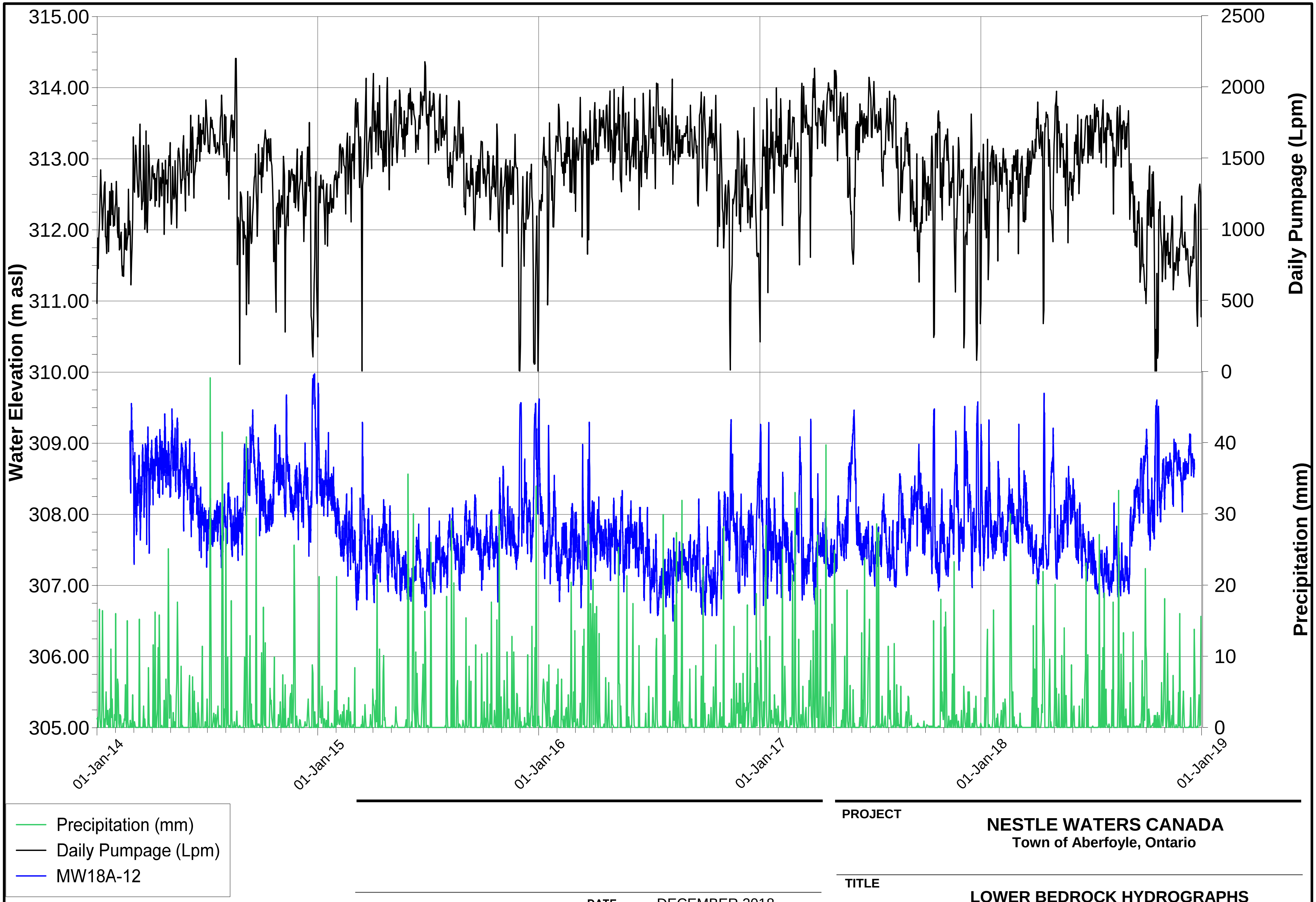
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D12



GOLDER

DATE DECEMBER 2018
DESIGN JH
REVIEW GP
APPROVED GP

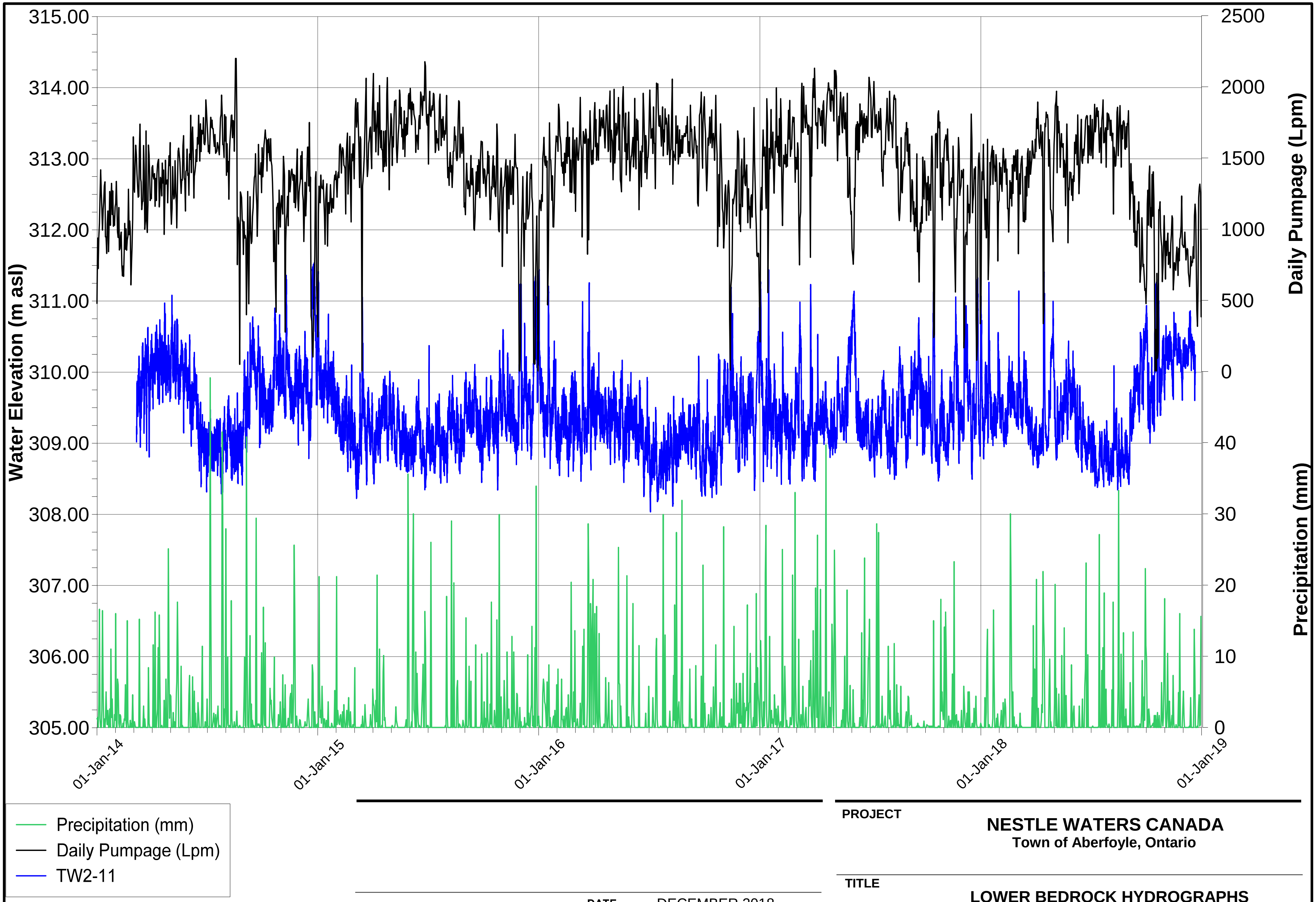
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D13



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

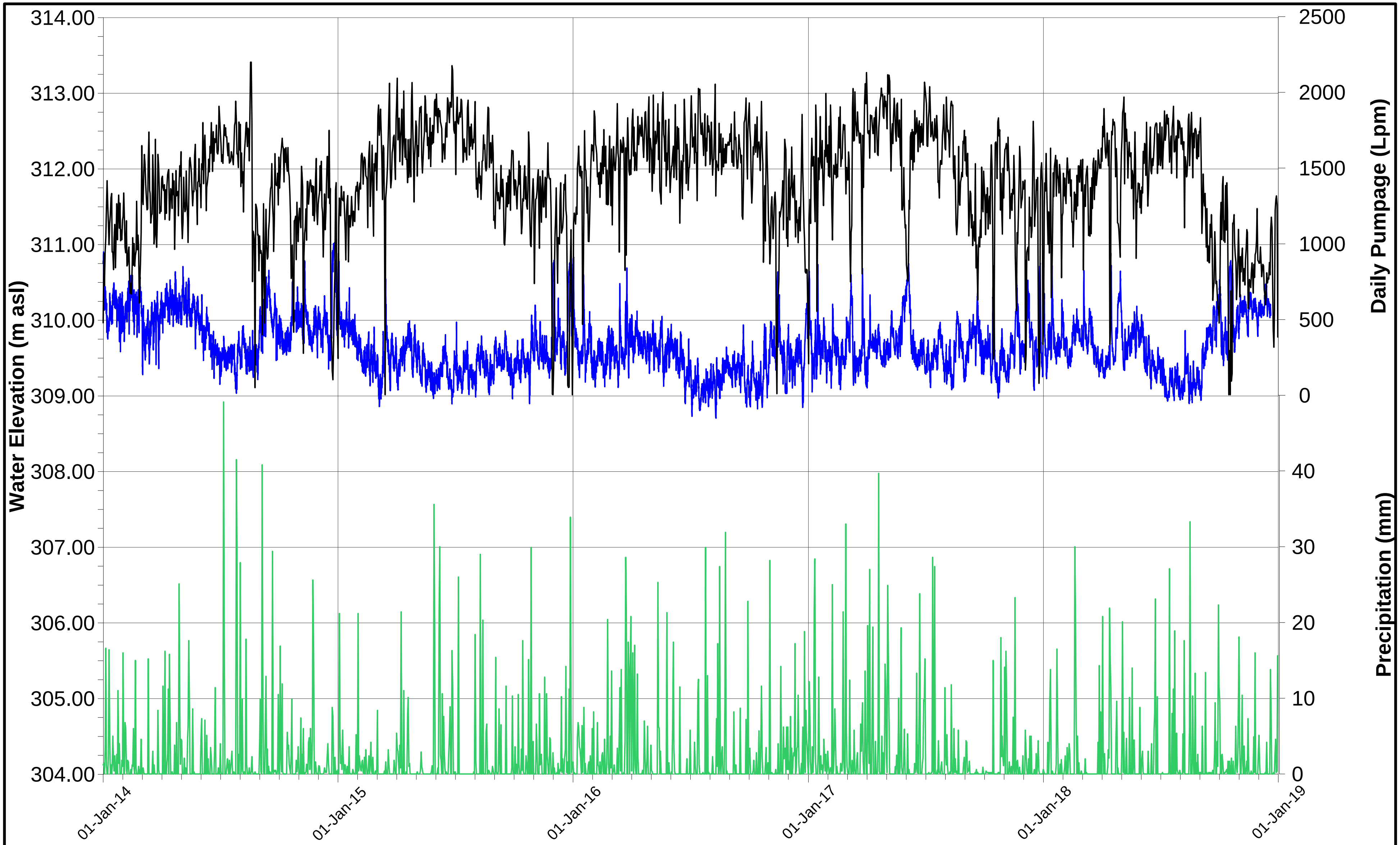
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D14



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

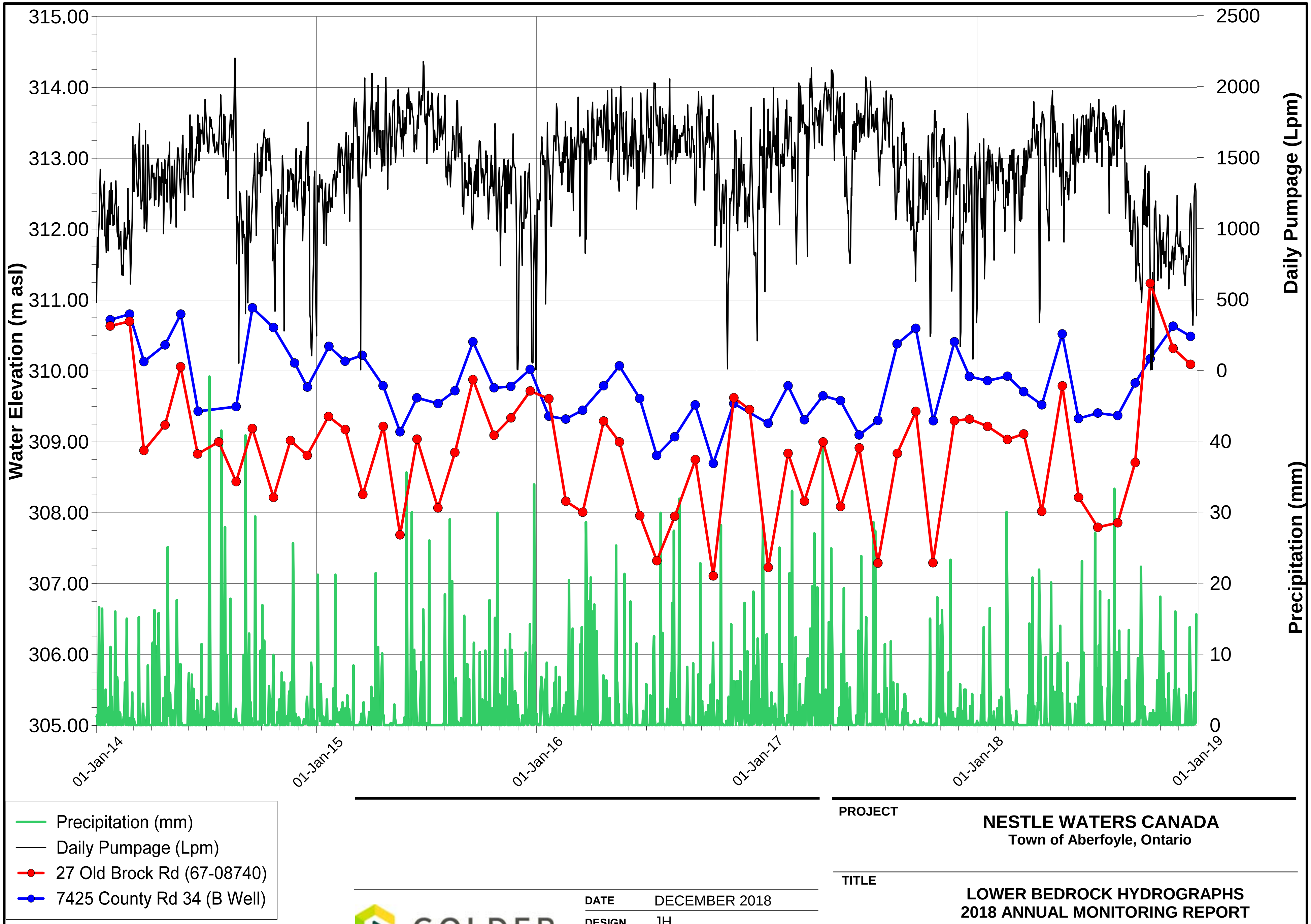
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D15



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT

NESTLE WATERS CANADA

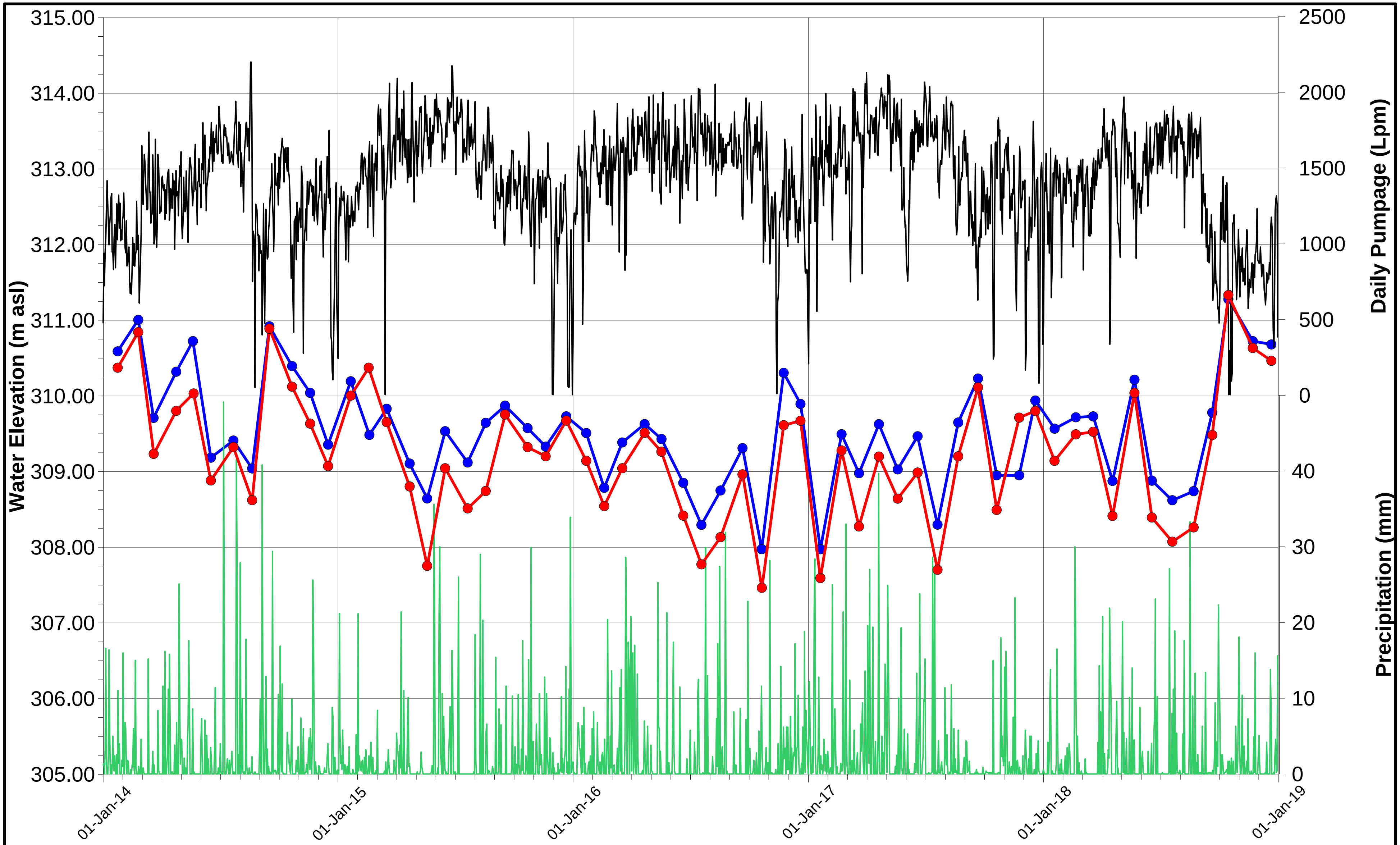
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS

2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D16



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

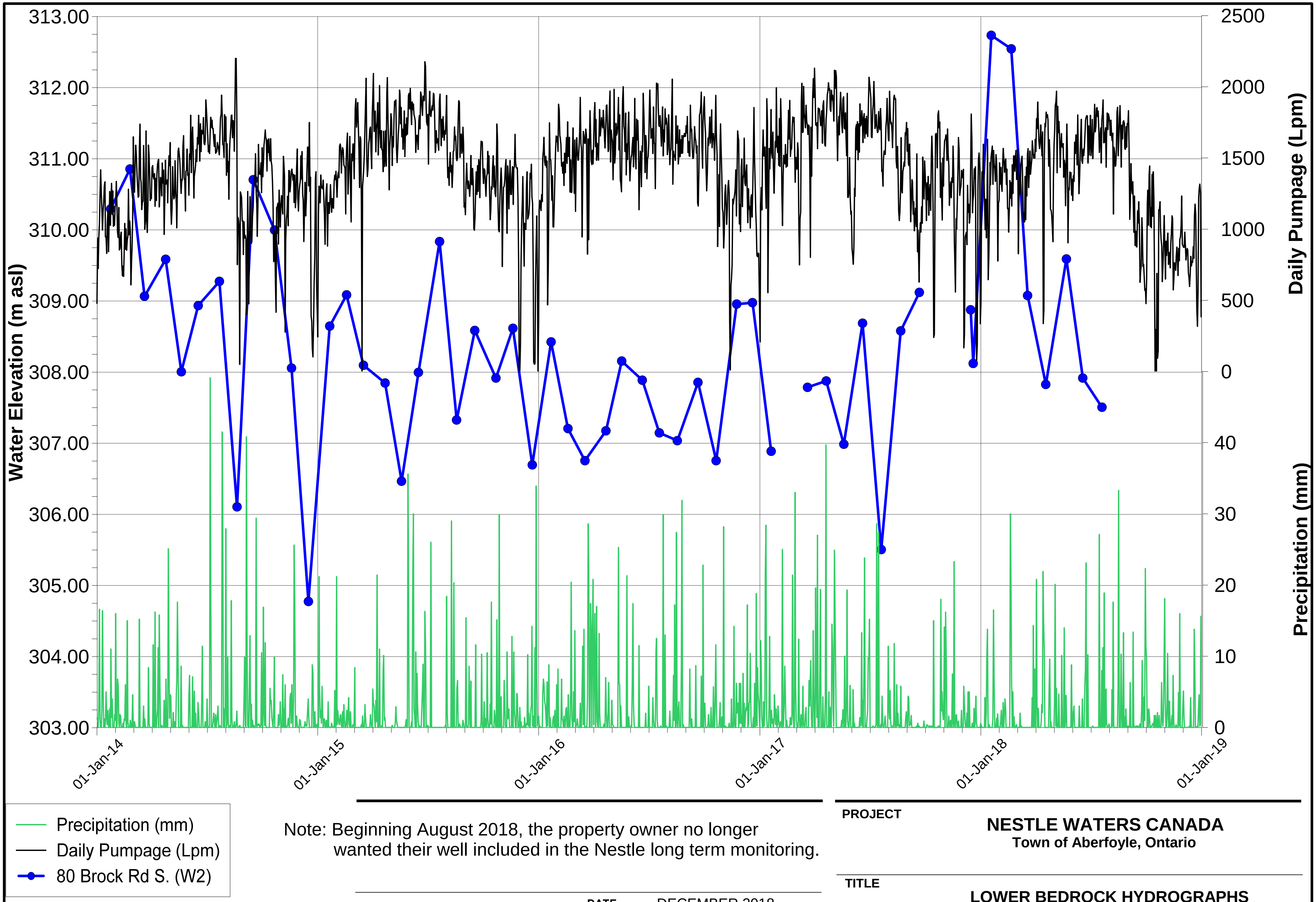
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D17



Note: Beginning August 2018, the property owner no longer wanted their well included in the Nestle long term monitoring.

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

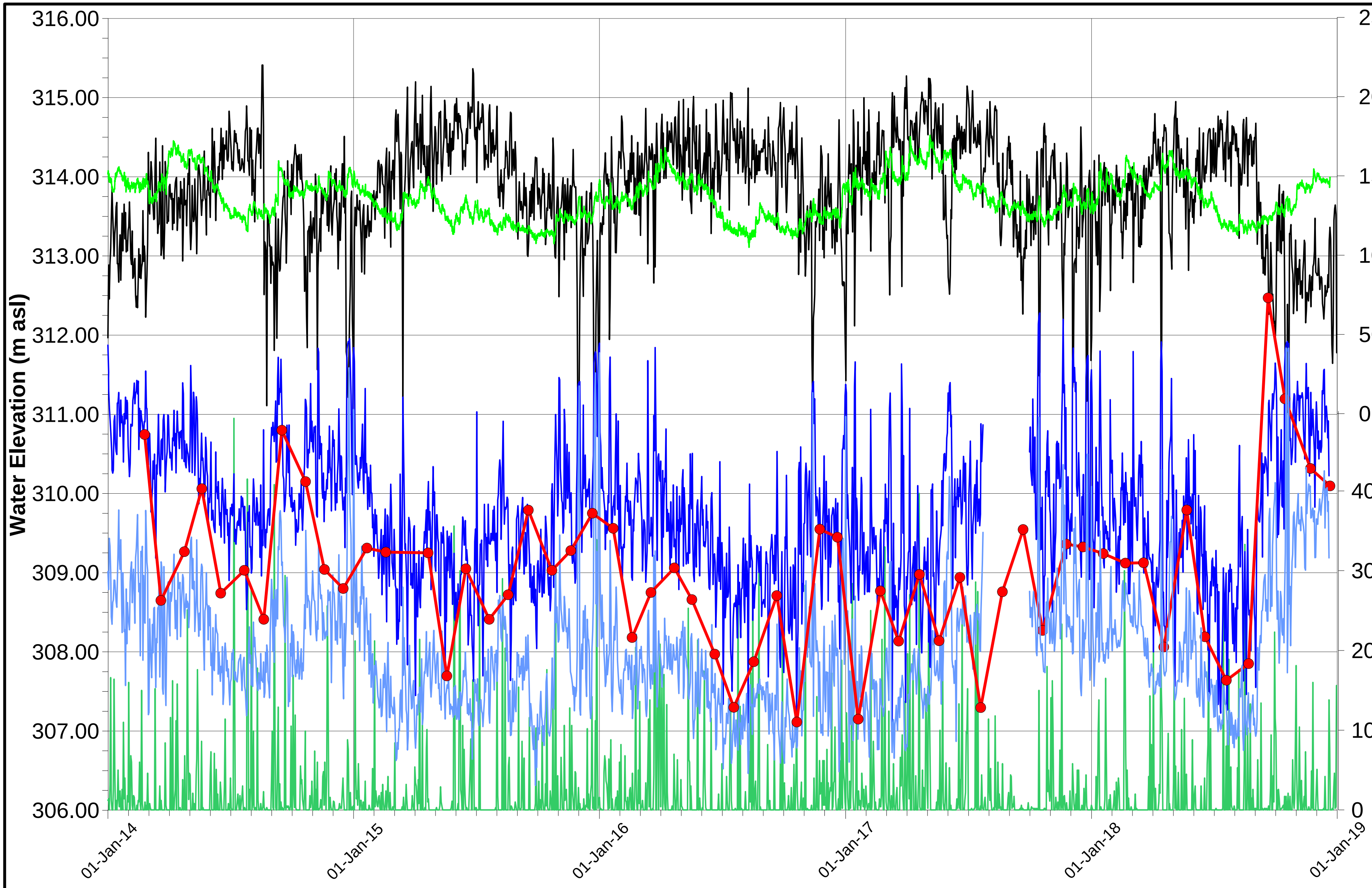
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D18



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

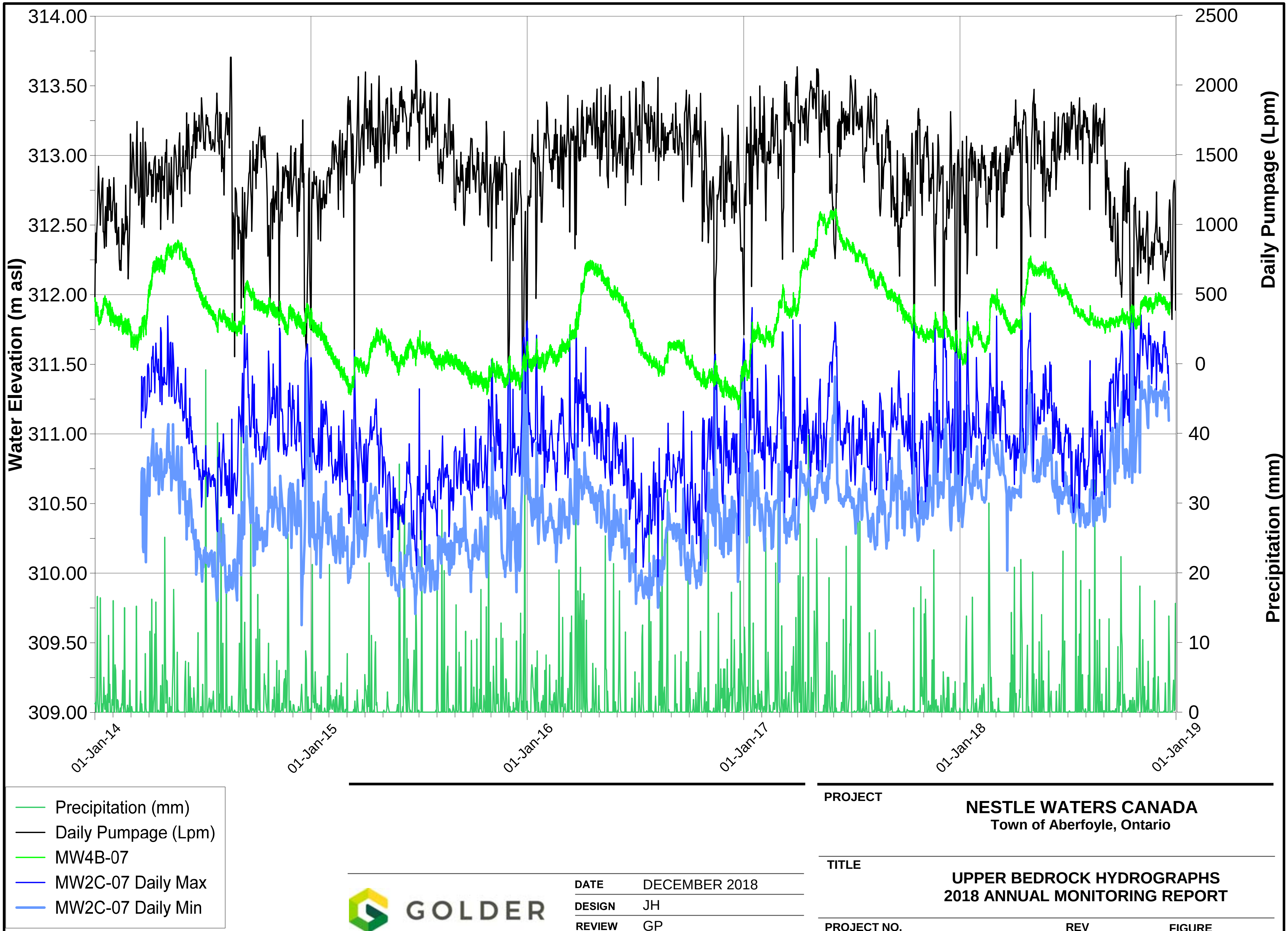
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MIDDLE BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D19



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

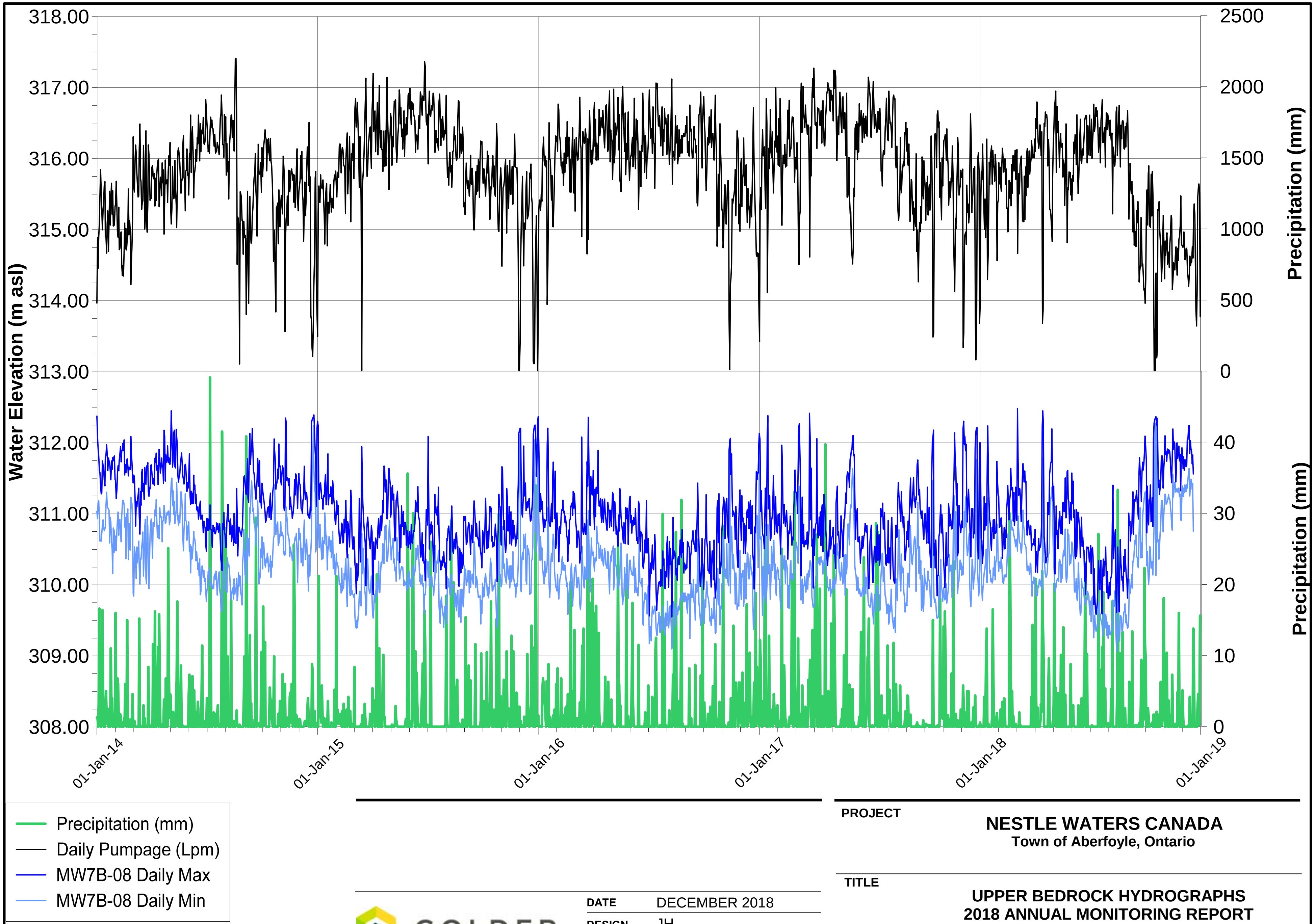
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D20



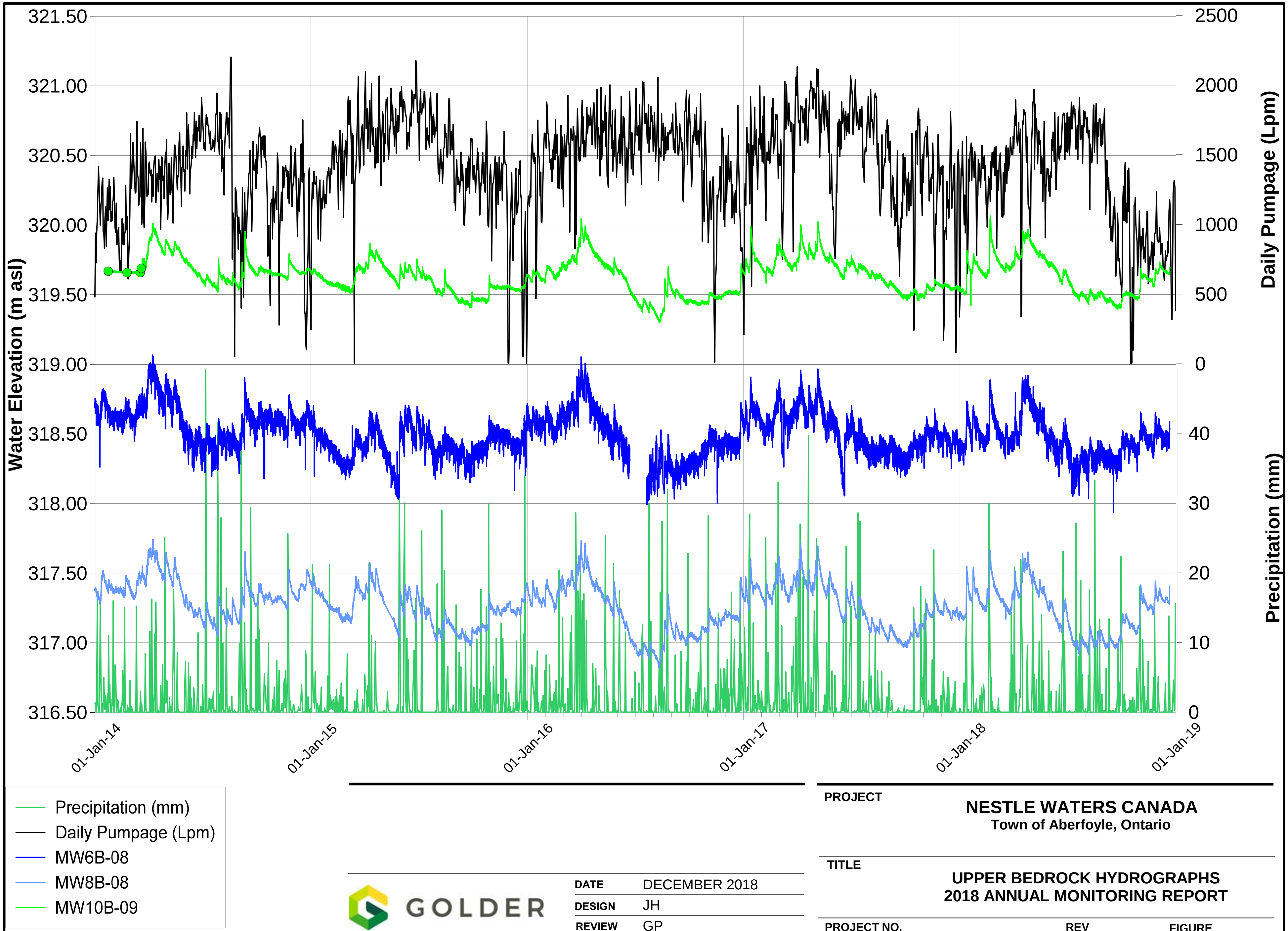
GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT
NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE
UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D21



GOLDER

DATE DECEMBER 2018
DESIGN JH
REVIEW GP
APPROVED GP

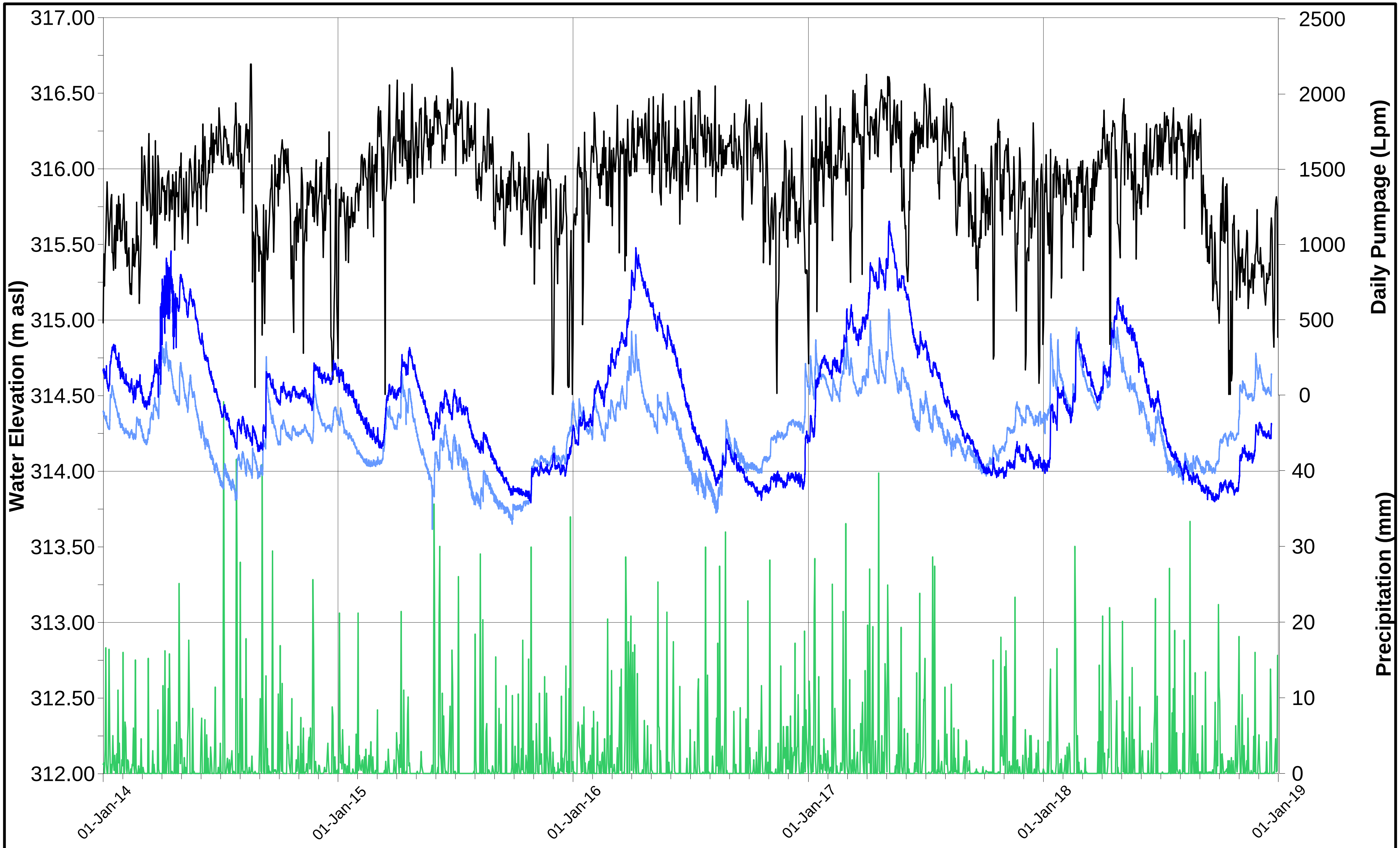
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO. 13-1152-0250 (1000)
REV A
FIGURE D22



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT

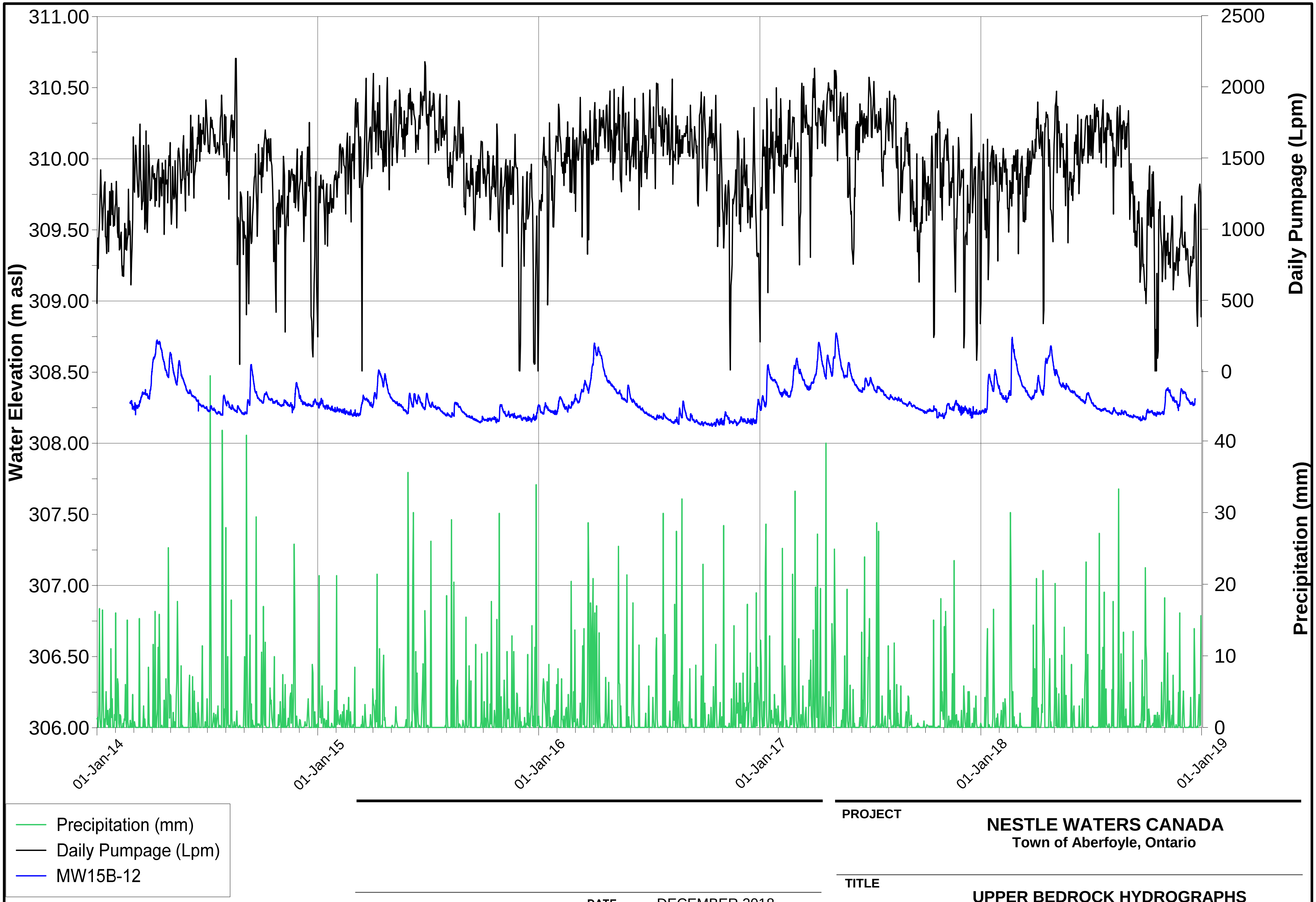
NESTLE WATERS CANADA

Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D23



PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

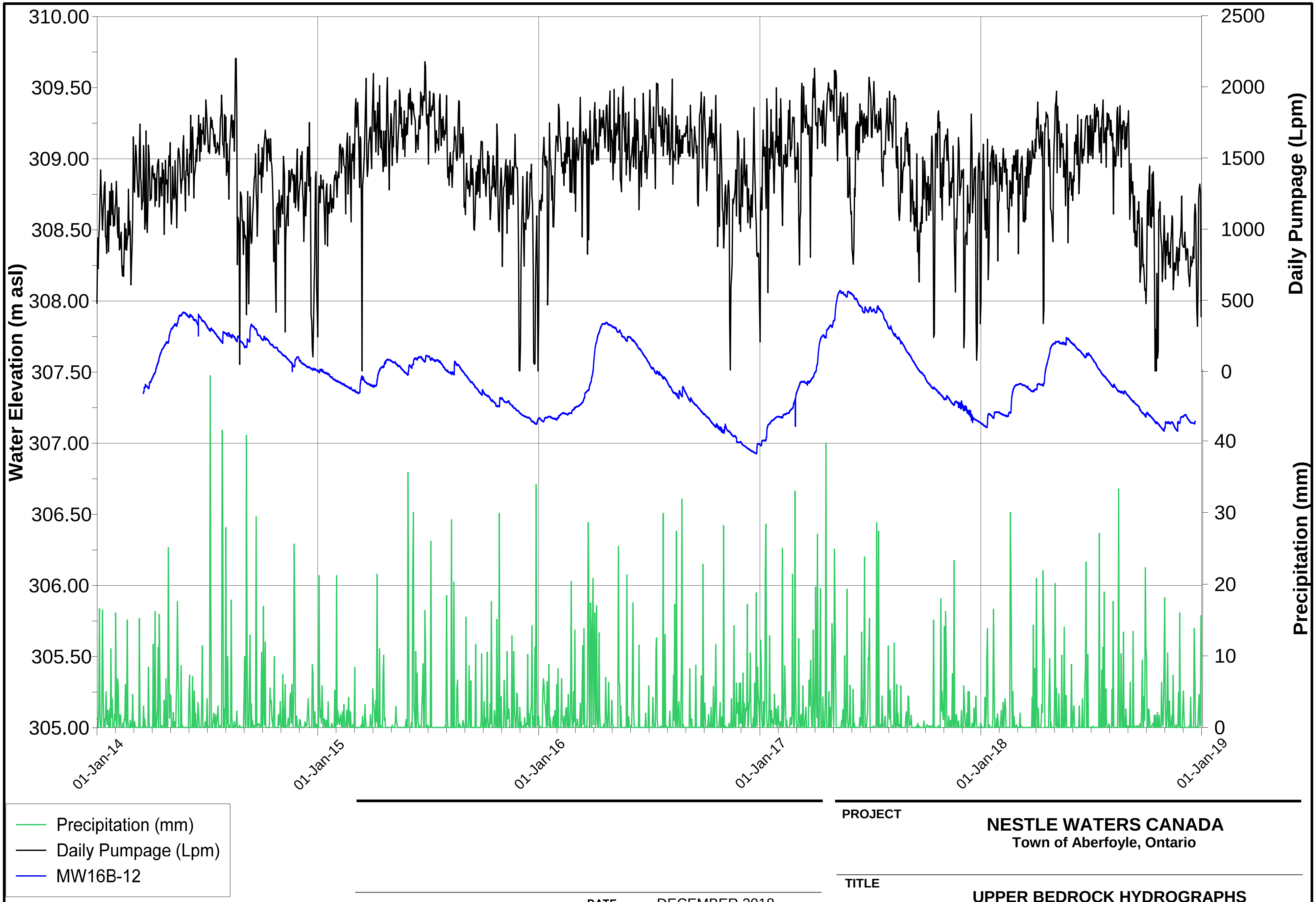
TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D24



GOLDER

DATE DECEMBER 2018
DESIGN JH
REVIEW GP
APPROVED GP

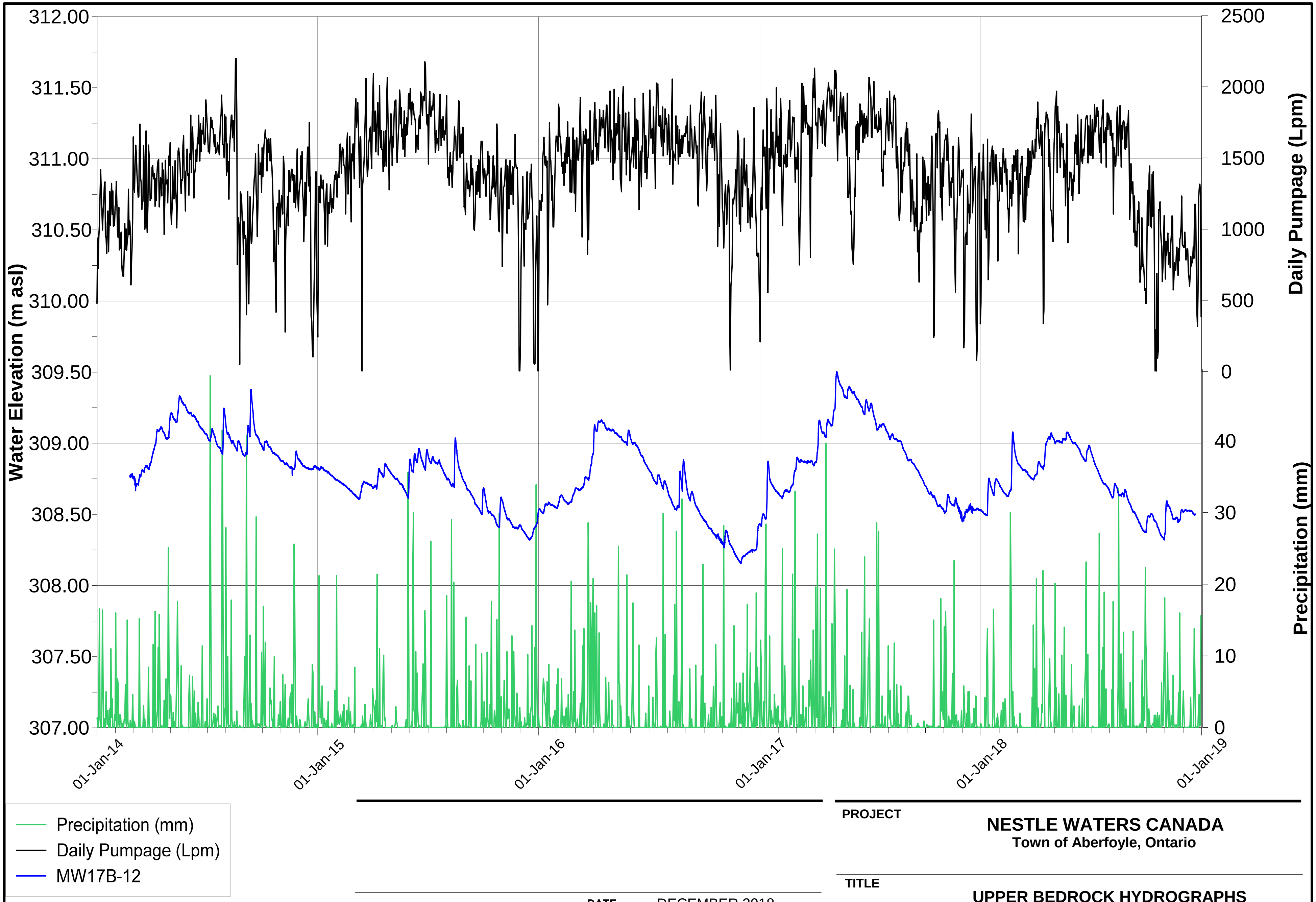
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO. 13-1152-0250 (1000)
REV A
FIGURE D25



DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

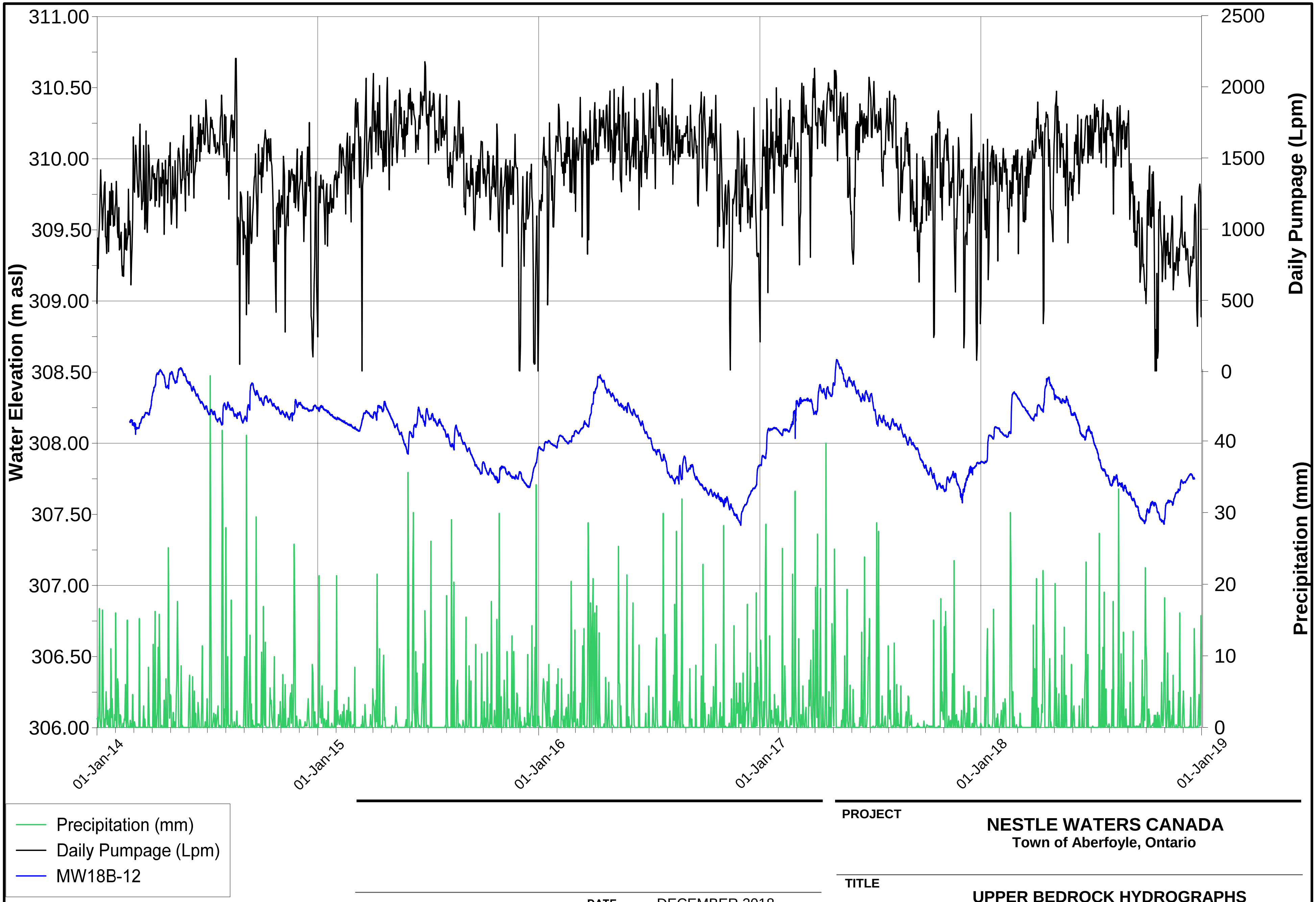
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D26



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

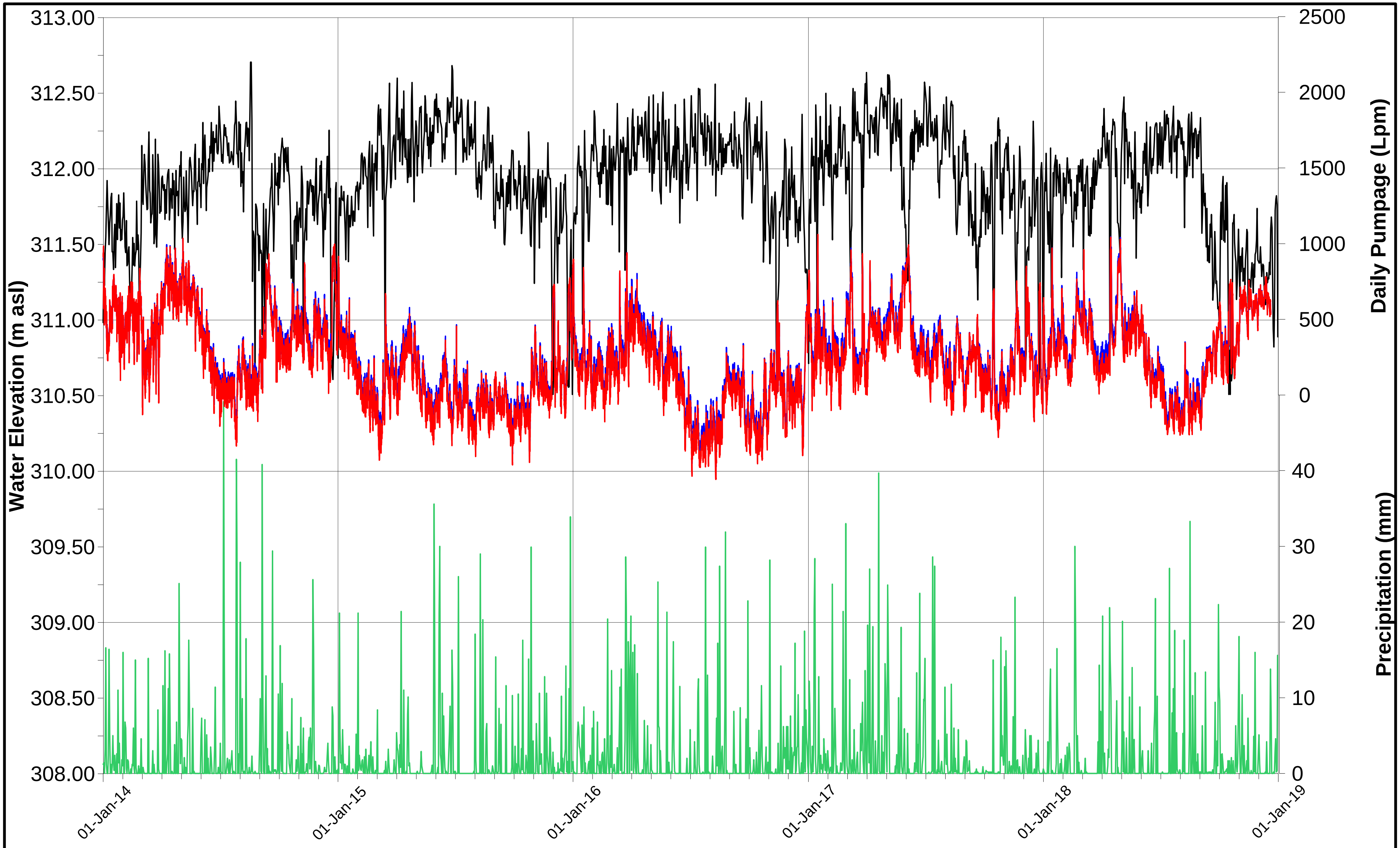
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D27



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

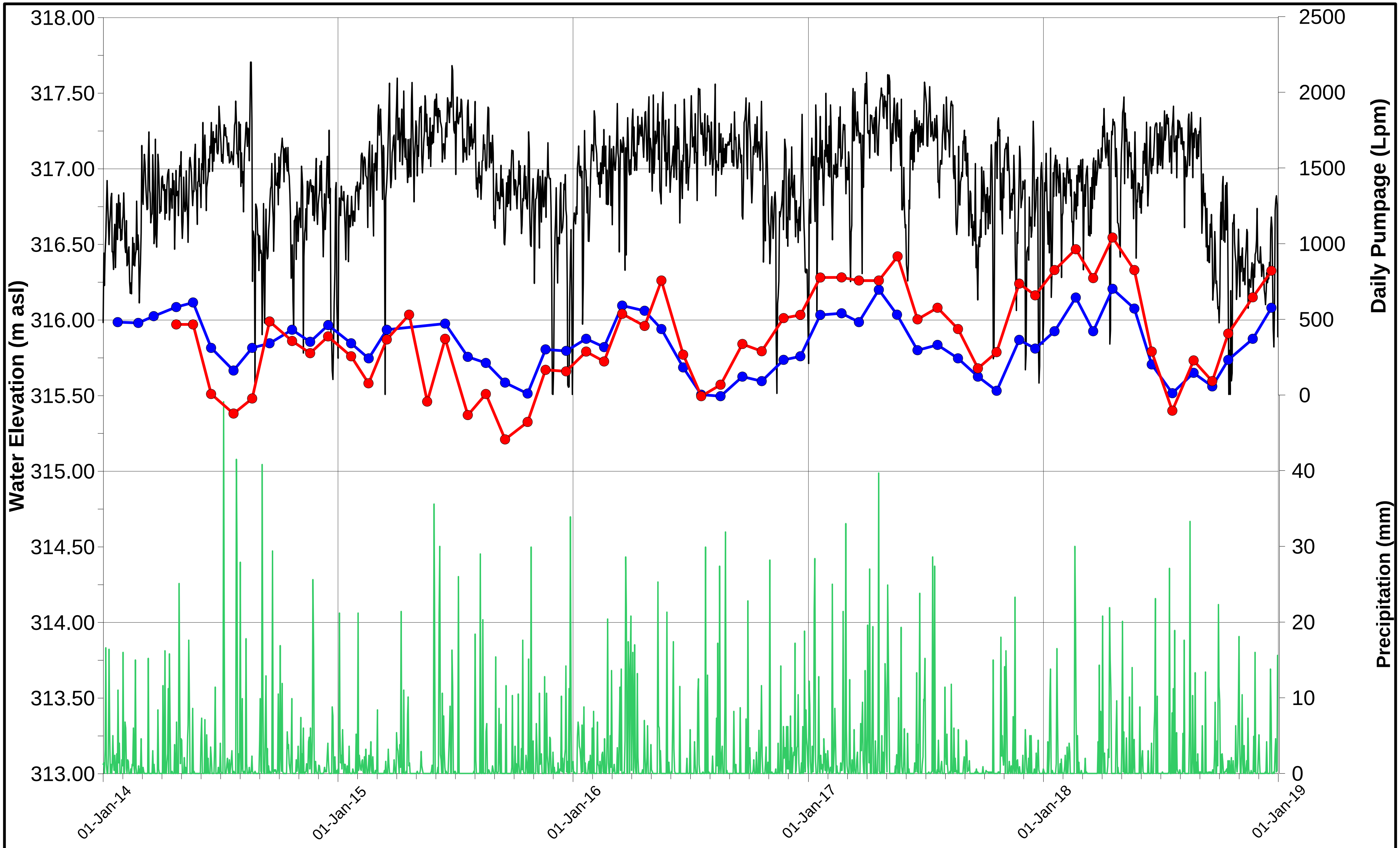
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D28



▬	Precipitation (mm)
▬	Daily Pumpage (Lpm)
●—●	2 Brock Rd N
●—●	7404 County Rd 34 (67-07589)

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

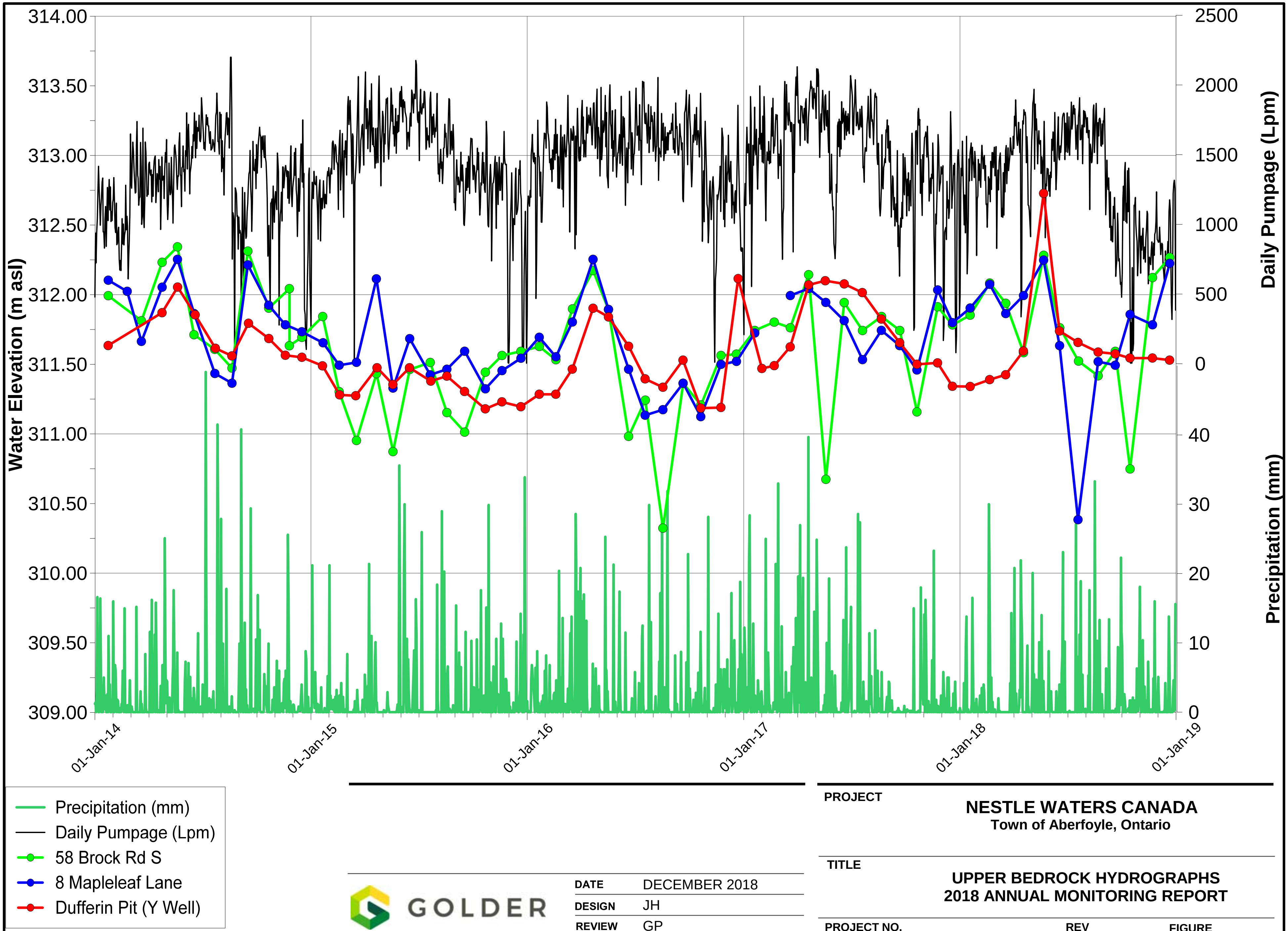
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D29



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

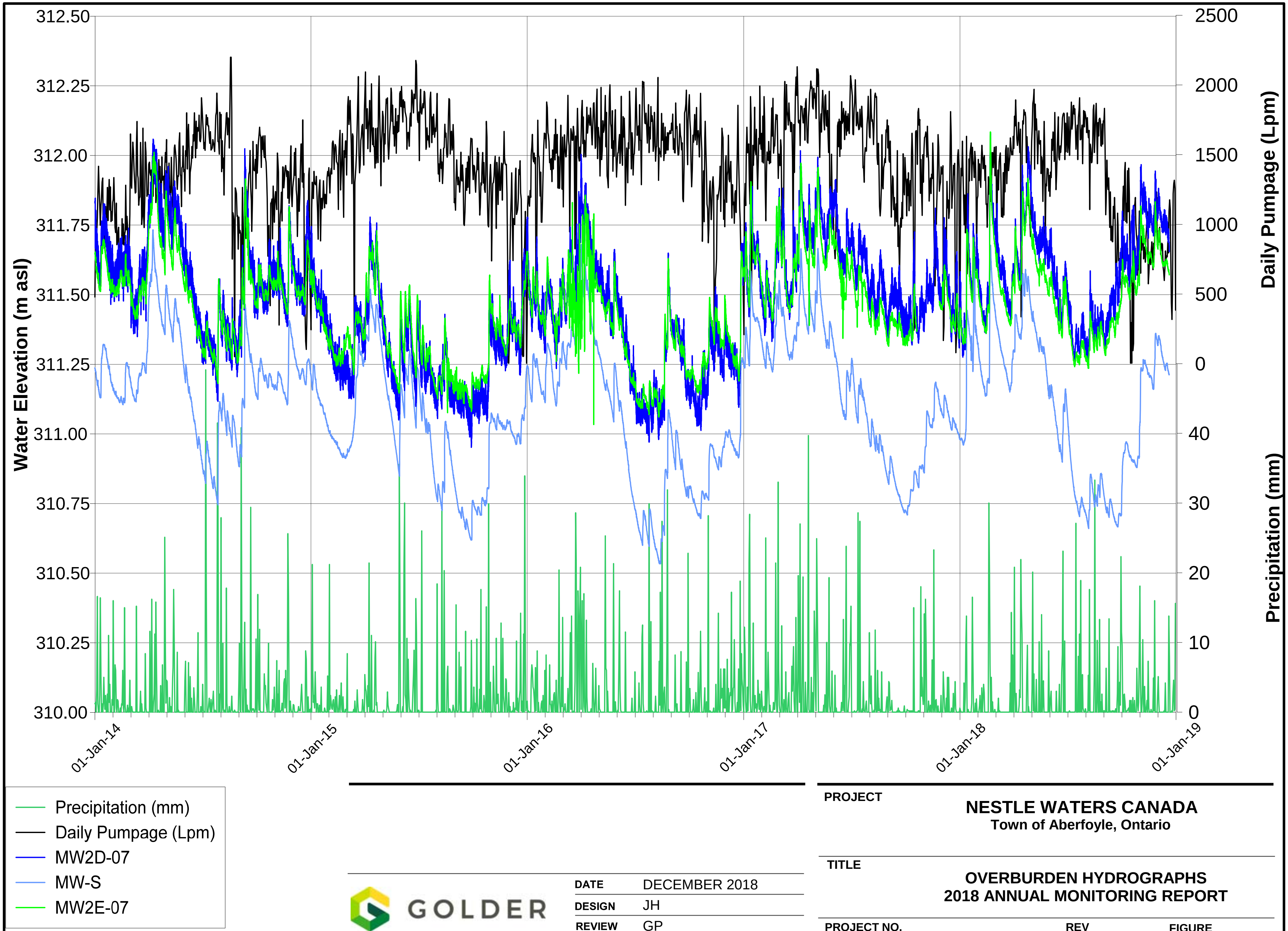
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

UPPER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D30



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

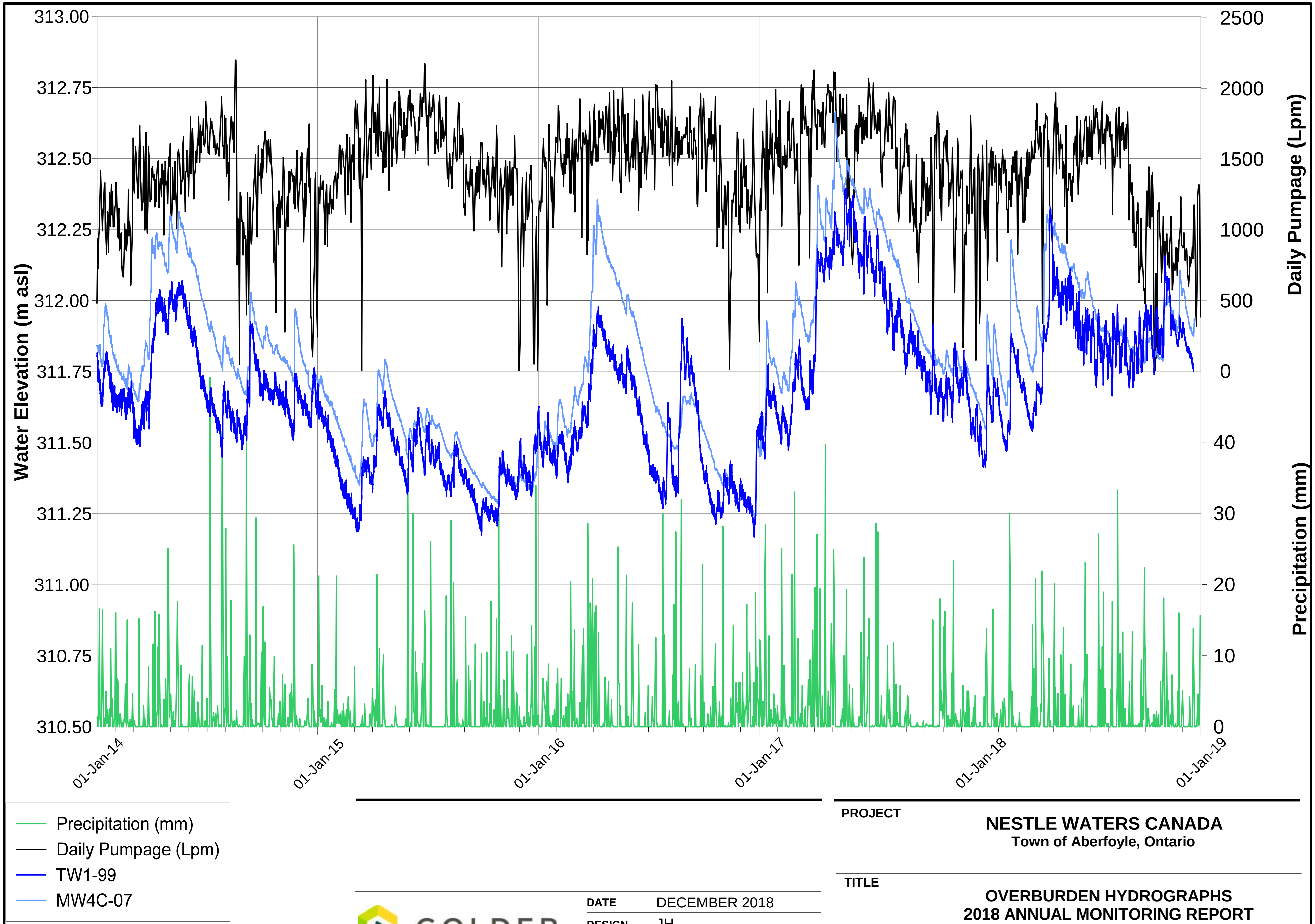
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

OVERBURDEN HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D31



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

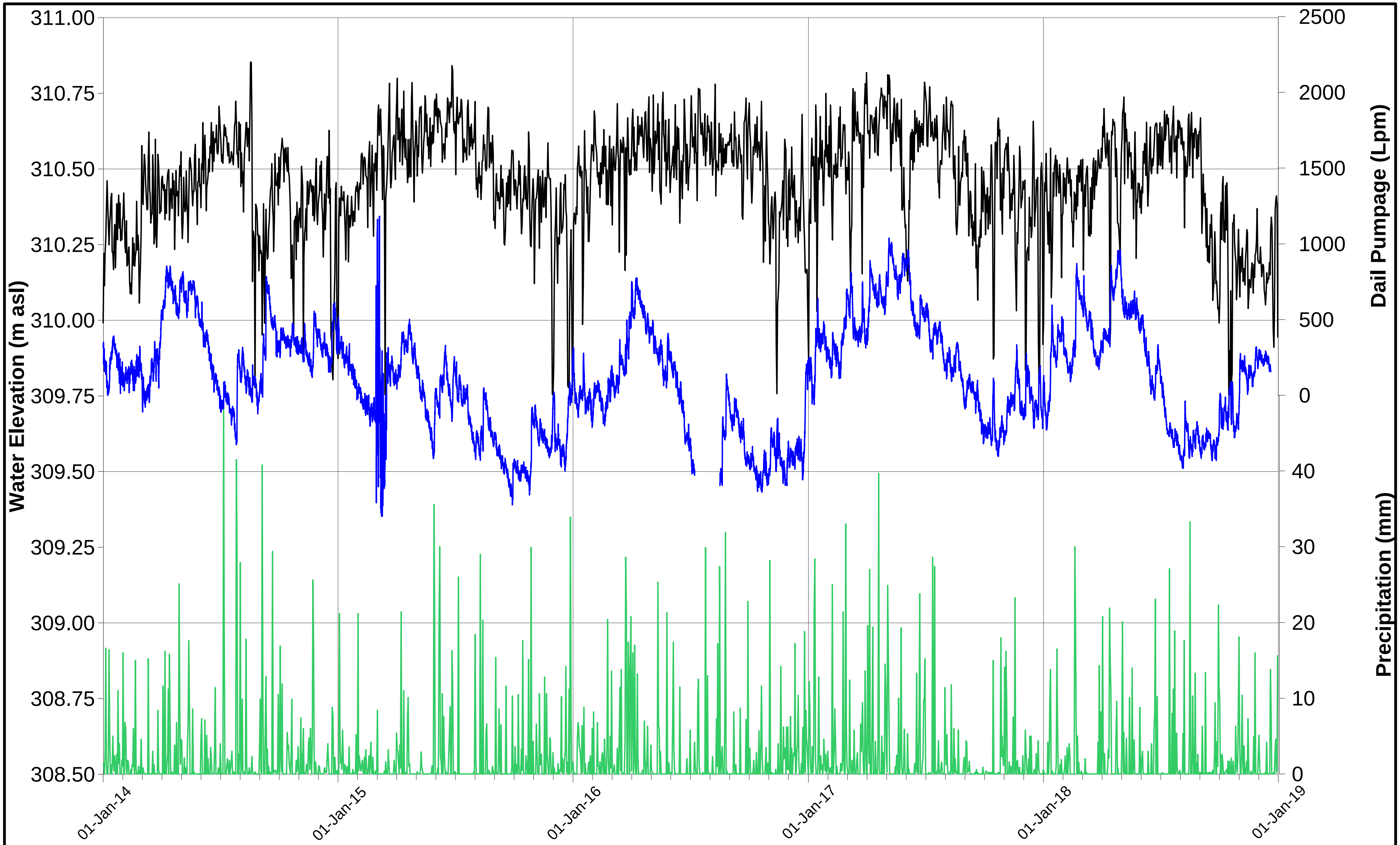
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

OVERBURDEN HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D32



🟩	Precipitation (mm)
■	Daily Pumpage (Lpm)
🟦	TW1-93

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

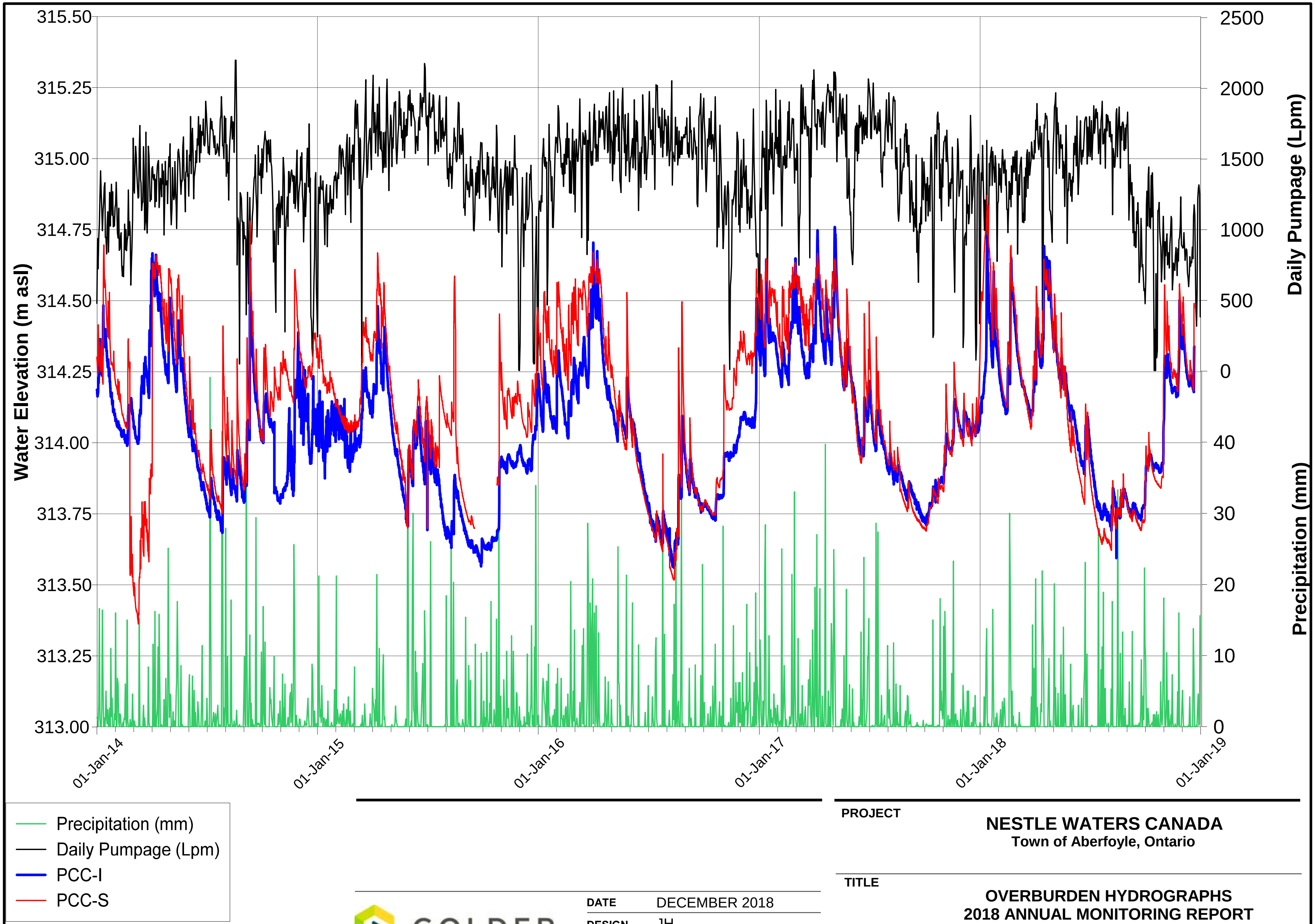
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

OVERBURDEN HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D33



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

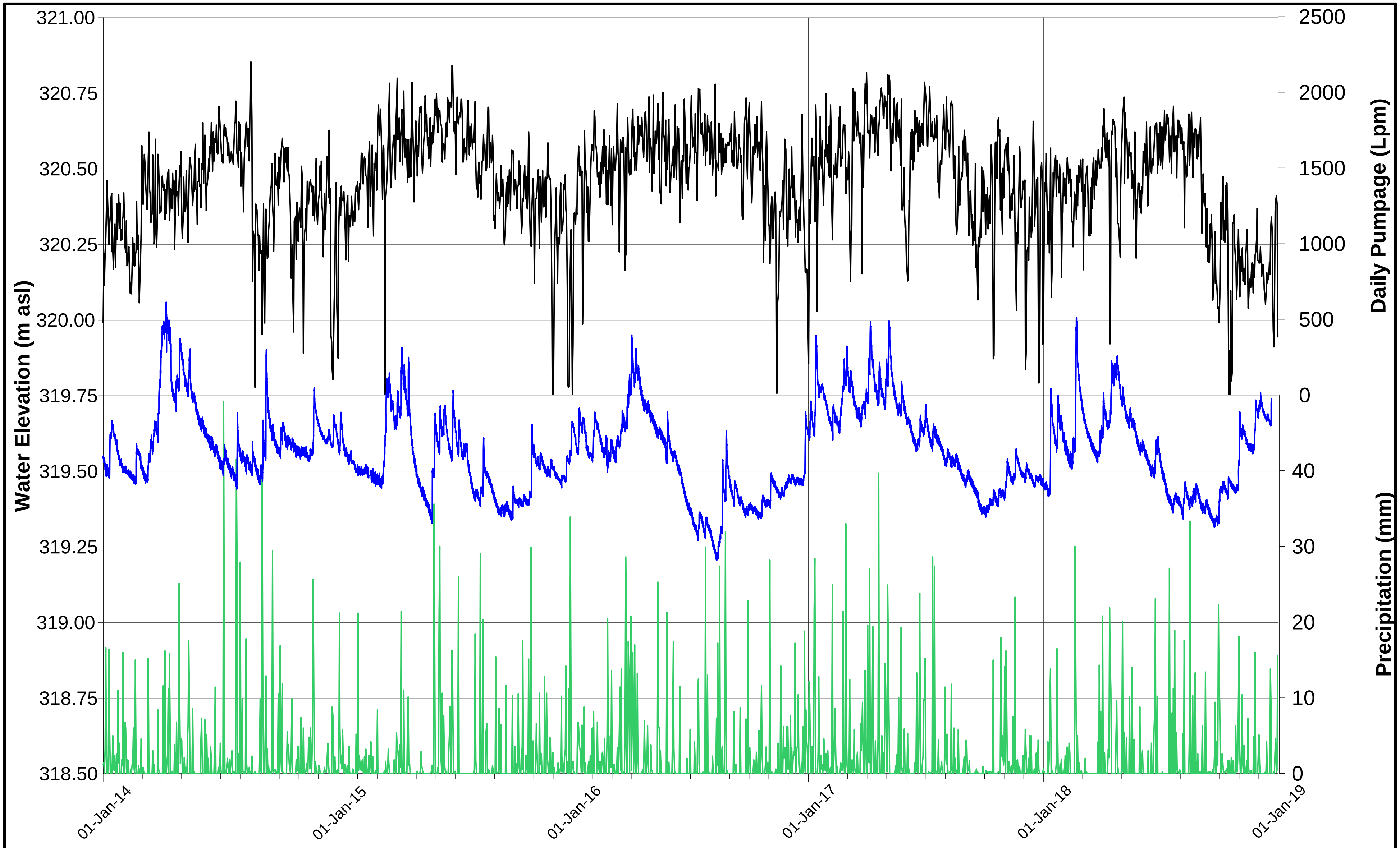
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

OVERBURDEN HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D34



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

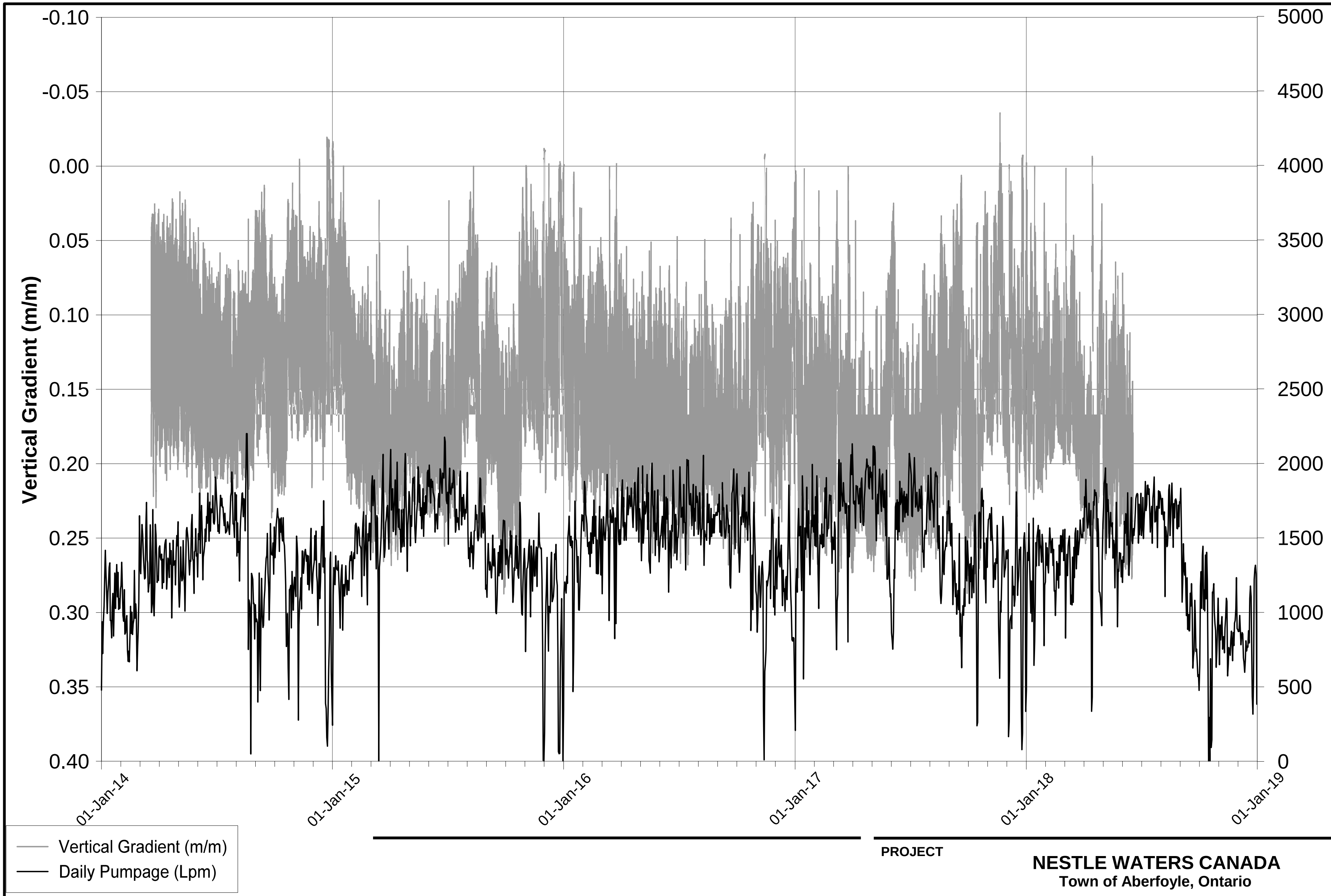
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

OVERBURDEN HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D35



Note: Vertical gradient between MW2C-07 and MW2A-07

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

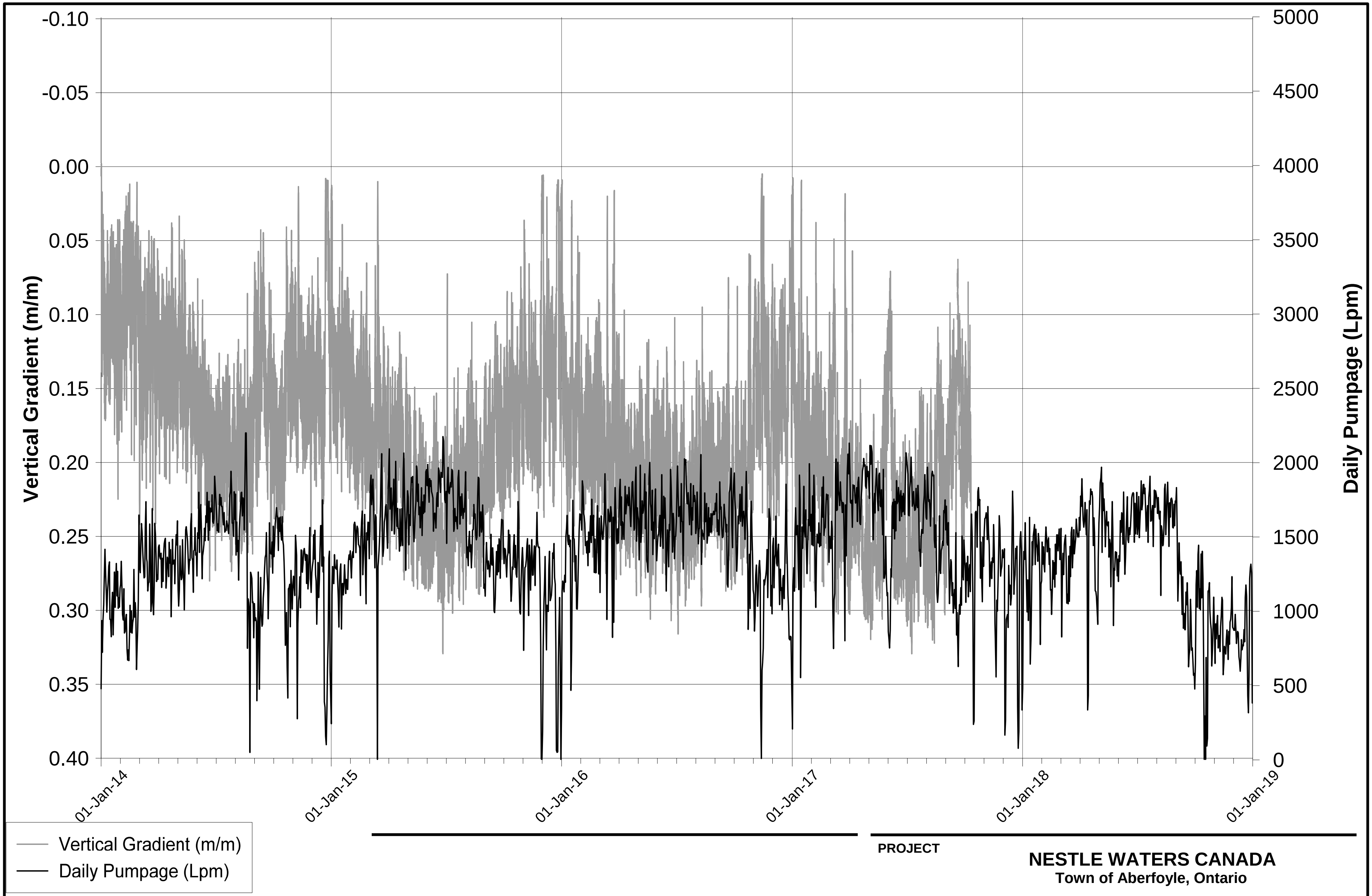
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW2 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D36



Note: Vertical gradient between MW4B-07 and MW4A-07

GOLDER

DATE DECEMBER 2018
DESIGN JH
REVIEW GP
APPROVED GP

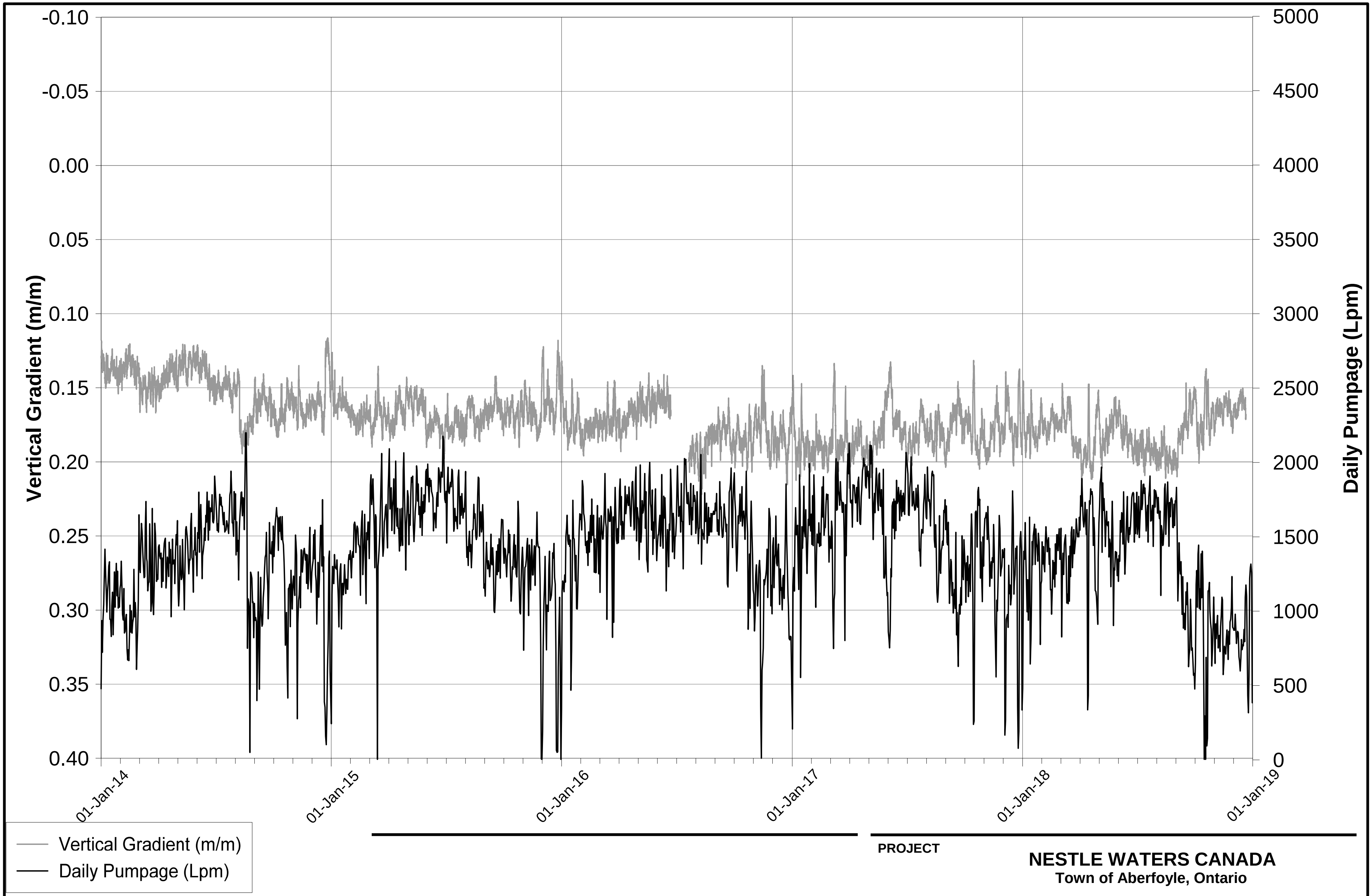
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW4 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D37



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

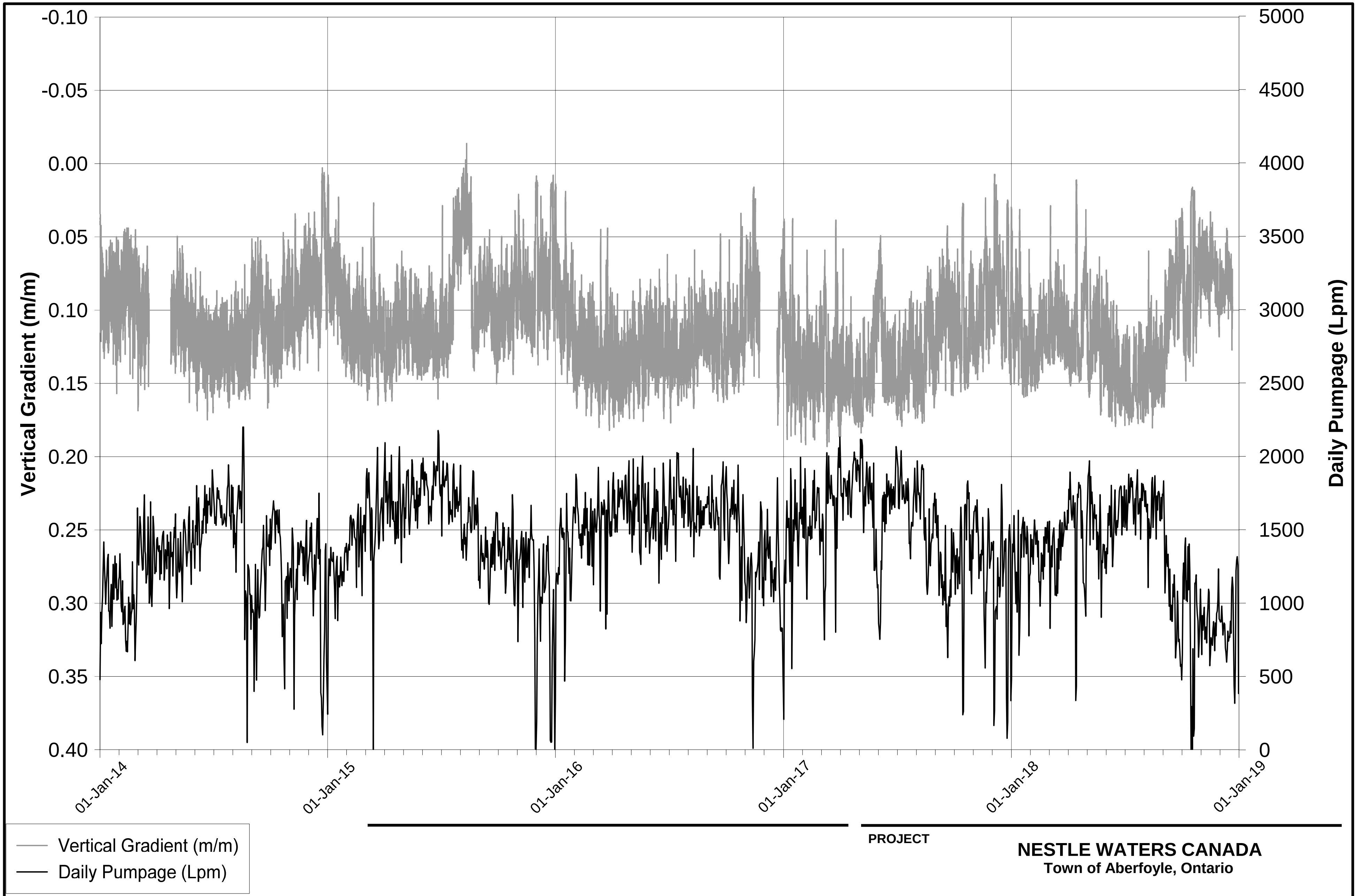
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW6 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D38



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

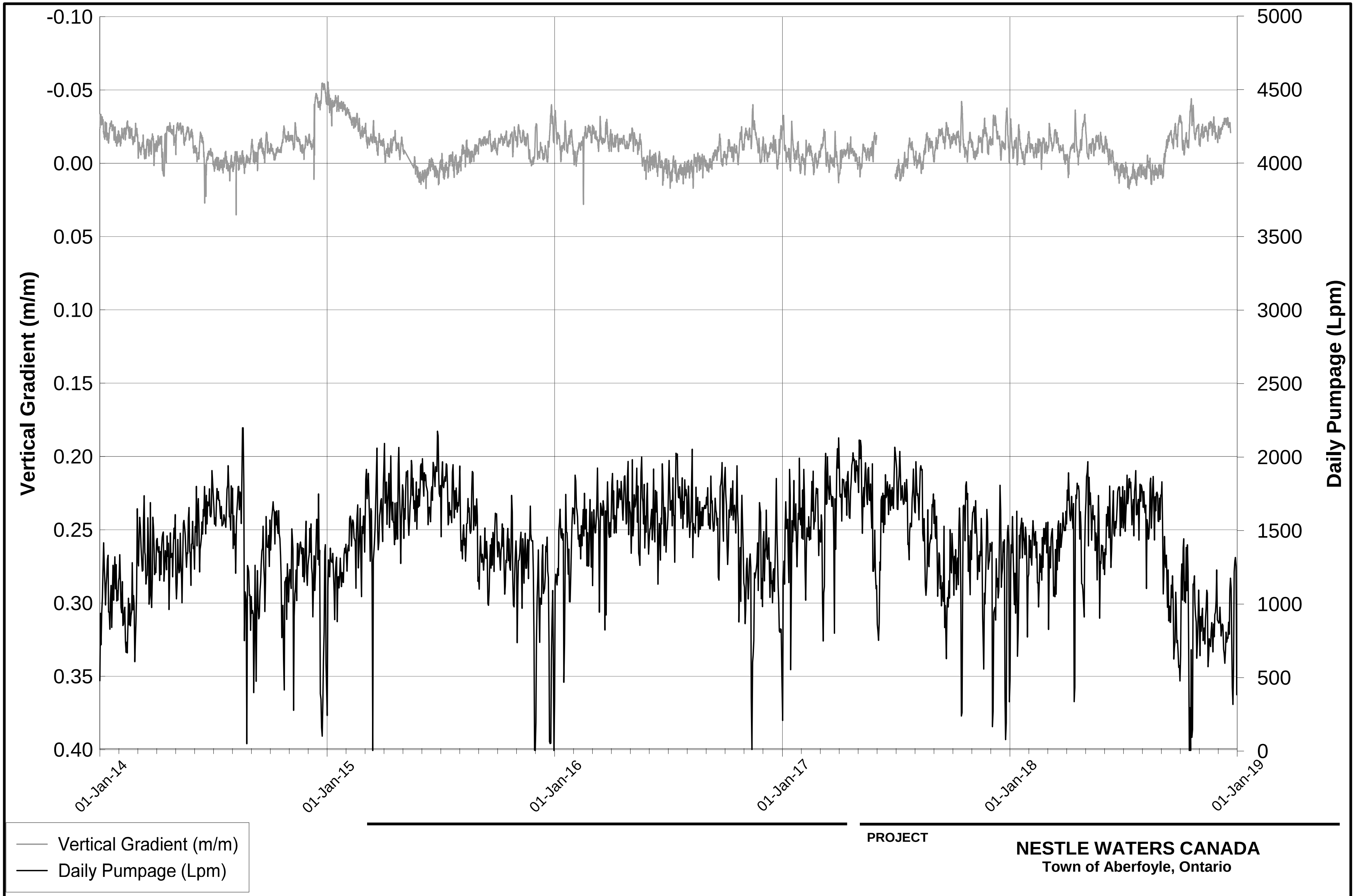
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW7 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D39



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

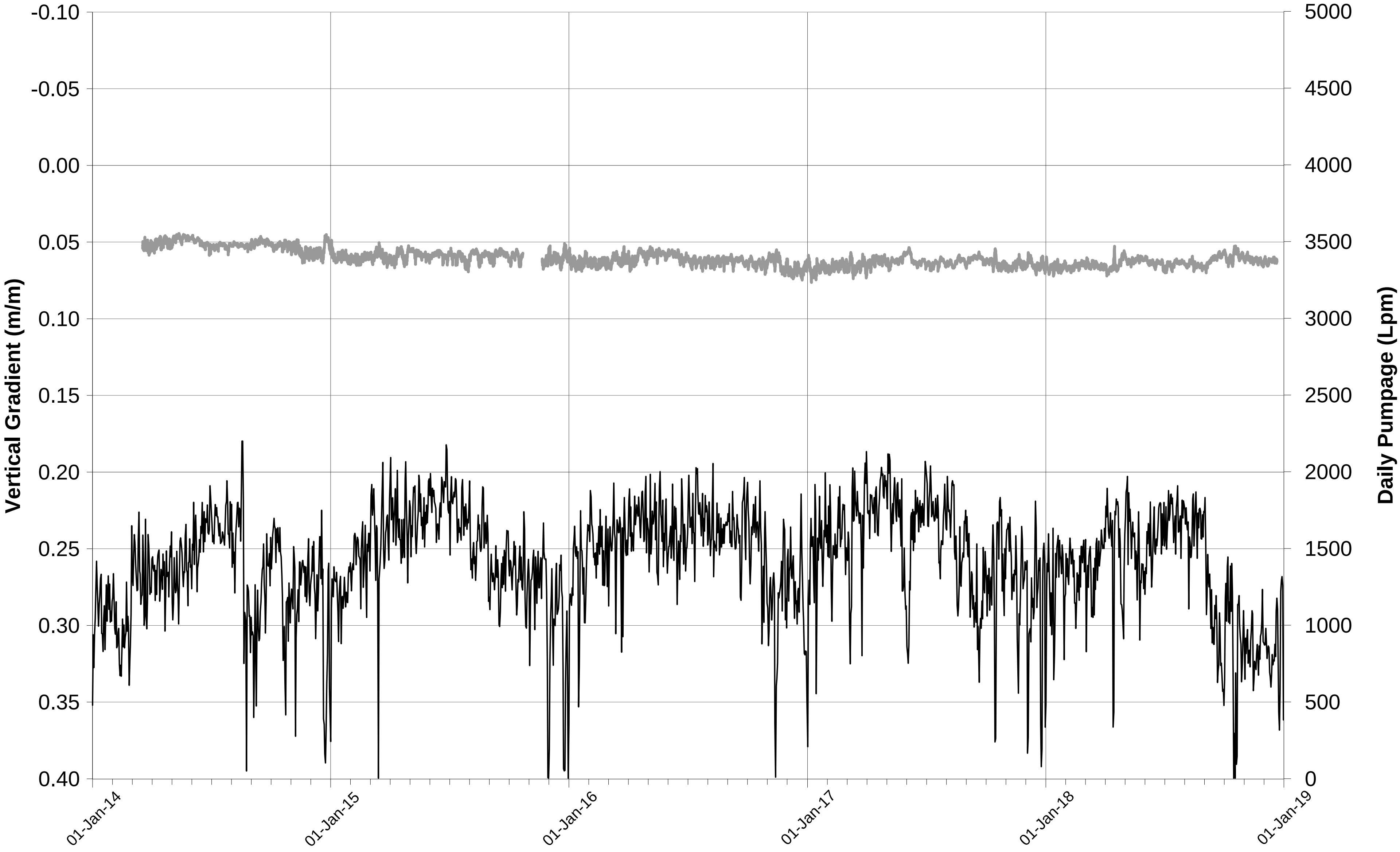
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW8 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D40



—	Vertical Gradient (m/m)
—	Daily Pumpage (Lpm)

Note: Vertical gradient between MW10B-09 and MW10C-09

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

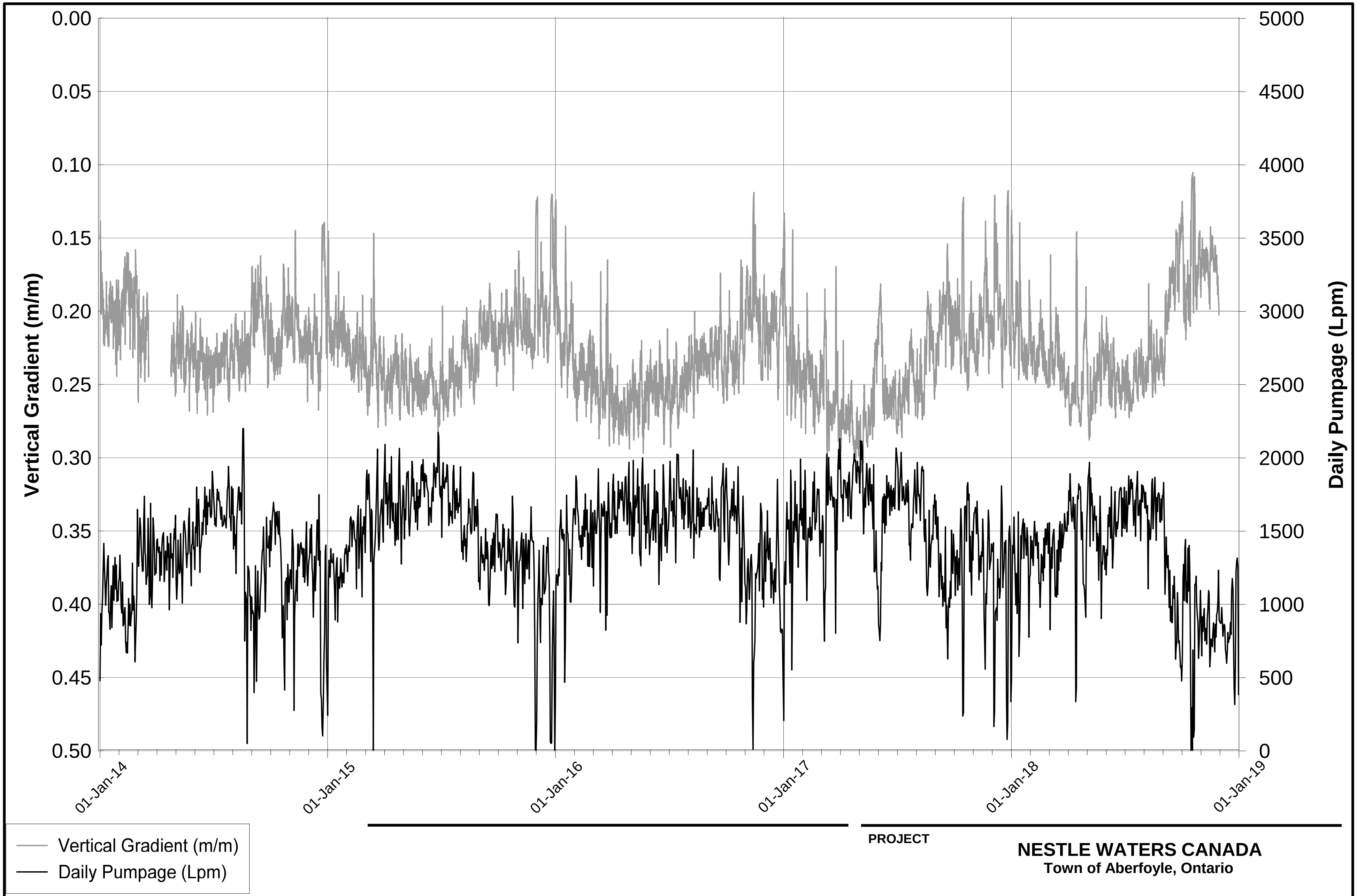
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW10 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D41



Note: Vertical gradient between MW14C-11 and MW14A-11

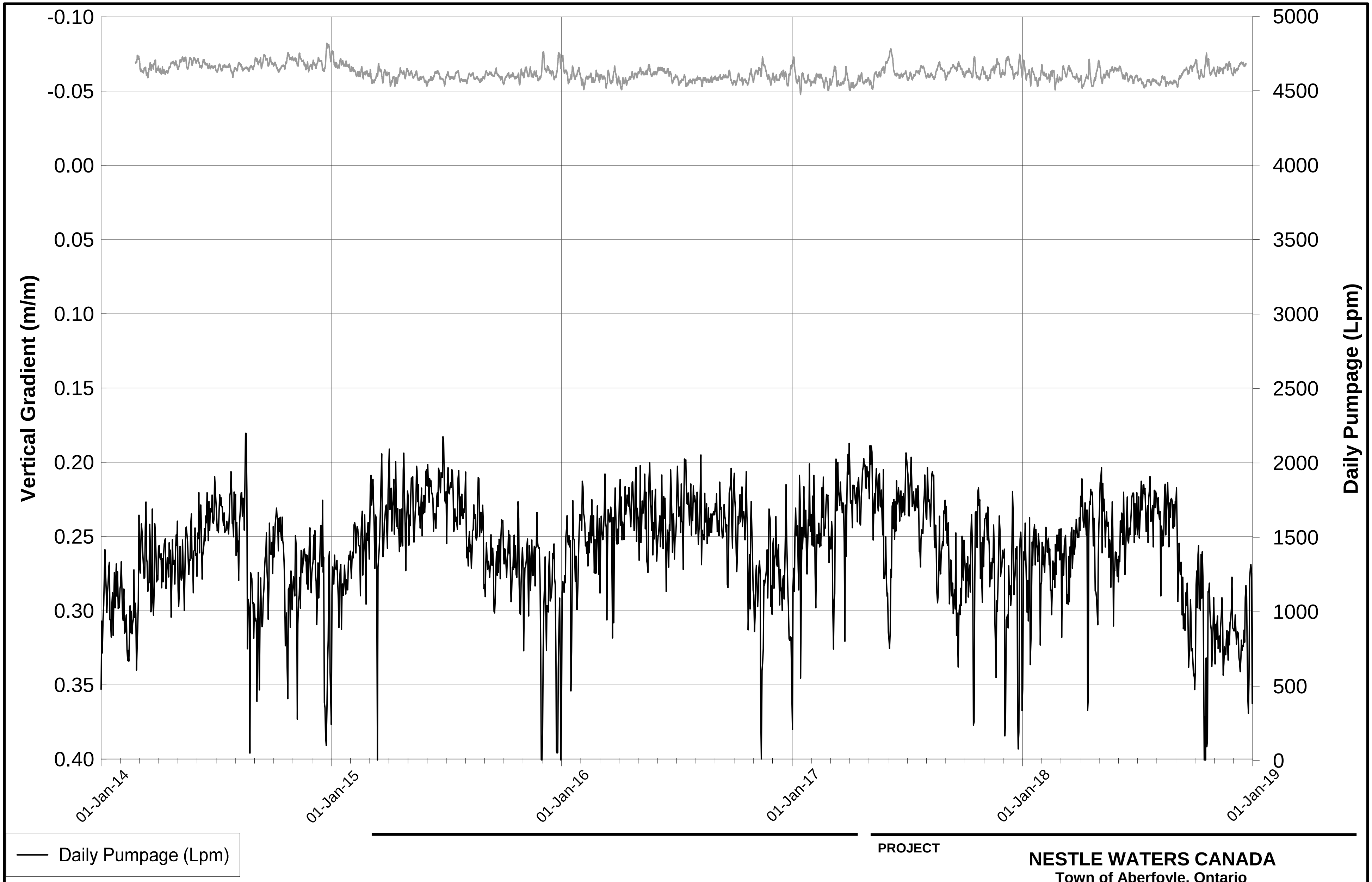
GOLDER

DATE DECEMBER 2018
DESIGN JH
REVIEW GP
APPROVED GP

PROJECT
NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE
MW14 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D42



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

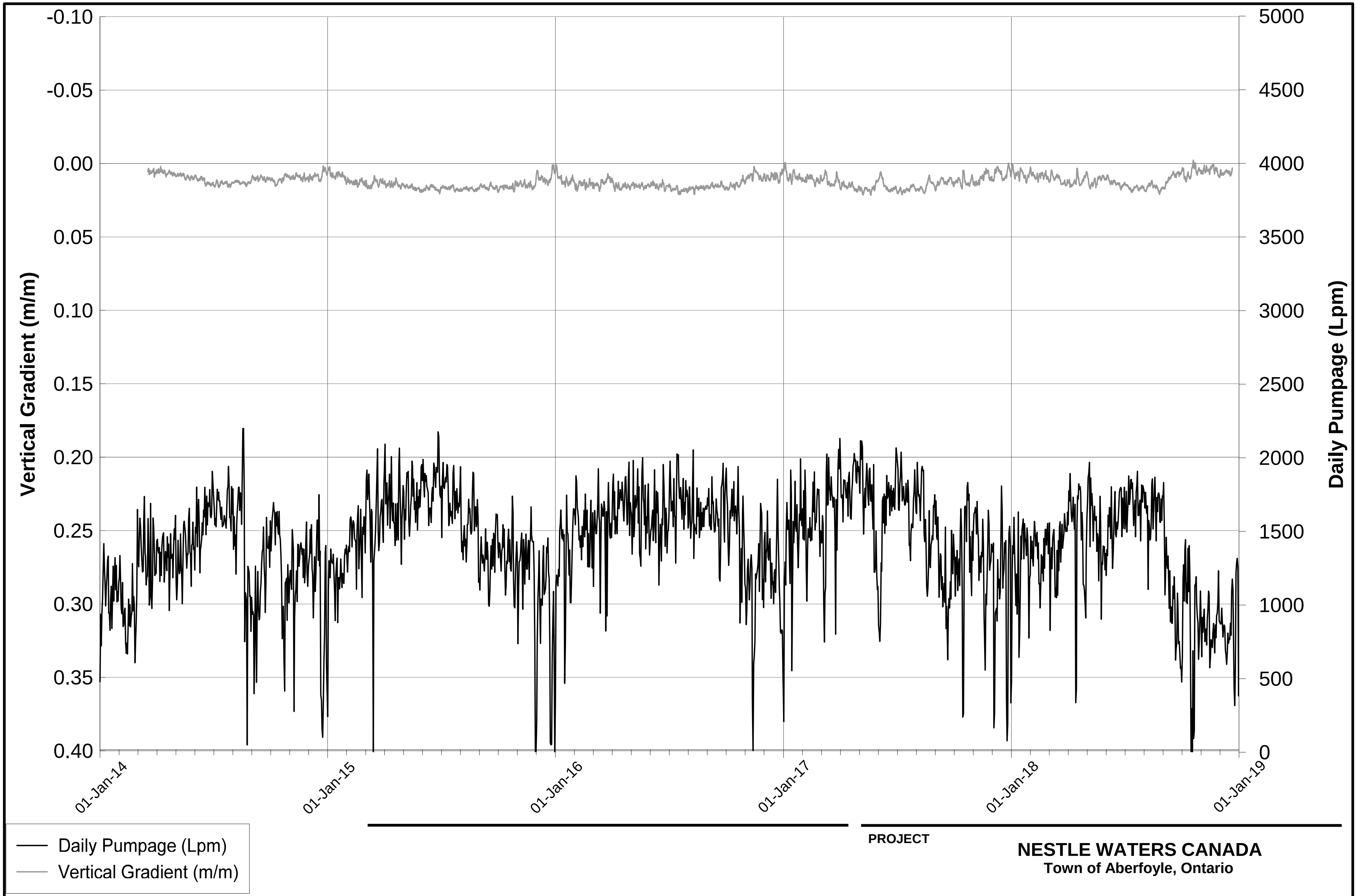
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW15 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D43



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

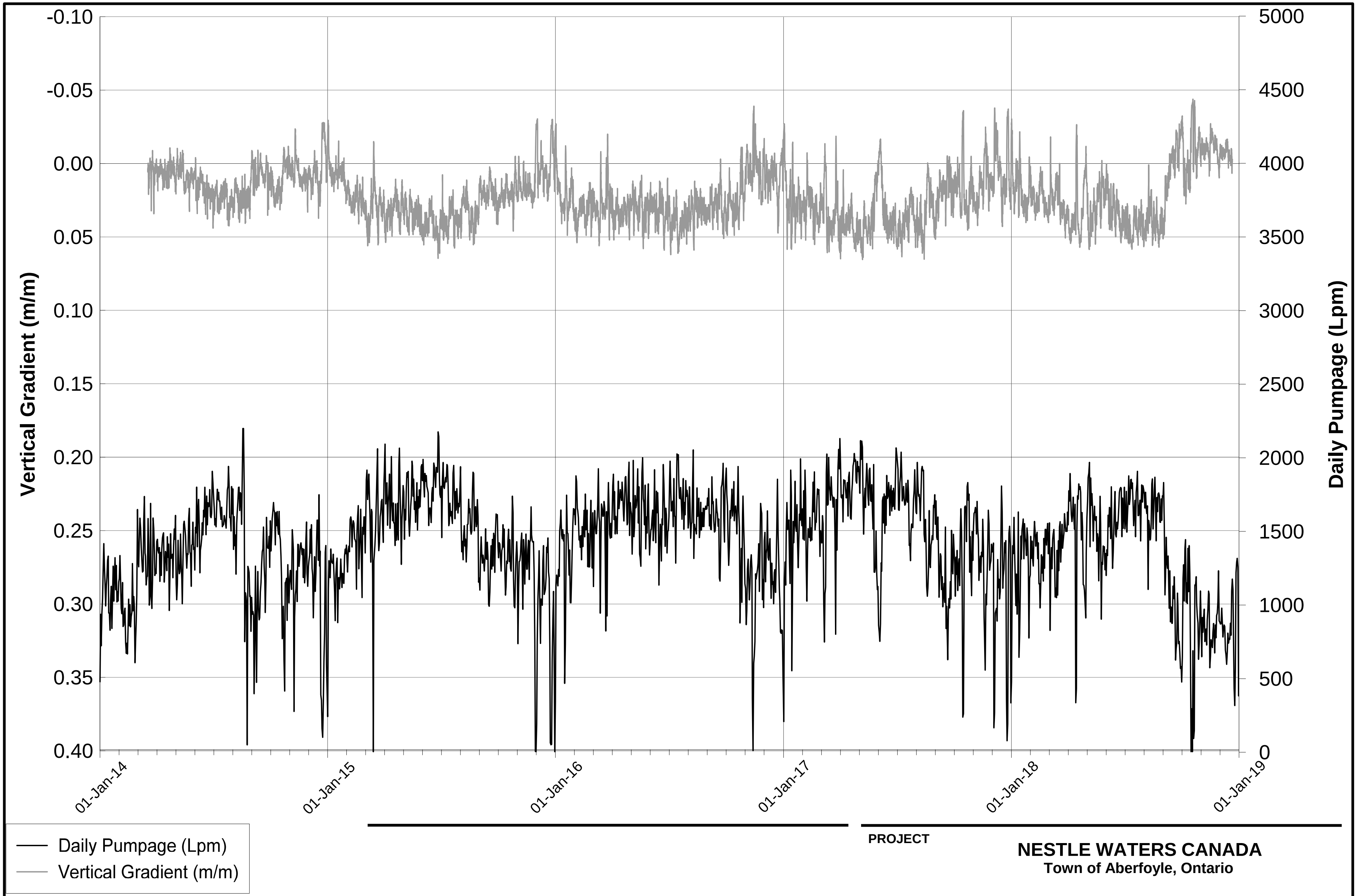
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW16 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	D44



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

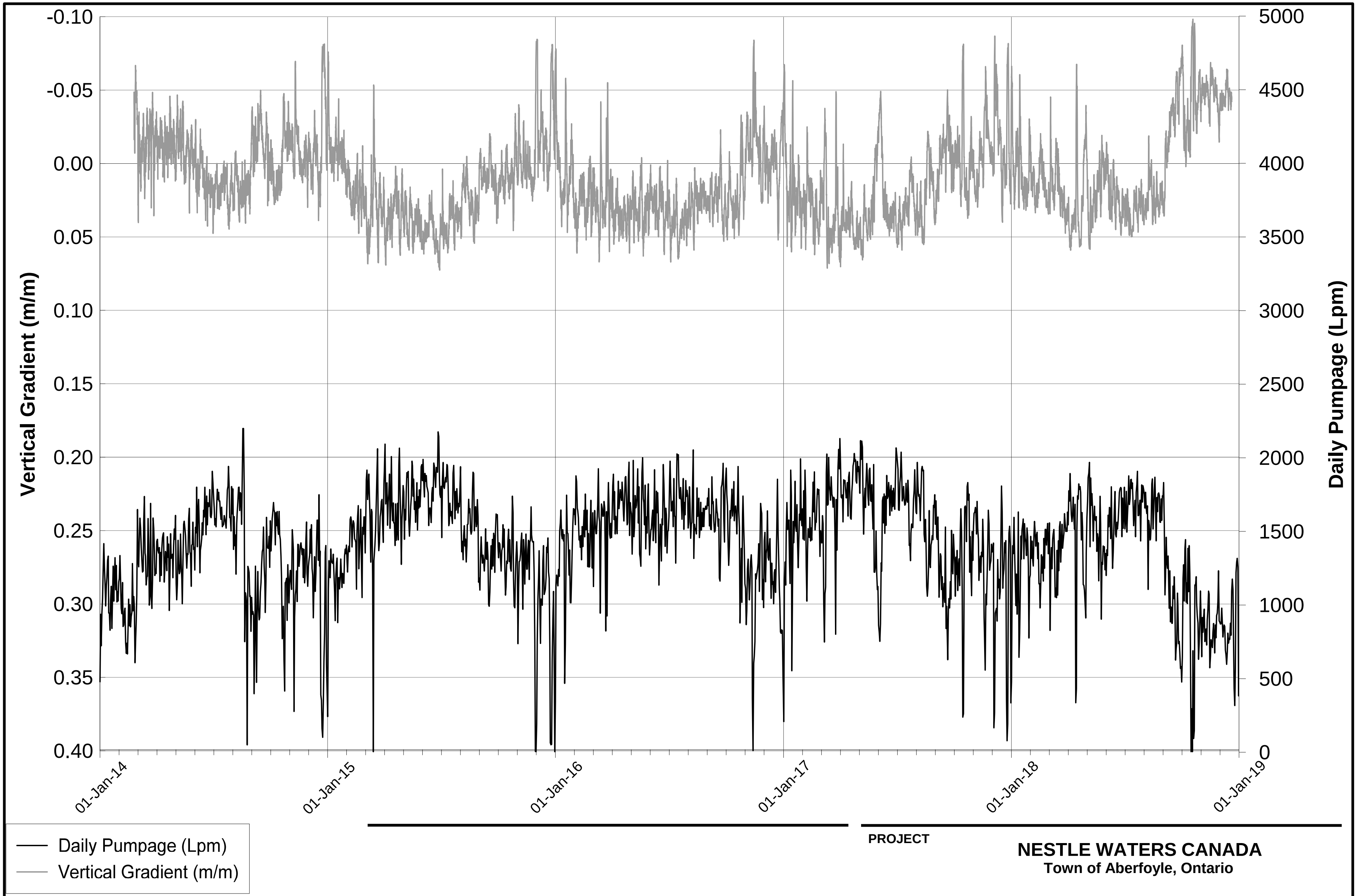
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW17 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D45



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MW18 VERTICAL GRADIENT
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D46

TABLE D1
Manual Groundwater Elevations
2018 Annual Report

Date	Water Level (masl)							
	TW3-80	MW02A-07	MW02B-07	MW02C-07	MW02D-07	MW02E-07	MW04A-07	MW04B-07
18-Jan-18	302.45	307.70	308.72	310.84	311.58	311.54	308.64	311.67
20/22-Feb-18	304.85	308.18	309.15	311.18	311.95	311.98	309.04	311.82
18/19/20-Mar-18	303.35	308.90	309.19	310.76	311.52	311.46	307.85	311.82
18/19-Apr-18	305.04	306.89	308.13	310.84	311.76	311.73	307.72	311.94
22/23-May-18	303.24	306.56	307.85	310.71	311.66	311.59	309.00	312.21
18/19-Jun-18	302.47	307.12	308.27	310.71	311.49	311.41	307.91	312.01
19/20-Jul-18	303.99	306.27	307.42	310.35	311.31	311.27	307.87	311.86
22/23/27-Aug-18	303.44	306.64	307.71	310.42	311.40	311.36	307.89	311.82
18/20-Sep-18	308.58	308.84	309.61	310.99	311.49	311.38	309.24	311.78
15/16-Oct-18	311.20	311.43	311.49	311.62	311.69	311.54	310.93	311.85
22/23-Nov-18	307.75	309.92	310.43	311.41	311.74	311.61	310.37	311.89
20/21-Dec-18	306.71	308.09	308.92	311.00	311.65	311.57	310.10	311.93

TABLE D1
Manual Groundwater Elevations
2018 Annual Report

Date	Water Level (masl)							
	MW04C-07	MW06A-08	MW06B-08	MW07A-08	MW07B-08	MW08A-08	MW08B-08	MW10A-09
18-Jan-18	311.81	315.34	318.50	308.46	310.38	317.52	317.30	319.68
20/22-Feb-18	312.05	315.57	318.72	309.38	311.00	317.57	317.56	319.79
18/19/20-Mar-18	311.83	315.49	318.40	309.22	310.69	317.48	317.25	319.57
18/19-Apr-18	312.18	315.23	318.79	308.28	310.44	317.70	317.53	319.92
22/23-May-18	312.19	315.75	318.59	310.78	311.01	317.67	317.38	319.81
18/19-Jun-18	312.01	315.07	318.30	308.47	310.29	317.03	317.09	319.49
19/20-Jul-18	311.90	314.87	318.27	307.99	310.03	316.81	316.96	319.38
22/23/27-Aug-18	311.91	315.02	318.36	308.17	310.08	317.03	317.07	319.49
18/20-Sep-18	311.79	315.06	318.05	309.25	310.61	317.14	316.96	319.37
15/16-Oct-18	311.82	315.16	318.36	310.85	311.56	317.33	317.13	319.46
22/23-Nov-18	311.90	315.45	318.38	310.32	311.35	317.57	317.23	319.56
20/21-Dec-18	311.94	315.56	318.54	310.57	311.62	317.71	317.38	319.74

TABLE D1
Manual Groundwater Elevations
2018 Annual Report

Date	Water Level (masl)							
	MW10B-09	MW10C-09	MW10D-09	MW14A-11	MW14B-11	MW14C-11	MW15A-12	MW15B-12
18-Jan-18	319.66	316.83	316.26	309.66	313.91	314.37	310.60	308.42
20/22-Feb-18	319.84	317.03	316.48	309.89	314.08	314.73	310.57	308.46
18/19/20-Mar-18	319.66	316.94	316.36	309.22	313.82	314.56	310.55	308.35
18/19-Apr-18	319.89	317.04	316.44	309.43	314.10	314.89	310.71	308.58
22/23-May-18	319.77	317.25	316.76	310.34	314.11	314.92	310.66	308.89
18/19-Jun-18	319.64	316.94	316.43	309.36	313.67	314.48	310.28	308.30
19/20-Jul-18	319.48	316.89	316.33	309.09	313.38	314.11	310.19	308.23
22/23/27-Aug-18	319.55	316.82	316.26	309.31	313.41	313.97	310.15	308.23
18/20-Sep-18	319.46	316.83	316.28	309.70	313.39	313.82	310.32	308.17
15/16-Oct-18	319.53	316.87	316.30	310.14	313.57	313.90	310.29	308.19
22/23-Nov-18	319.59	316.89	316.28	310.43	313.83	314.07	310.50	308.17
20/21-Dec-18	319.69	317.06	316.47	310.33	314.02	314.31	310.68	308.31

TABLE D1
Manual Groundwater Elevations
2018 Annual Report

Date	Water Level (masl)							
	MW16A-12	MW16B-12	MW17A-12	MW17B-12	MW18A-12	MW18B-12	MW-D	MW-I
18-Jan-18	307.05	307.20	308.19	308.69	307.90	308.05	310.90	310.83
20/22-Feb-18	307.04	307.27	308.11	308.69	307.89	308.16	311.20	311.15
18/19/20-Mar-18	307.11	307.39	308.11	308.79	307.83	308.21	310.88	310.83
18/19-Apr-18	307.21	307.52	307.82	308.98	307.44	308.38	310.91	310.81
22/23-May-18	307.44	308.06	308.86	309.32	308.54	308.45	311.04	311.00
18/19-Jun-18	307.22	307.63	308.17	308.91	307.65	308.04	310.65	310.63
19/20-Jul-18	307.02	307.50	307.66	308.79	307.30	307.82	310.41	310.35
22/23/27-Aug-18	306.86	307.37	307.77	308.66	307.46	307.71	310.46	310.39
18/20-Sep-18	306.98	307.25	308.26	308.44	306.31	307.53	310.71	310.69
15/16-Oct-18	306.89	307.16	308.41	308.46	308.43	307.58	310.98	310.98
22/23-Nov-18	307.01	307.09	308.72	308.47	308.66	307.66	310.98	310.98
20/21-Dec-18	307.05	307.16	308.58	308.50	308.64	308.03	310.61	311.04

TABLE D1
Manual Groundwater Elevations
2018 Annual Report

Date	Water Level (masl)							
	MW-S	PCC-D	PCC-I	PCC-S	TW1-93	TW1-99	TW2-11	PW5 Meadows of Aberfoyle
18-Jan-18	311.34	Frozen	314.40	Frozen	309.89	311.65	309.55	309.57
20/22-Feb-18	311.63	Frozen	314.52	Frozen	309.99	311.68	309.70	309.72
18/19/20-Mar-18	311.23	Frozen	314.13	314.13	309.93	311.62	309.41	309.73
18/19-Apr-18	311.51	314.44	314.59	315.19	310.07	311.87	309.08	308.88
22/23-May-18	311.30	314.57	314.24	313.79	310.08	311.97	309.43	310.22
18/19-Jun-18	310.96	314.21	313.92	313.84	309.80	311.82	309.18	308.88
19/20-Jul-18	310.73	314.02	313.75	313.72	309.61	311.87	309.05	308.62
22/23/27-Aug-18	310.81	314.07	313.82	313.83	309.64	311.77	308.95	308.74
18/20-Sep-18	310.70	314.00	313.73	313.71	309.58	311.83	309.49	309.78
15/16-Oct-18	310.92	314.21	313.92	313.89	309.71	311.79	311.01	311.28
22/23-Nov-18	310.92	314.48	314.18	314.24	309.80	311.85	310.43	310.73
20/21-Dec-18	311.21	314.64	314.34	314.48	309.83	312.45	310.21	310.68

TABLE D1
Manual Groundwater Elevations
2018 Annual Report

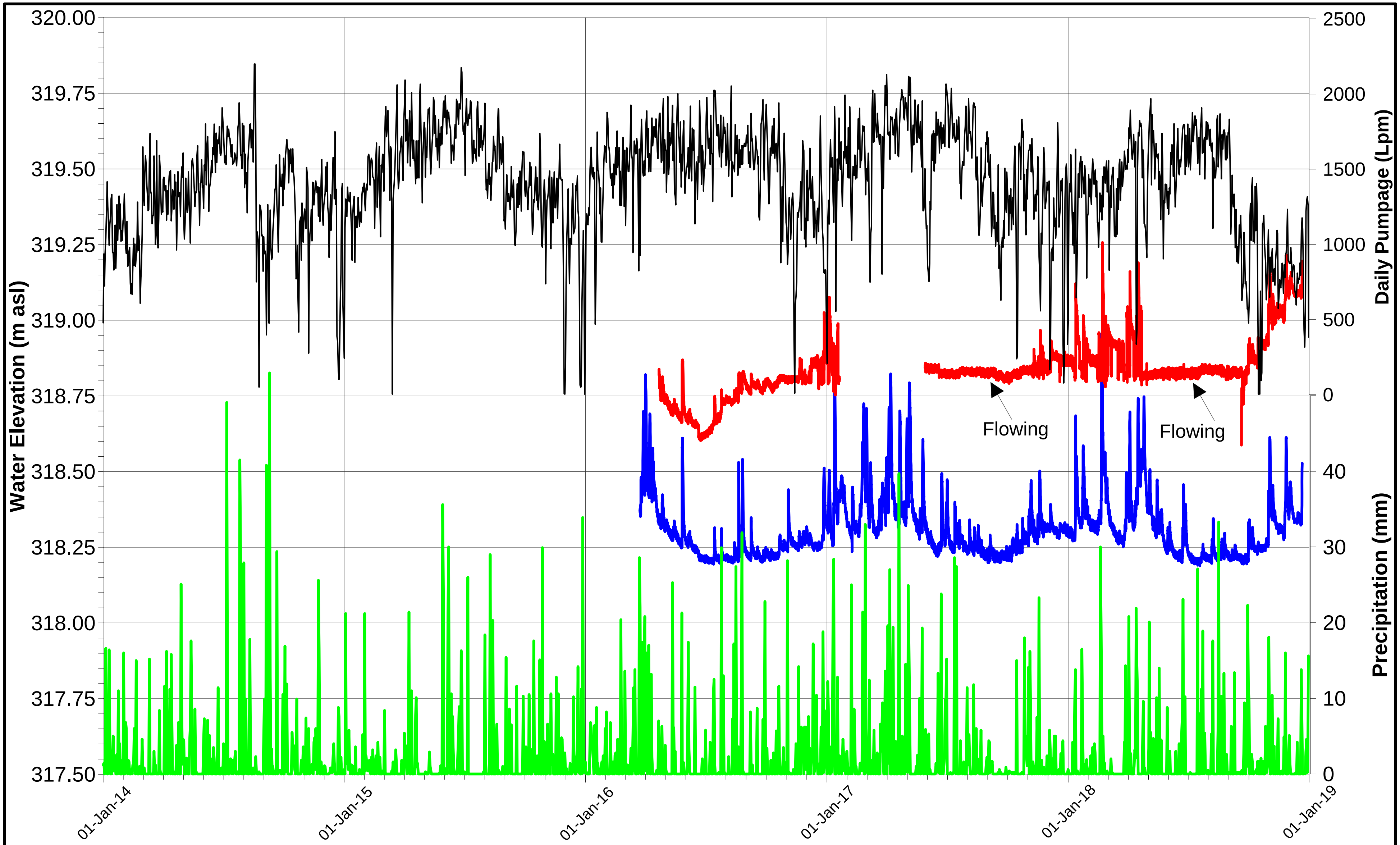
Date	Water Level (masl)							
	#125 Brock S. (Y Well)	#2 Brock N.	#27 Old Brock	#50 Brock S. (I Well)	#58 Brock S.	#7404 Rd. 34	#7425 Rd. 34 (B Well)	#8 Maple Leaf Lane
18-Jan-18	311.34	315.93	309.22	309.24	311.85	316.33	309.86	311.90
20/22-Feb-18	311.39	316.15	309.03	309.12	312.08	316.47	309.93	312.07
18/19/20-Mar-18	311.43	315.93	309.11	309.13	311.94	316.28	309.71	311.86
18/19-Apr-18	311.60	316.21	308.02	308.06	311.58	316.55	309.52	311.99
22/23-May-18	312.73	316.08	309.79	309.79	312.28	316.33	310.52	312.25
18/19-Jun-18	311.74	315.71	308.22	308.19	311.76	315.79	309.33	311.63
19/20-Jul-18	311.66	315.52	307.79	307.64	311.52	315.40	309.41	310.38
22/23/27-Aug-18	311.59	315.65	307.86	307.85	311.42	315.73	309.37	311.52
18/20-Sep-18	311.58	315.56	308.71	312.47	307.82	315.60	309.83	311.49
15/16-Oct-18	311.55	315.74	311.24	311.20	310.75	315.91	310.17	311.86
22/23-Nov-18	311.55	315.88	310.32	310.32	312.12	316.15	310.63	311.78
20/21-Dec-18	311.53	316.08	310.09	310.10	312.27	316.33	310.49	312.22

TABLE D1
Manual Groundwater Elevations
2018 Annual Report

Date	Water Level (masl)		
	#80 Brock S. (W2 Well)	#98 Brock S. (M1 Well)	Fireflow
18-Jan-18	312.74	309.14	309.73
20/22-Feb-18	312.55	309.49	309.79
18/19/20-Mar-18	309.08	309.53	309.67
18/19-Apr-18	307.83	308.41	309.53
22/23-May-18	309.59	310.04	309.88
18/19-Jun-18	307.92	308.39	309.45
19/20-Jul-18	307.51	308.07	309.13
22/23/27-Aug-18	not available	308.26	309.14
18/20-Sep-18	not available	309.48	309.76
15/16-Oct-18	not available	311.33	310.42
22/23-Nov-18	not available	310.63	310.19
20/21-Dec-18	not available	310.46	310.06

APPENDIX E

Surface Water Level Monitoring



Note: MP1-16S and MP1-16D Reference elevations
are taken from a topographic map.

Note: MP1-16D casing was extended September 20, 2018.

GOLDER

DATE December 2018
DESIGN KJ
REVIEW GP
APPROVED GP

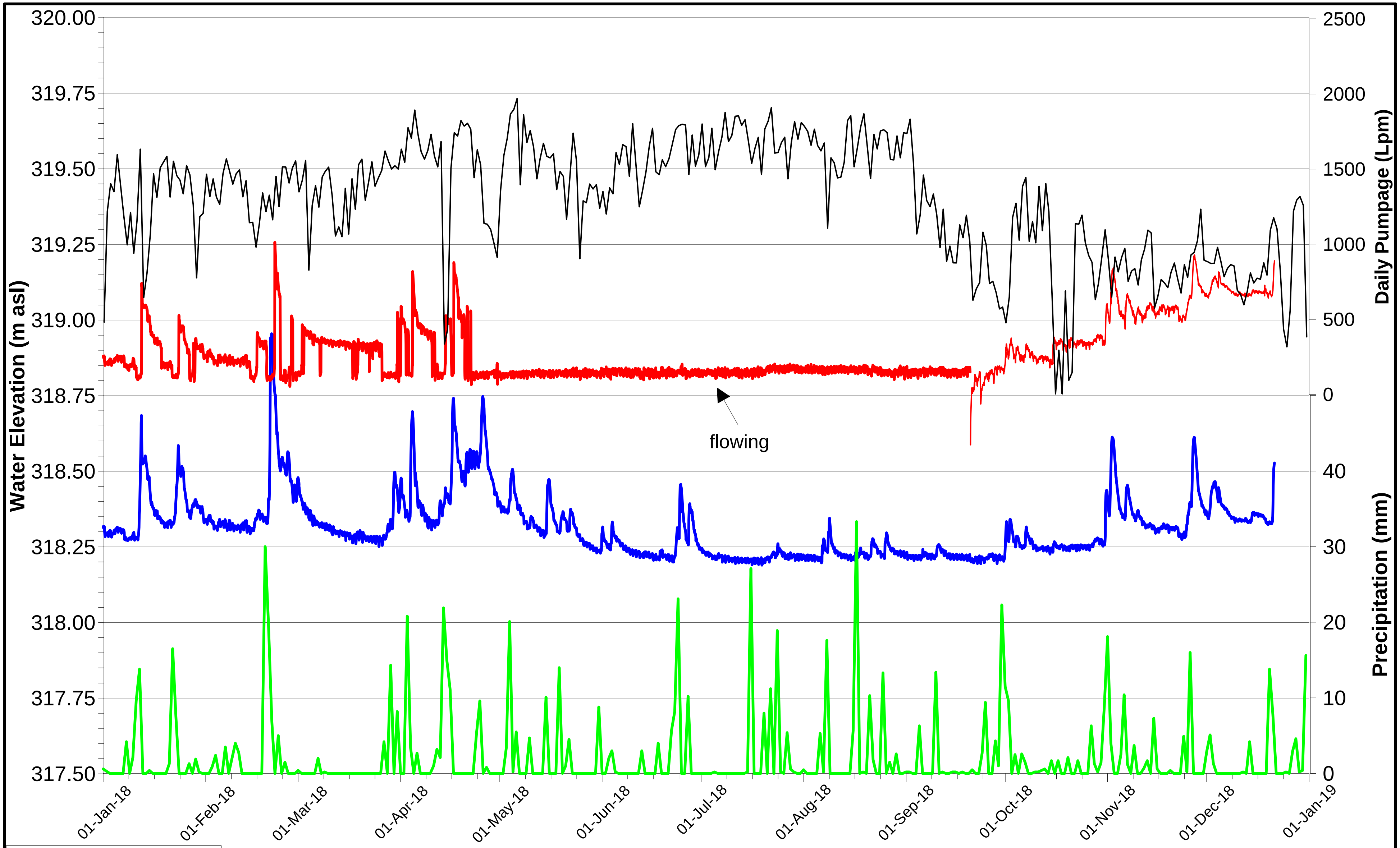
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP1-16 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO. 13-1152-0250 (1000)
REV A
FIGURE E1a



Note: MP1-16S and MP1-16D Reference elevations
are taken from a topographic map.

Note: MP1-16D casing was extended September 20, 2018.

GOLDER

DATE	DECEMBER 2018
DESIGN	KJ
REVIEW	GP
APPROVED	GP

PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

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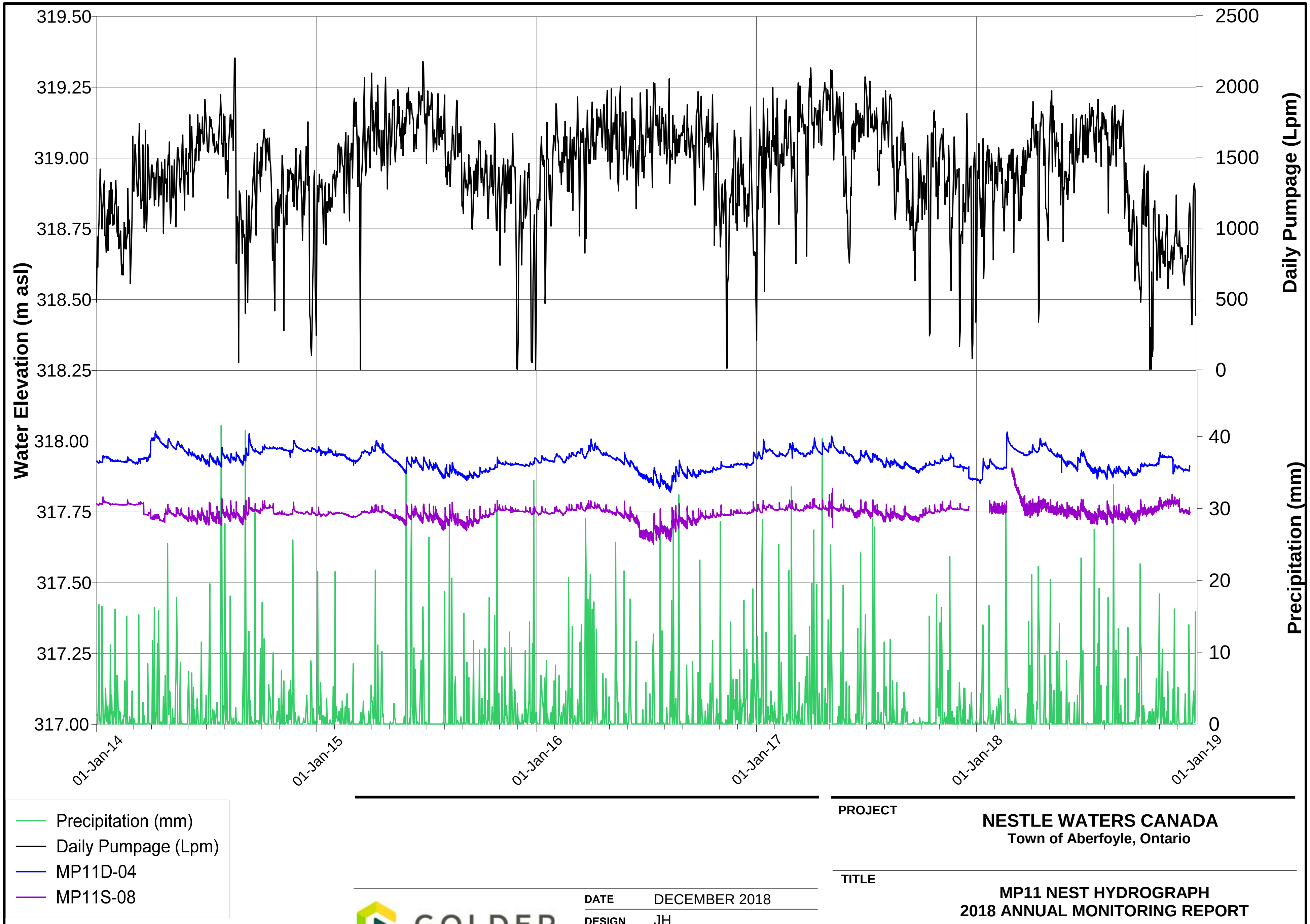
MP1-16 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E1b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

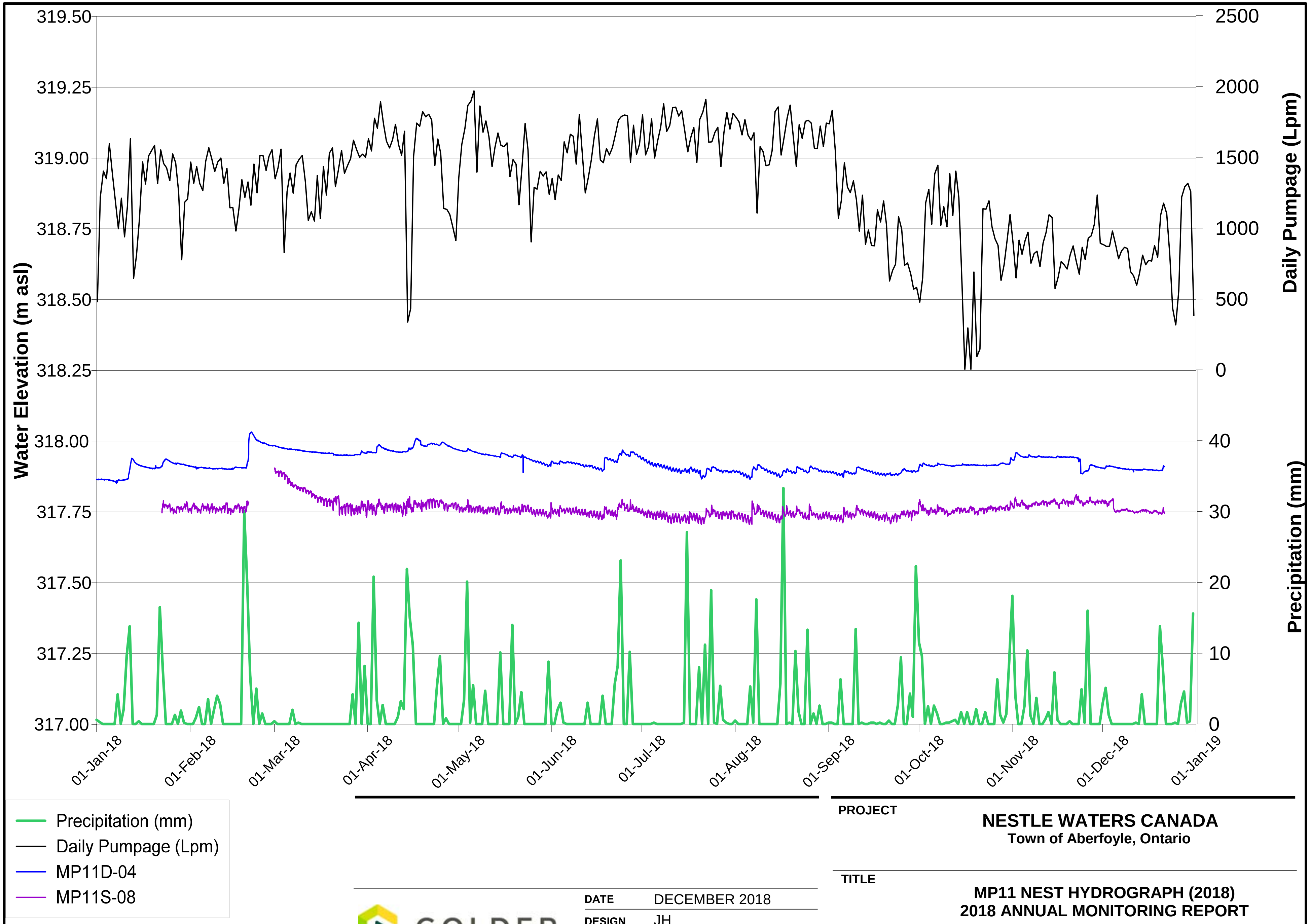
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP11 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E2a



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

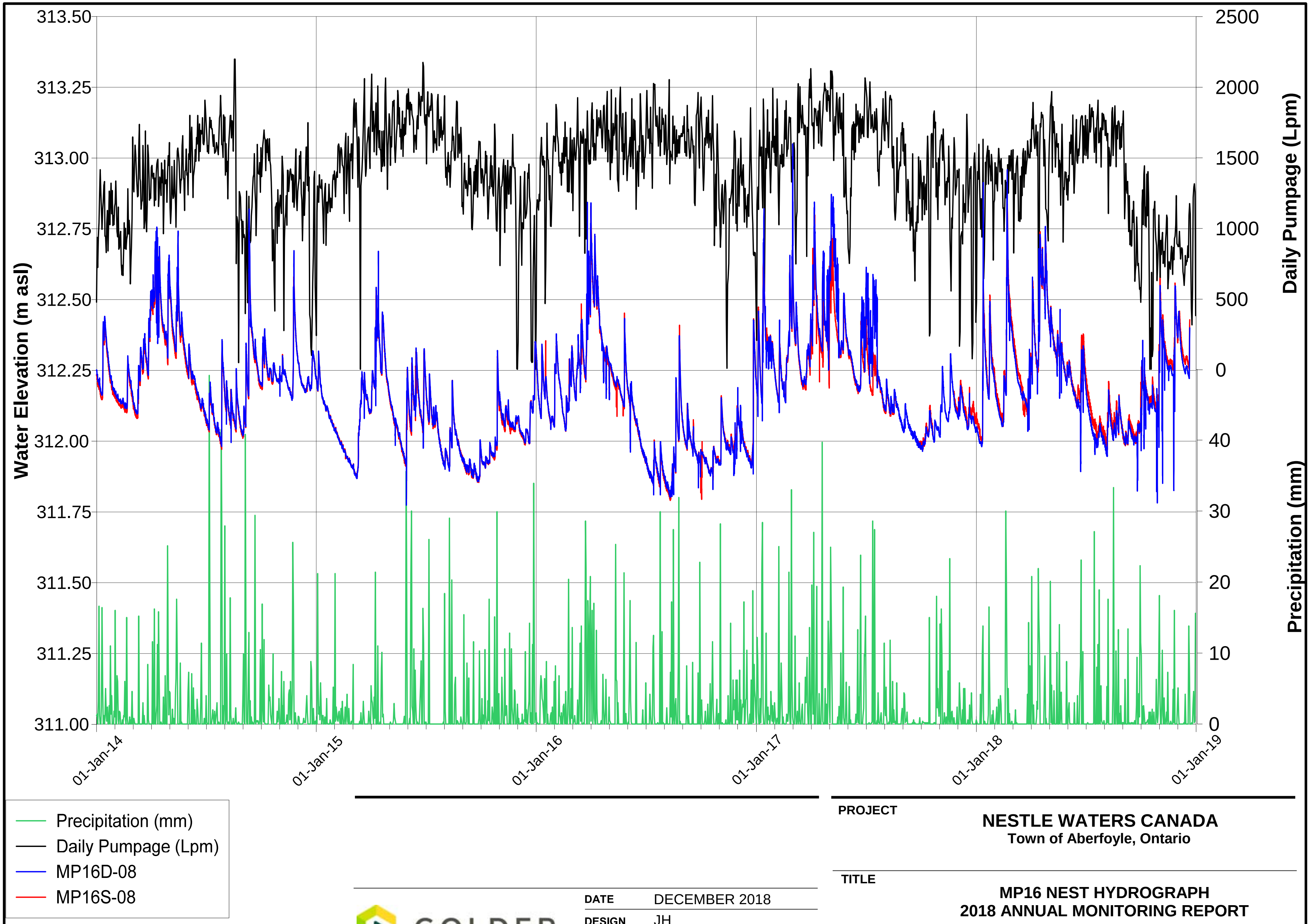
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP11 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E2b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

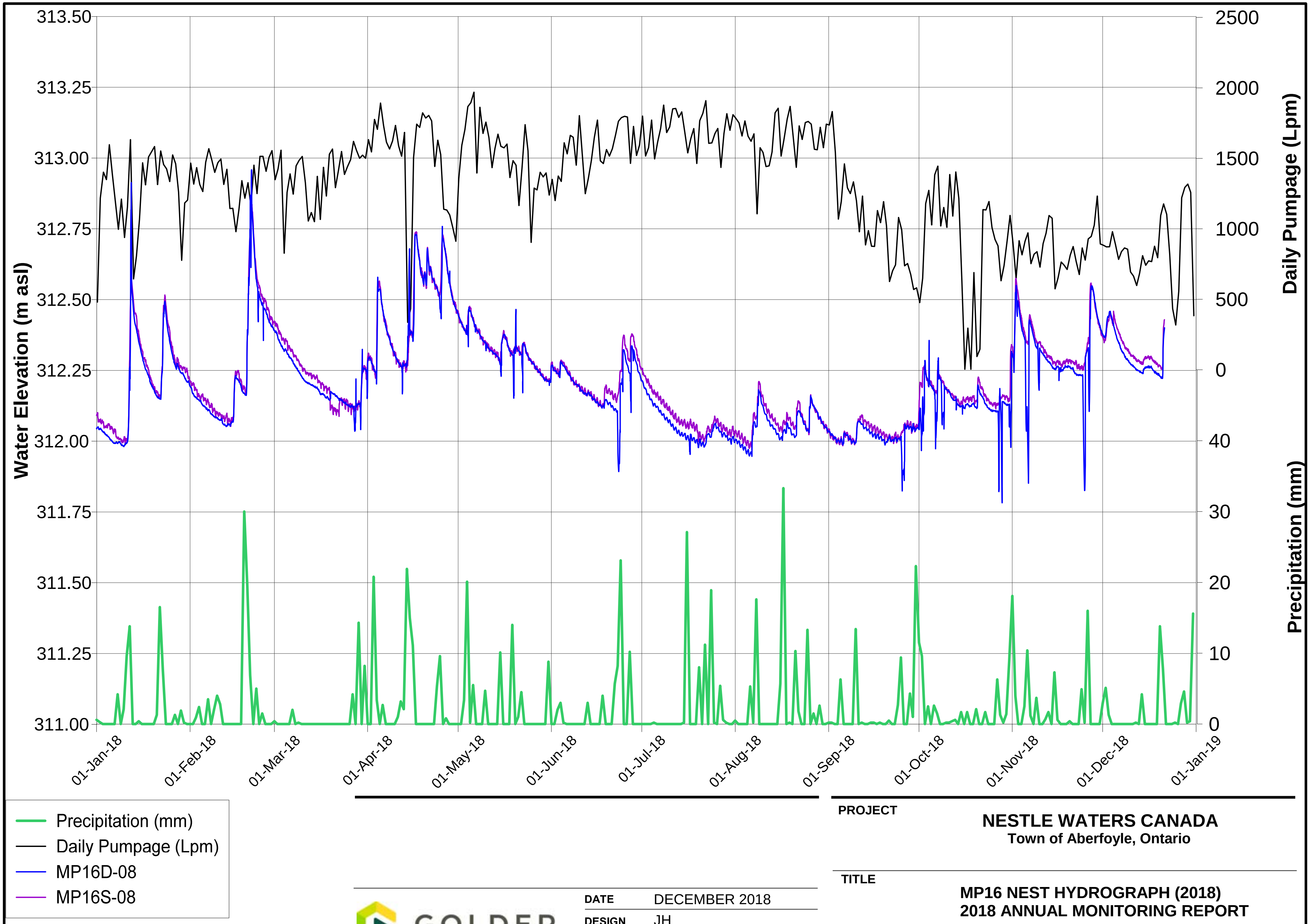
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP16 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E3a



DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

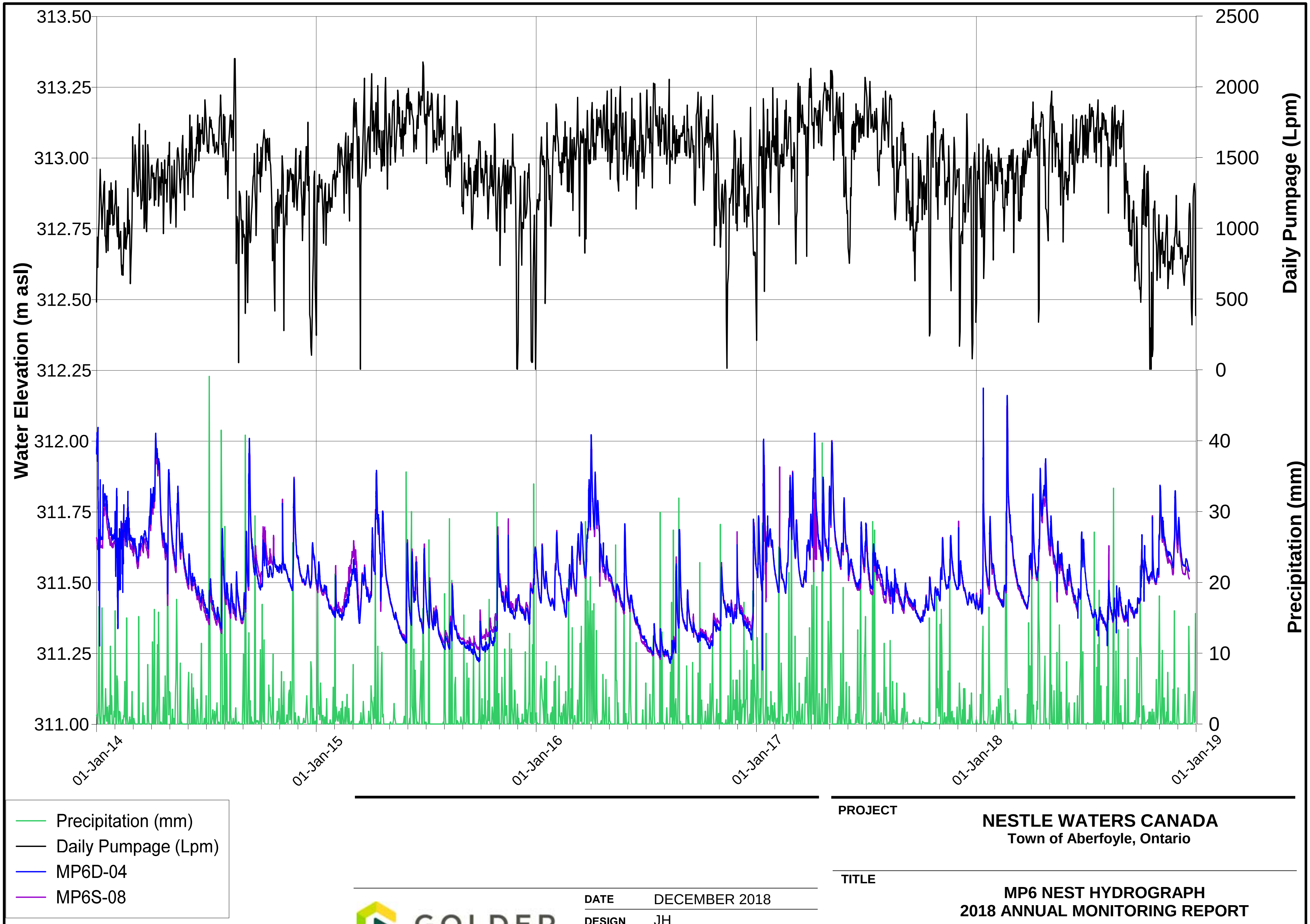
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP16 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E3b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

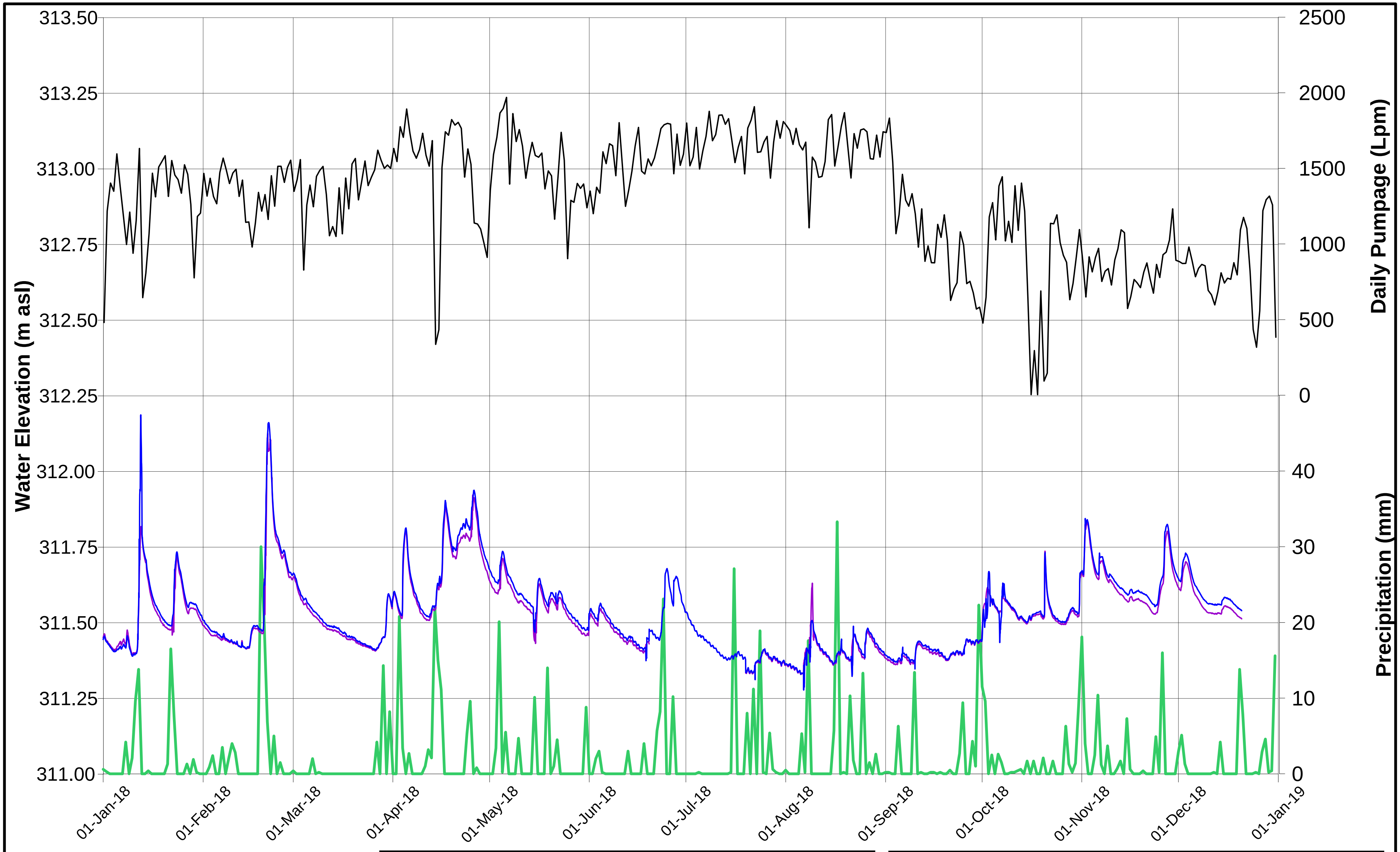
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP6 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E4a



🟩 Precipitation (mm)
— Daily Pumpage (Lpm)
— MP6D-04
— MP6S-08

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

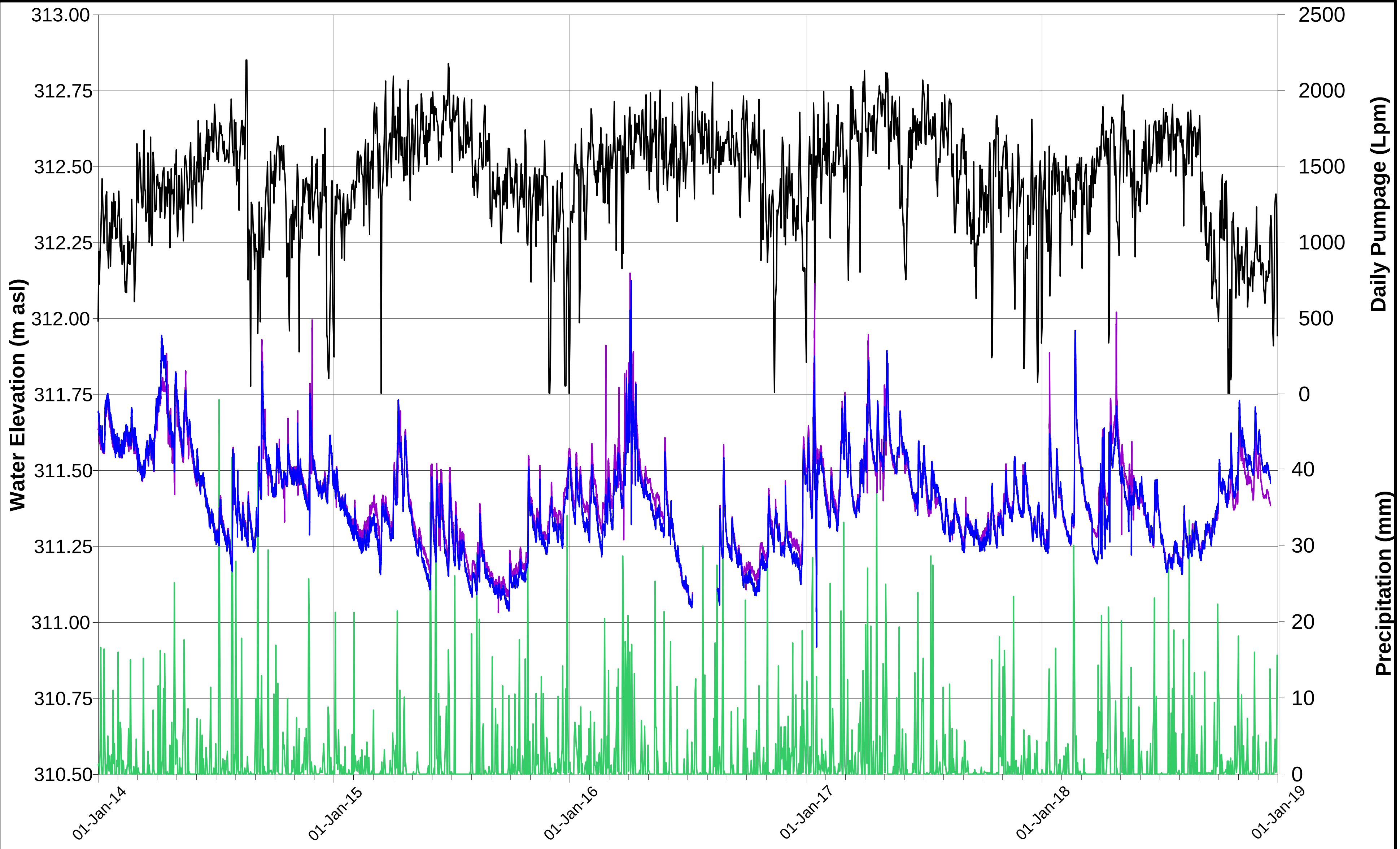
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP6 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E4b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

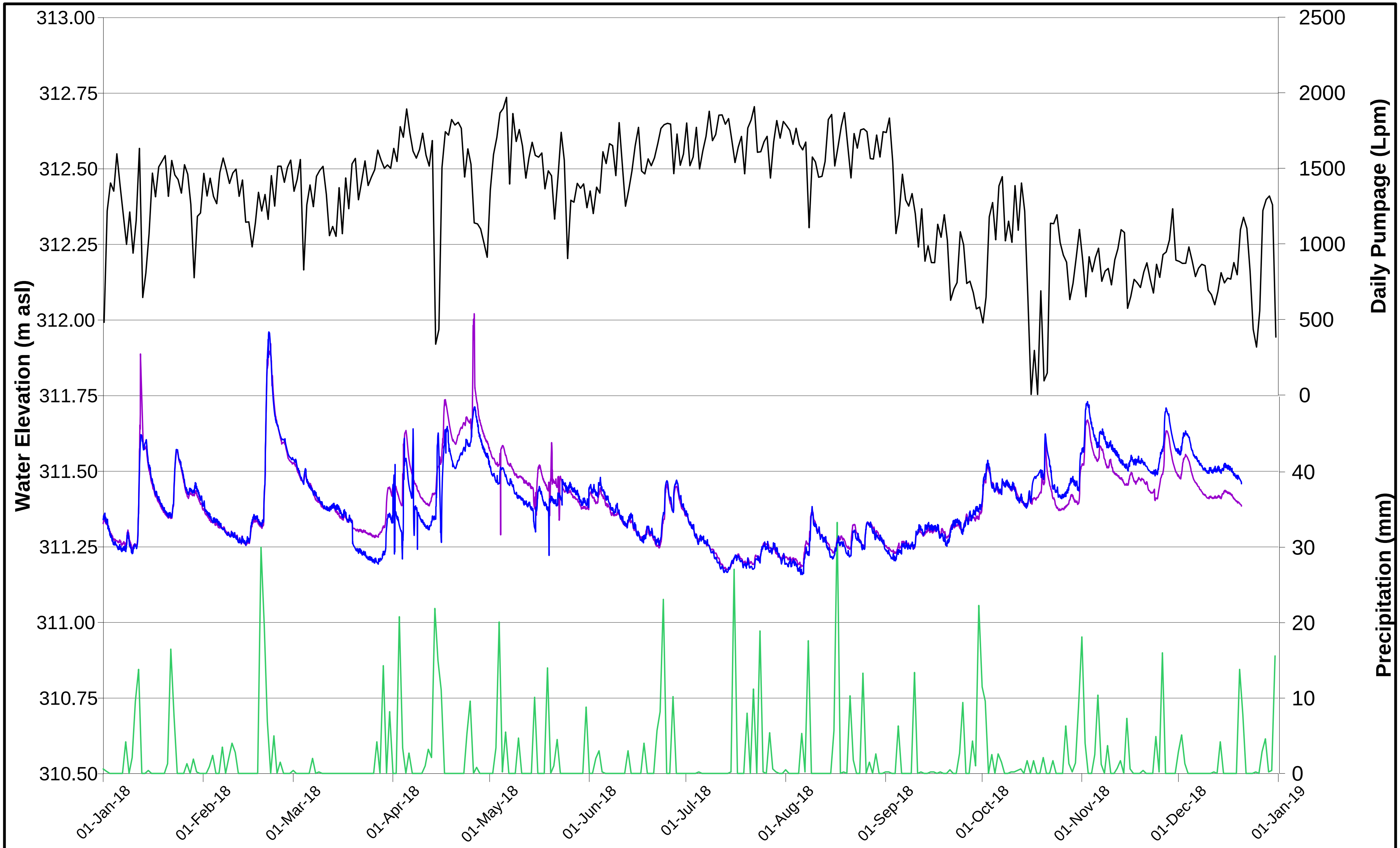
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP12 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E5a



Precipitation (mm)
Daily Pumpage (Lpm)
MP12D-04
MP12S-04

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

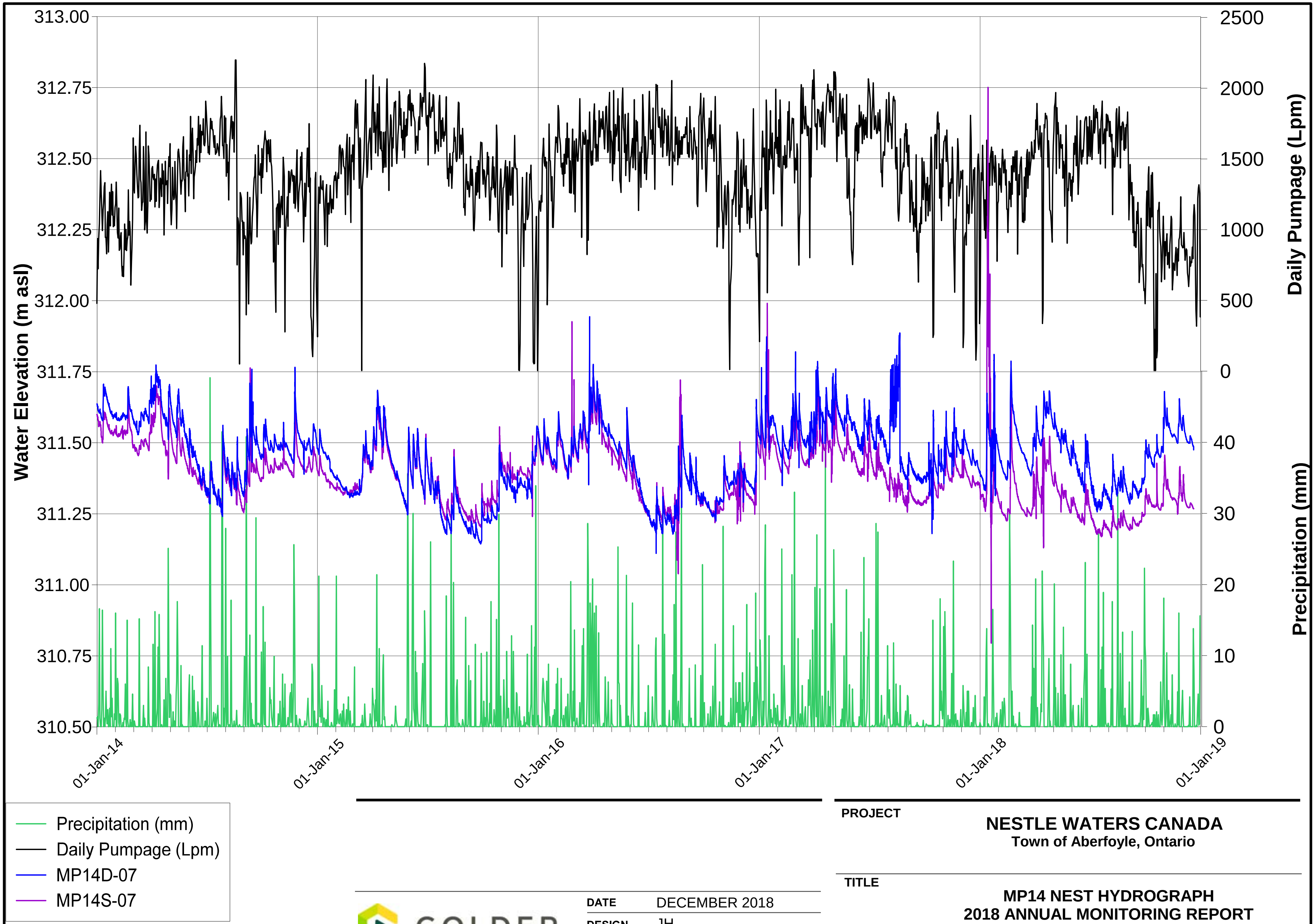
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP12 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E5b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

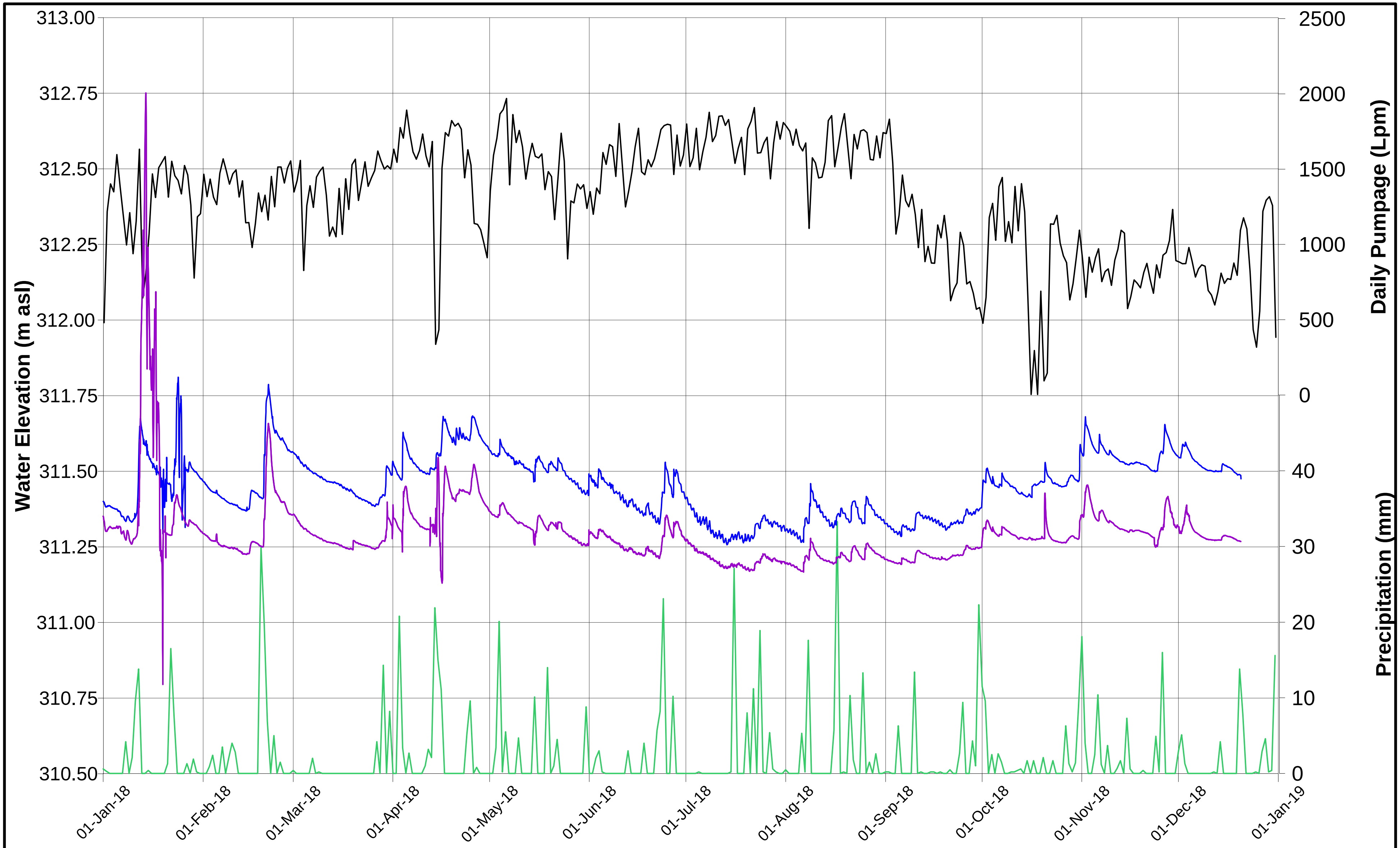
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP14 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E6a



🟩	Precipitation (mm)
⬛	Daily Pumpage (Lpm)
🟦	MP14D-07
🟪	MP14S-07

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

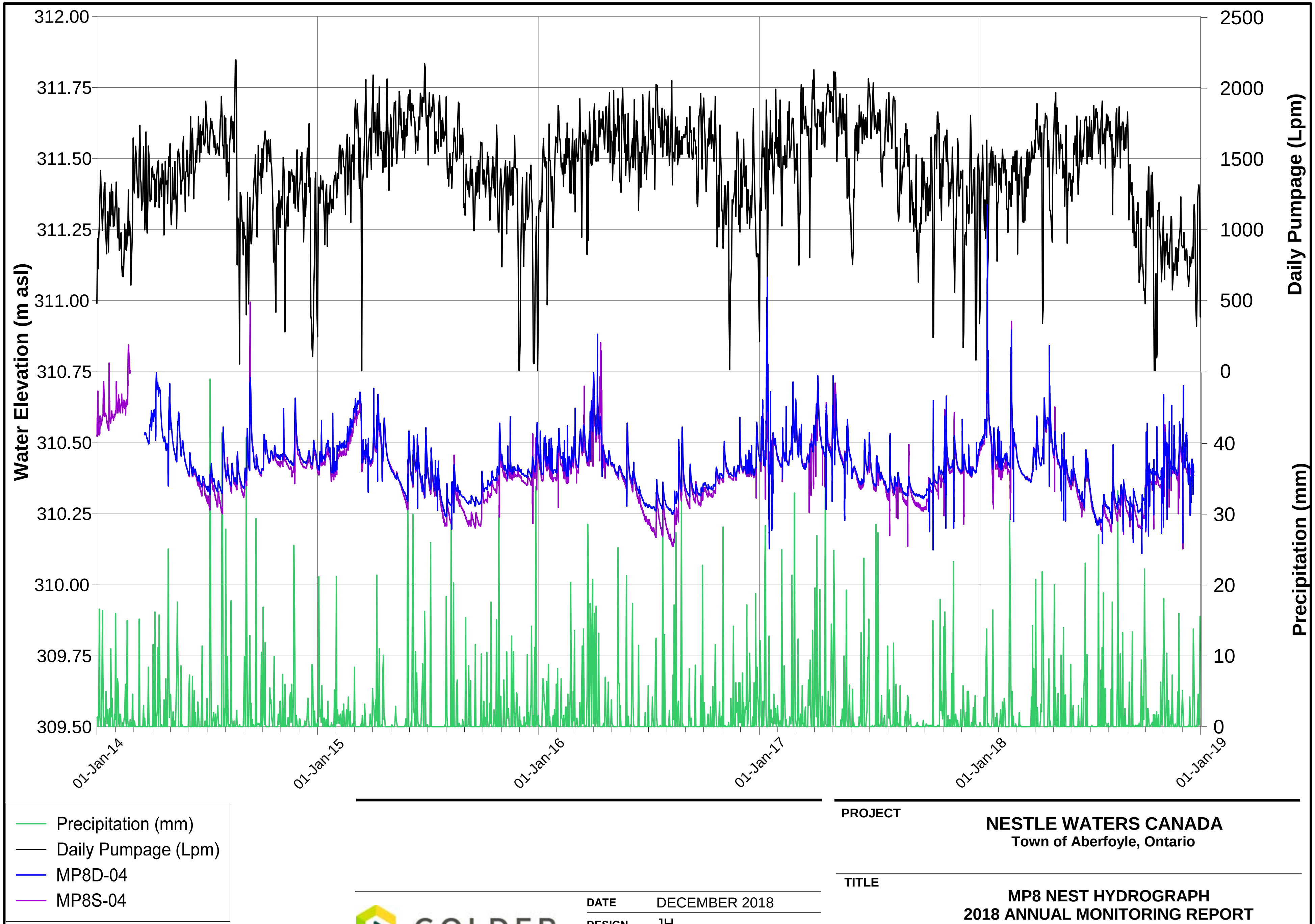
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP14 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E6b



PROJECT

NESTLE WATERS CANADA

Town of Aberfoyle, Ontario

TITLE

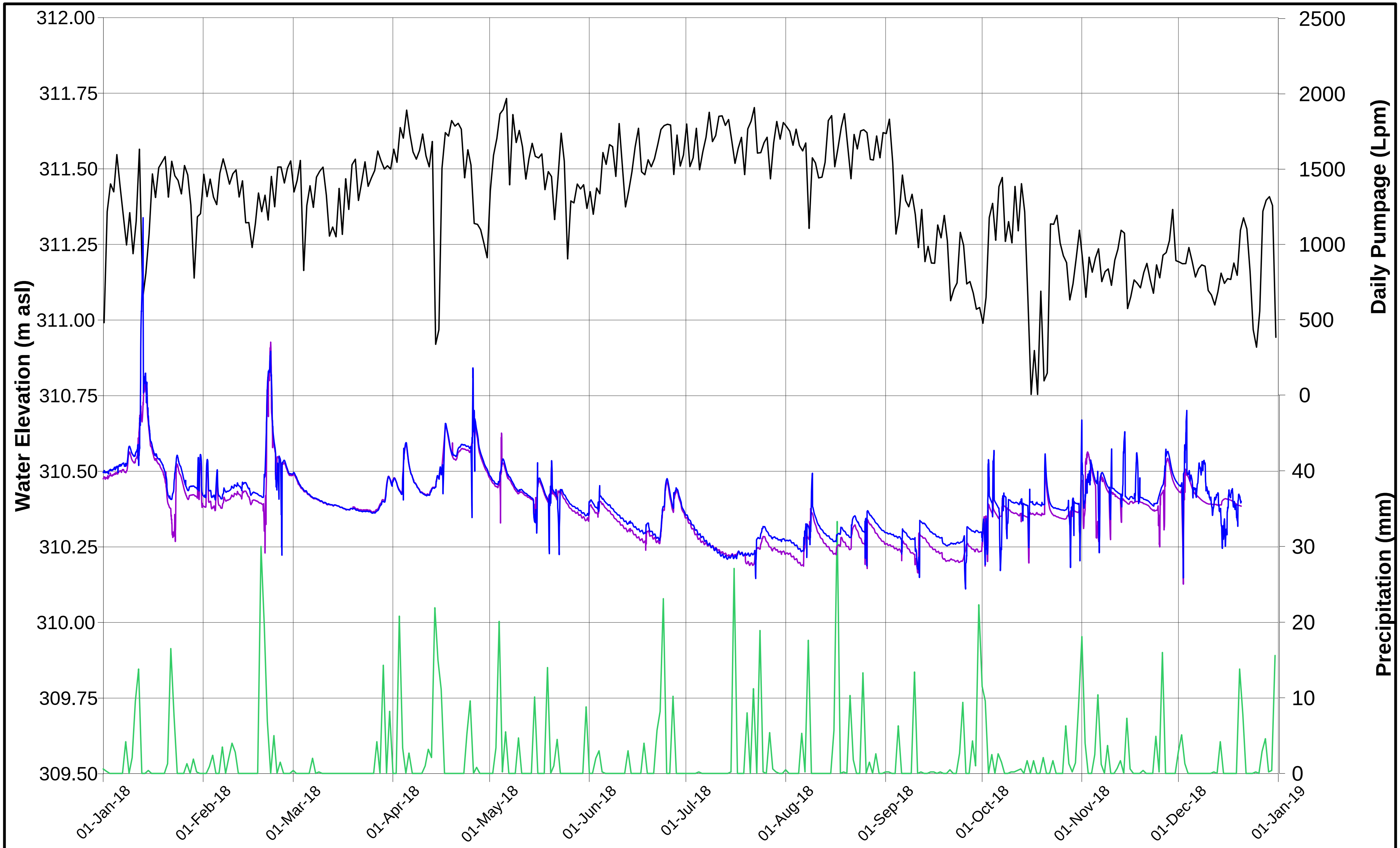
MP8 NEST HYDROGRAPH

2018 ANNUAL MONITORING REPORT

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E7a



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

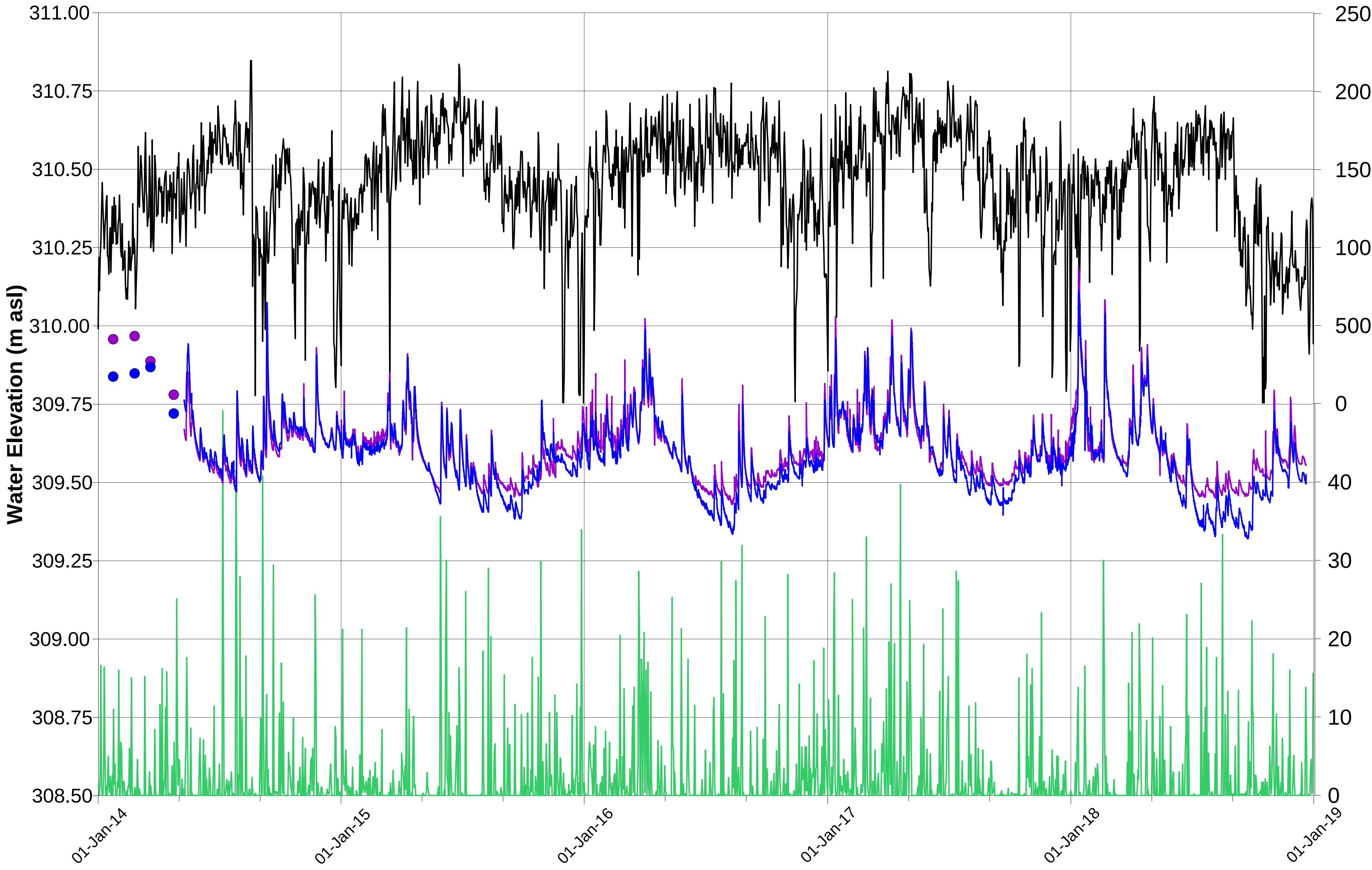
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP8 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E7b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

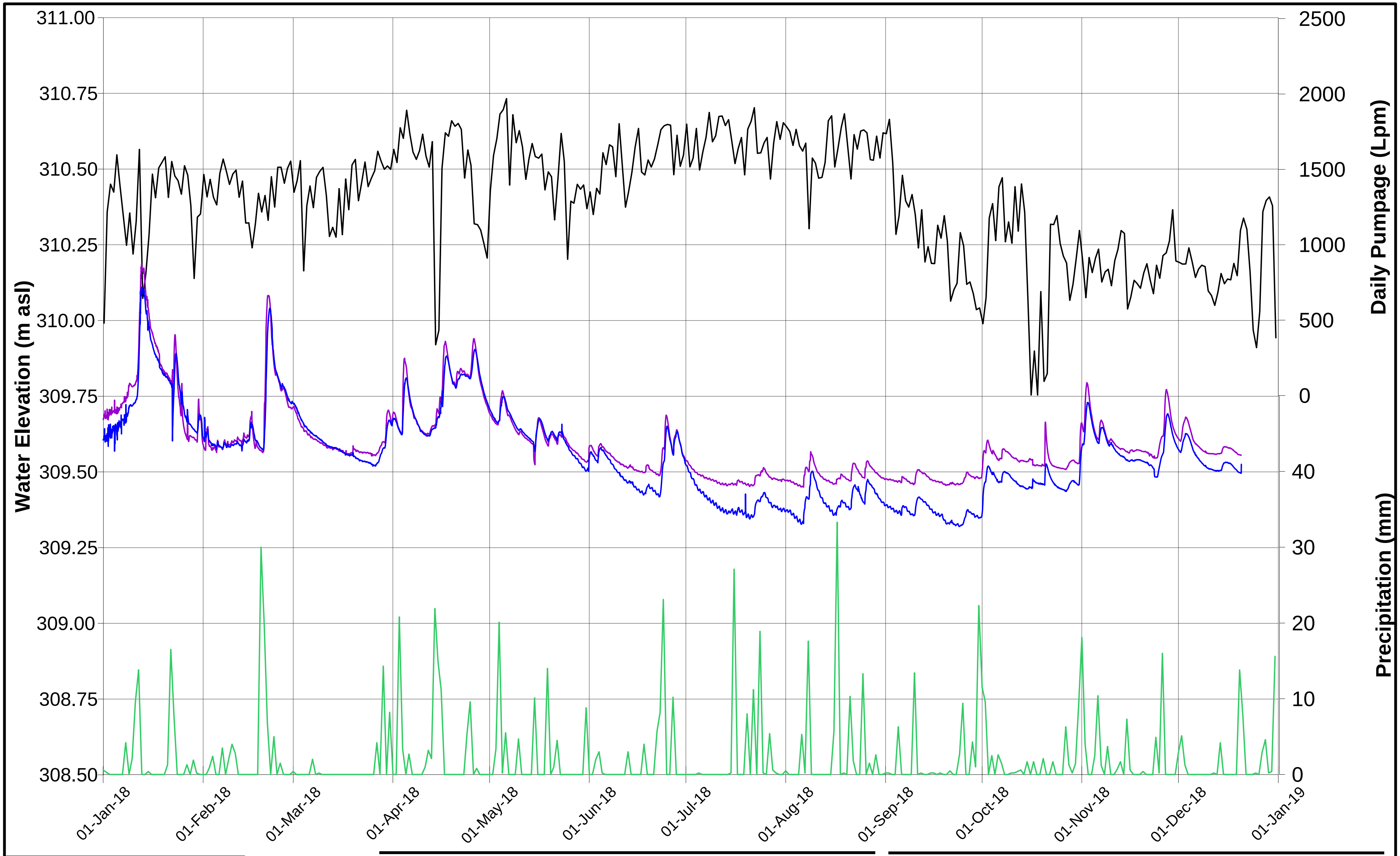
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP17 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E8a



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

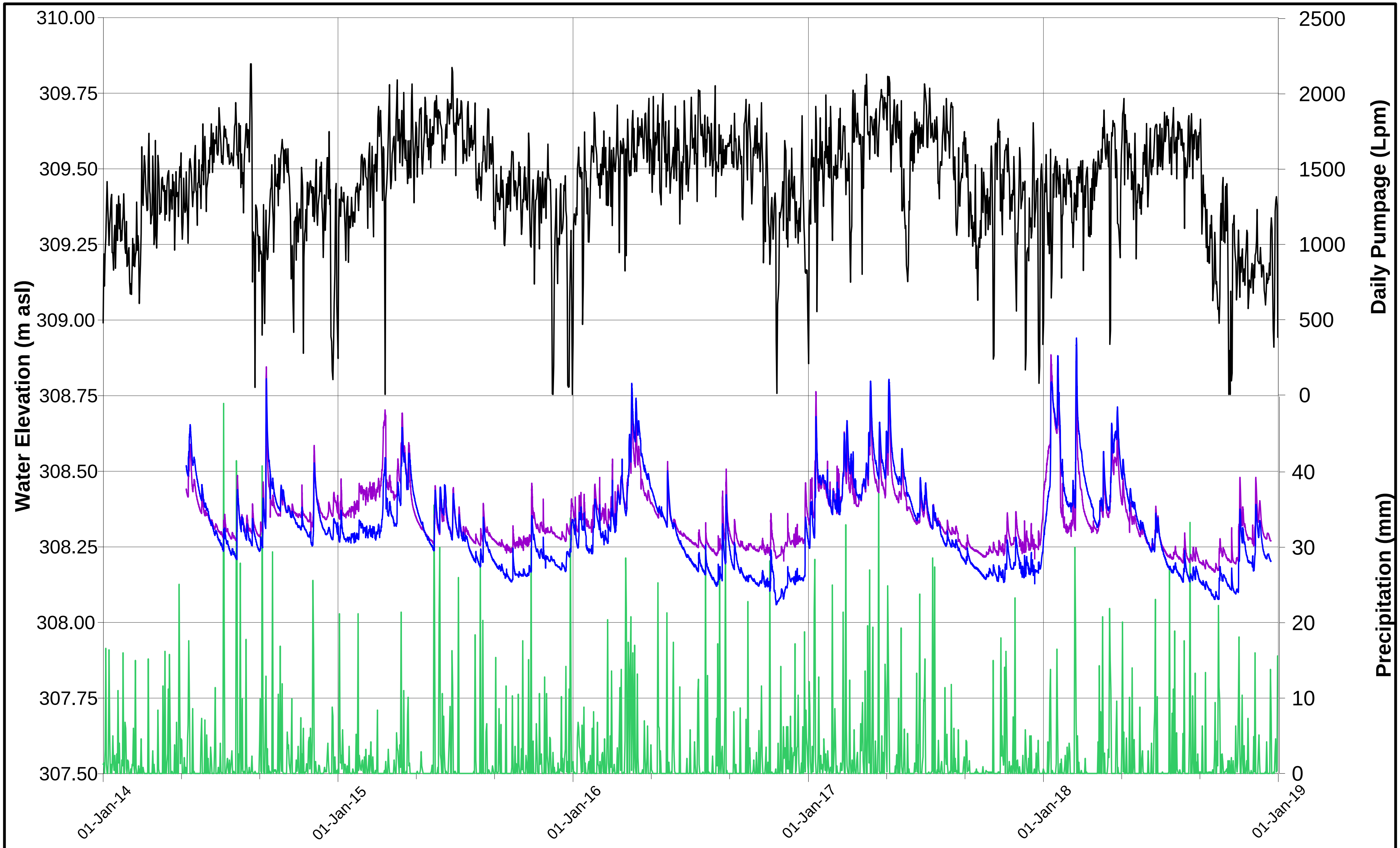
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP17 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E8b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

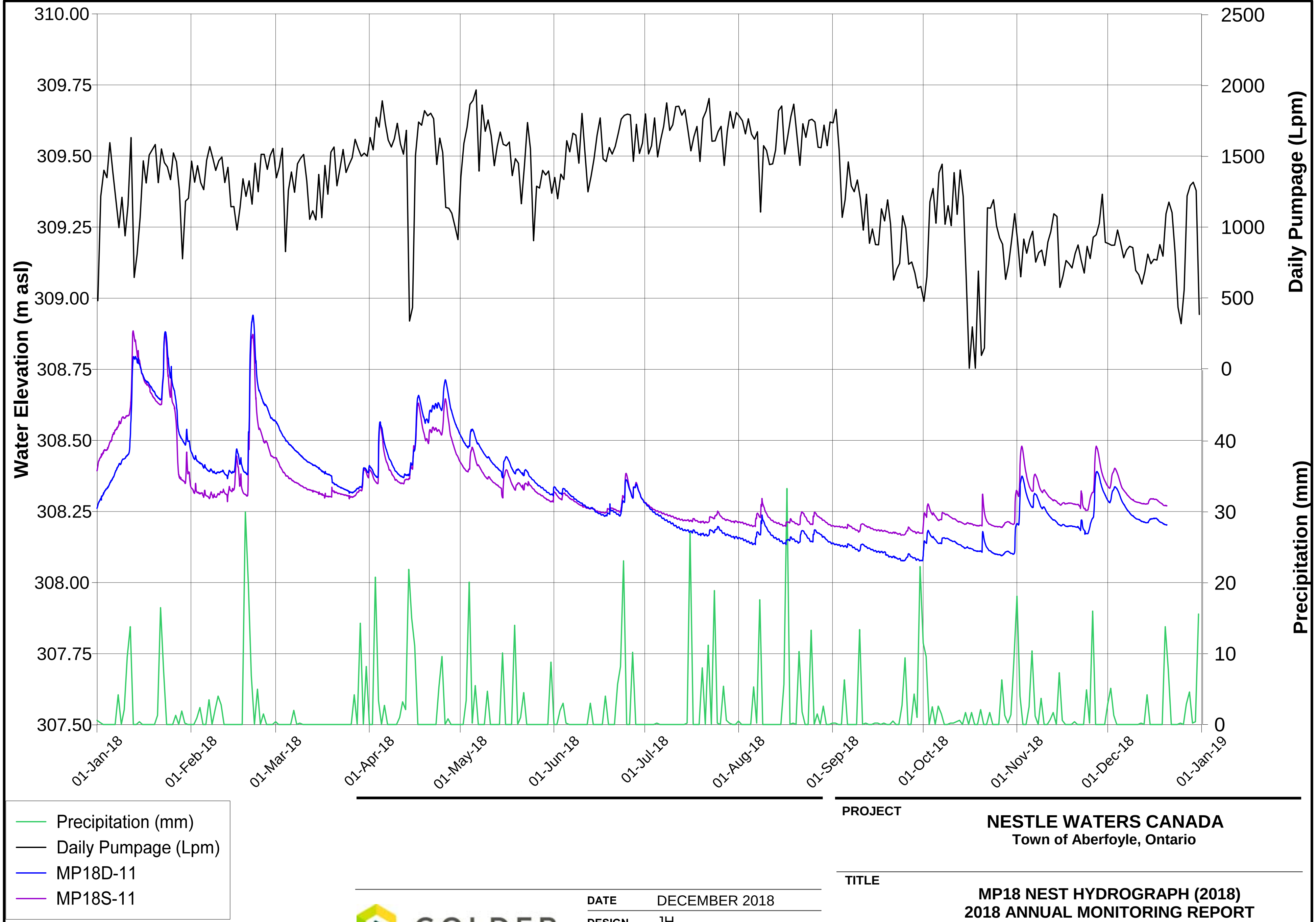
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP18 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E9a



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

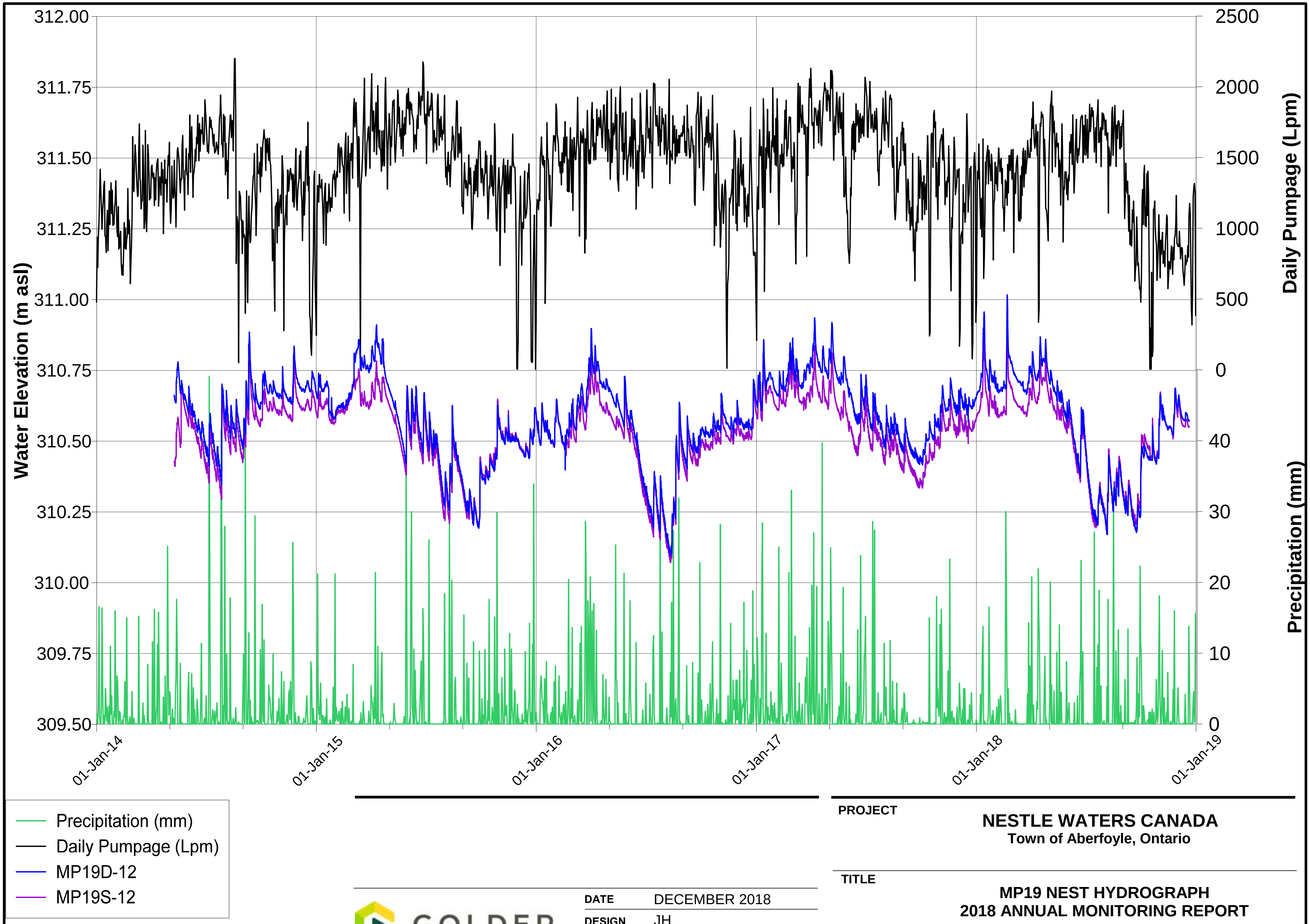
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP18 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E9b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT

NESTLE WATERS CANADA

Town of Aberfoyle, Ontario

TITLE

MP19 NEST HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E10a

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

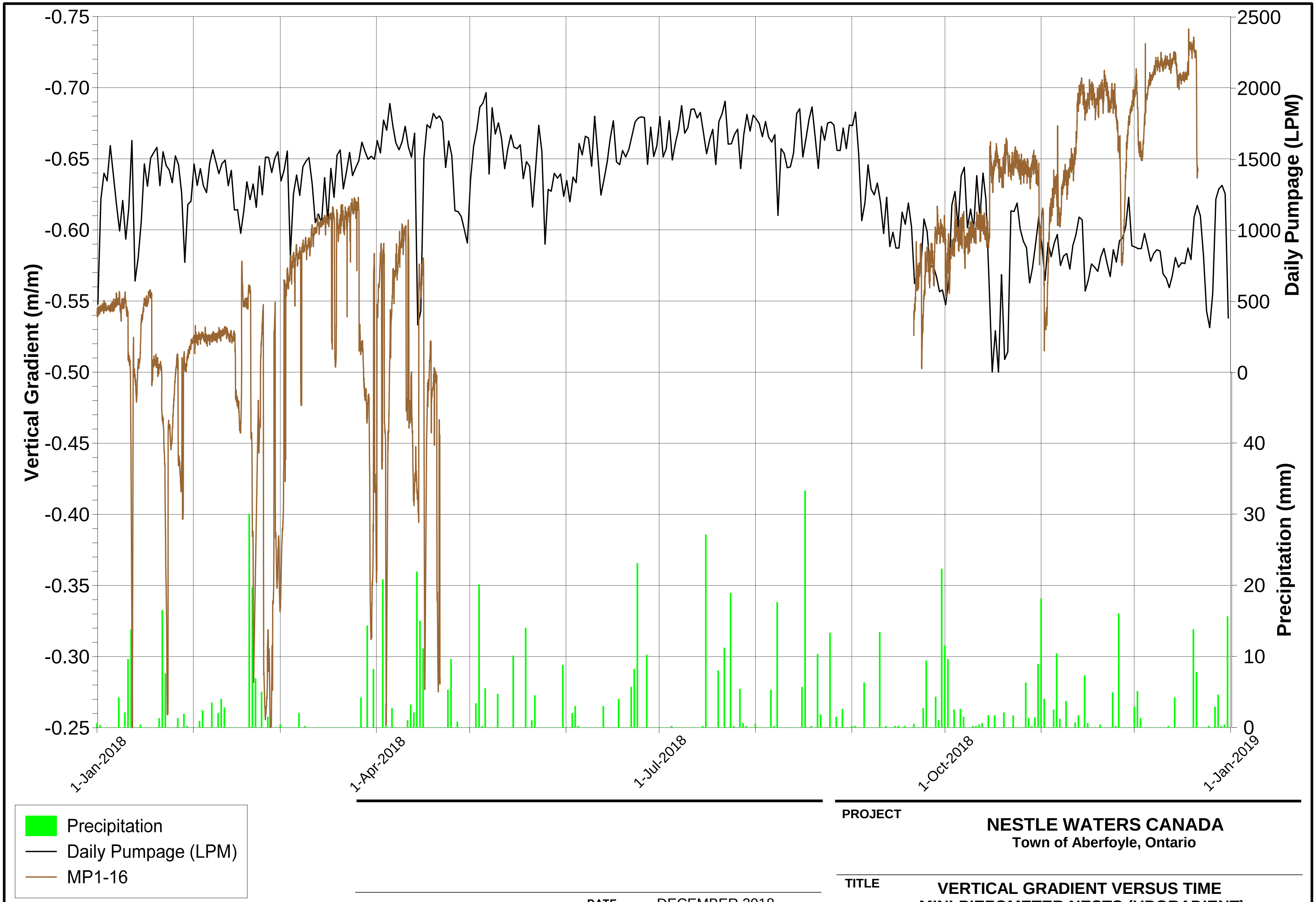
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

MP19 NEST HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E10b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

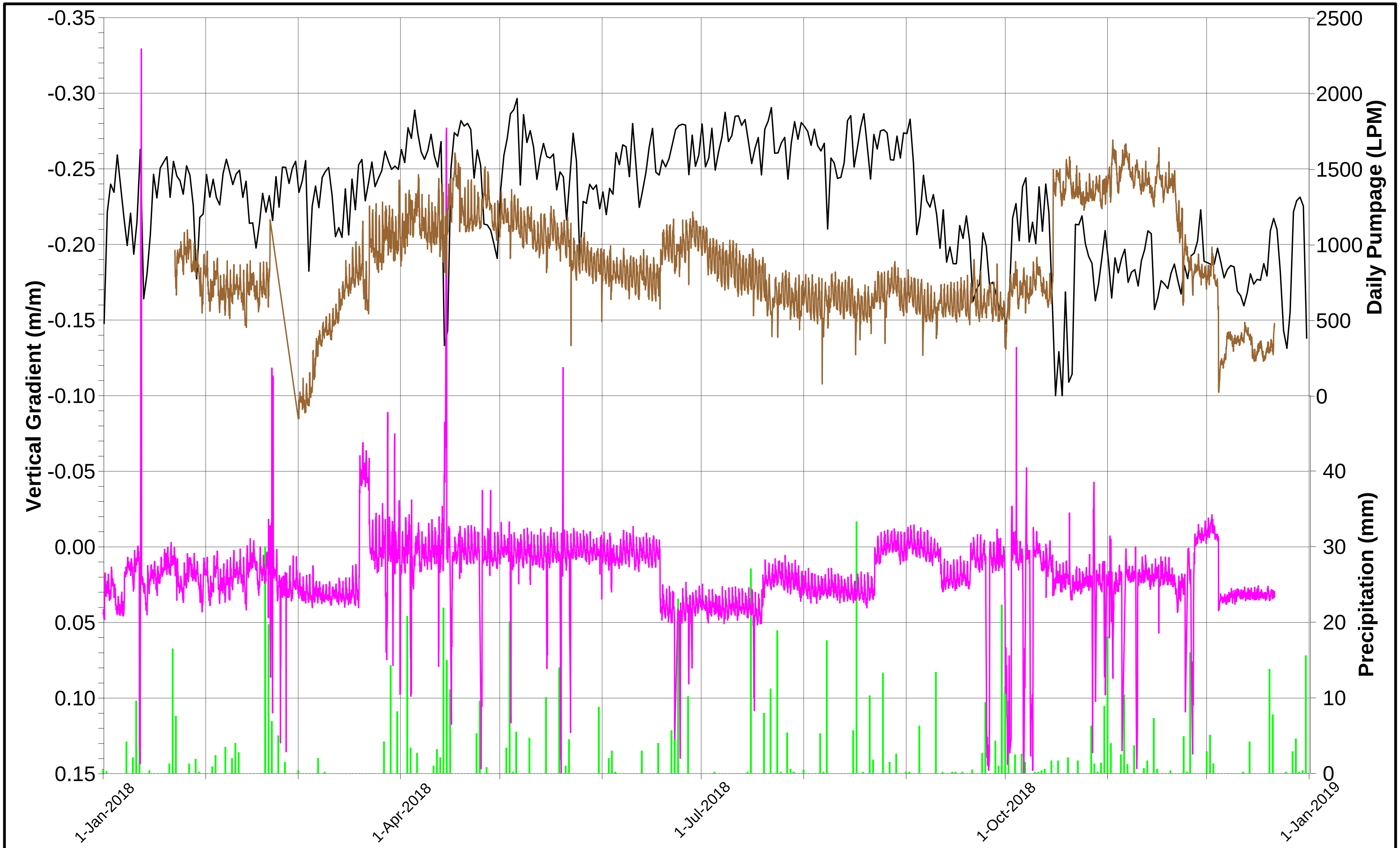
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

VERTICAL GRADIENT VERSUS TIME
MINI-PIEZOMETER NESTS (UPGRADIENT)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E11a



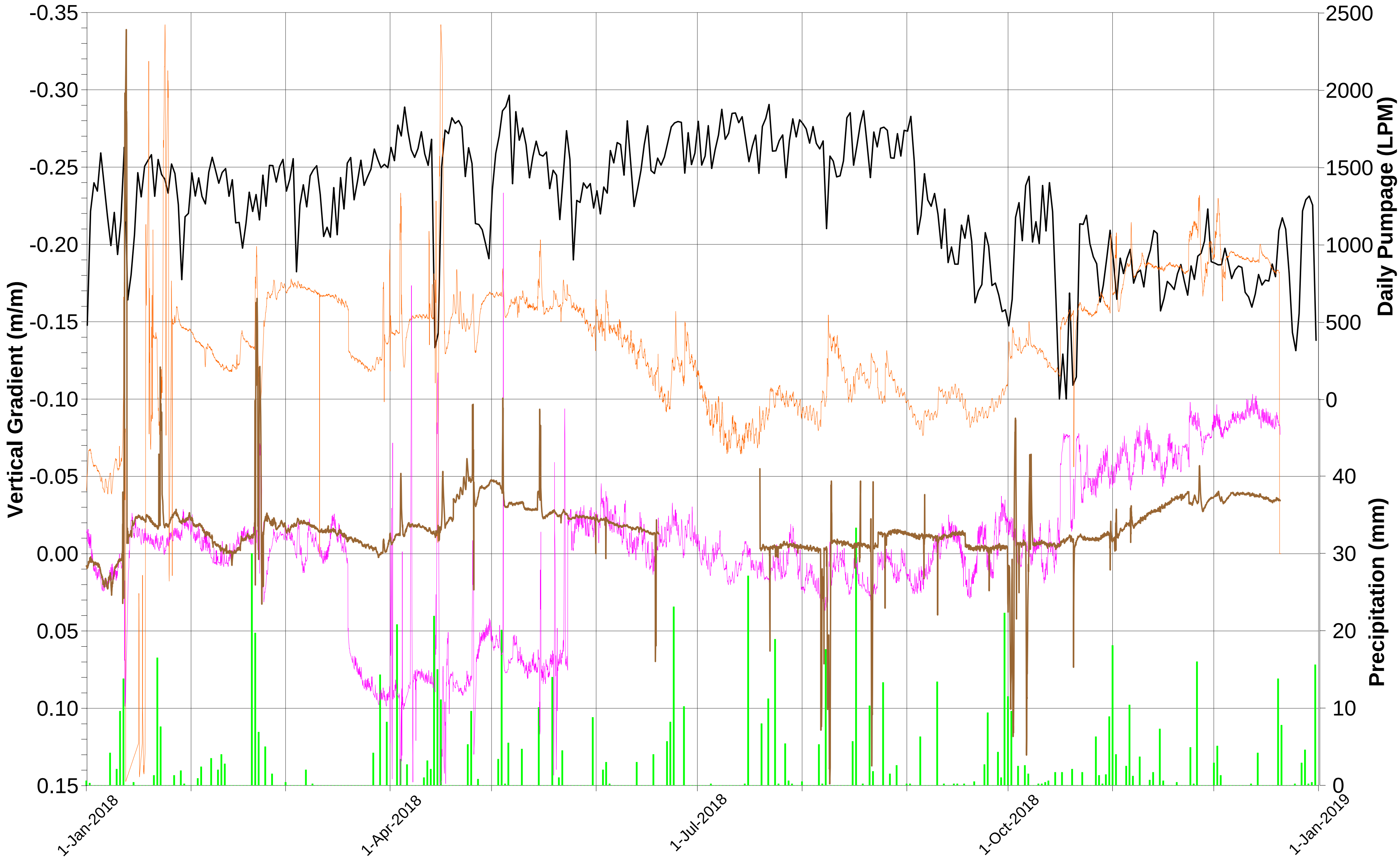
🟩 Precipitation
— Daily Pumpage (LPM)
— MP11
— MP16

PROJECT	**NESTLE WATERS CANADA** **Town of Aberfoyle, Ontario**
TITLE	**VERTICAL GRADIENT VERSUS TIME** **MINI-PIEZOMETER NESTS (UPGRADIENT)** **2018 ANNUAL MONITORING REPORT**

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E11b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

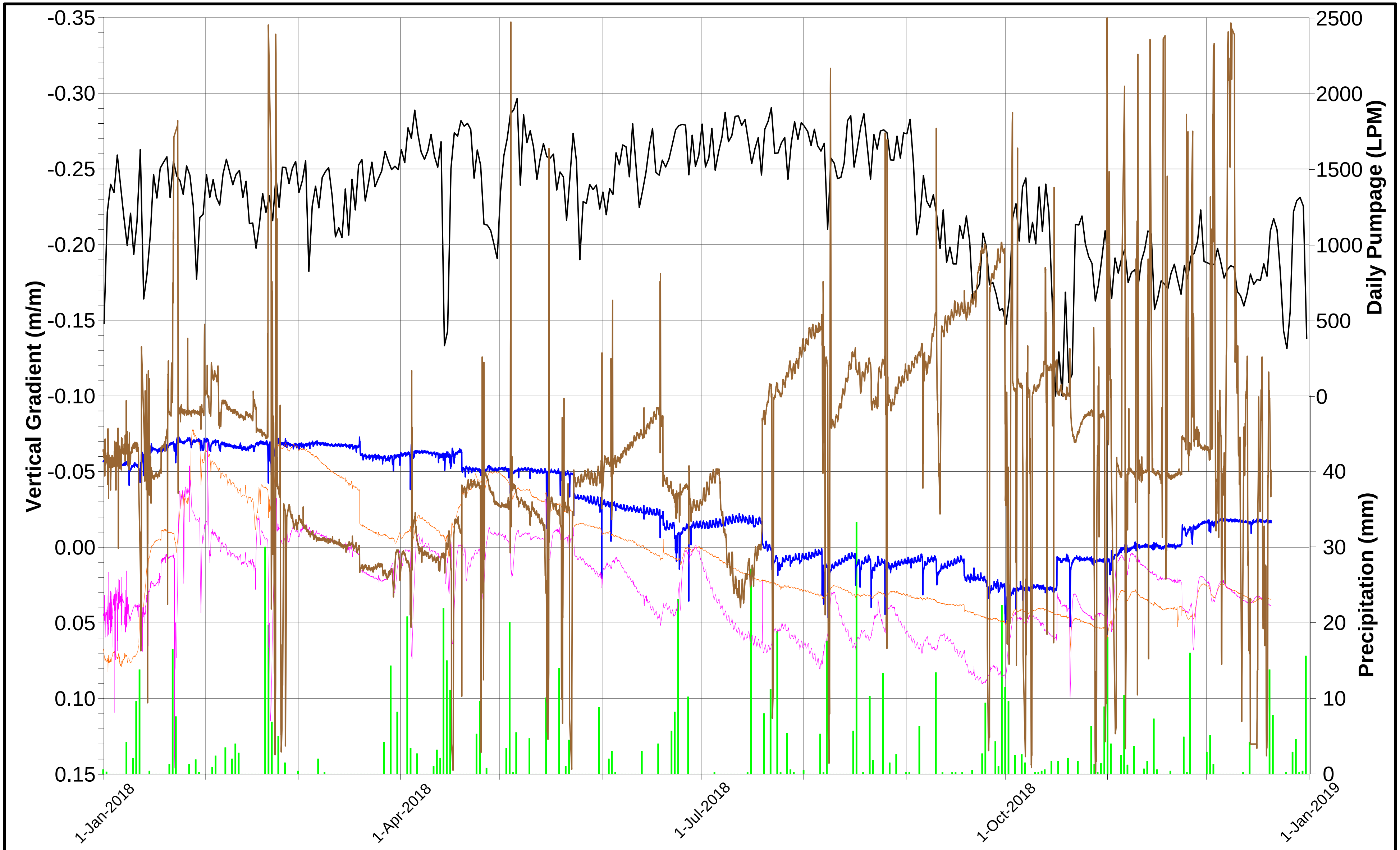
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

VERTICAL GRADIENT VERSUS TIME
MINI-PIEZOMETER NESTS (ONSITE)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E11c



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

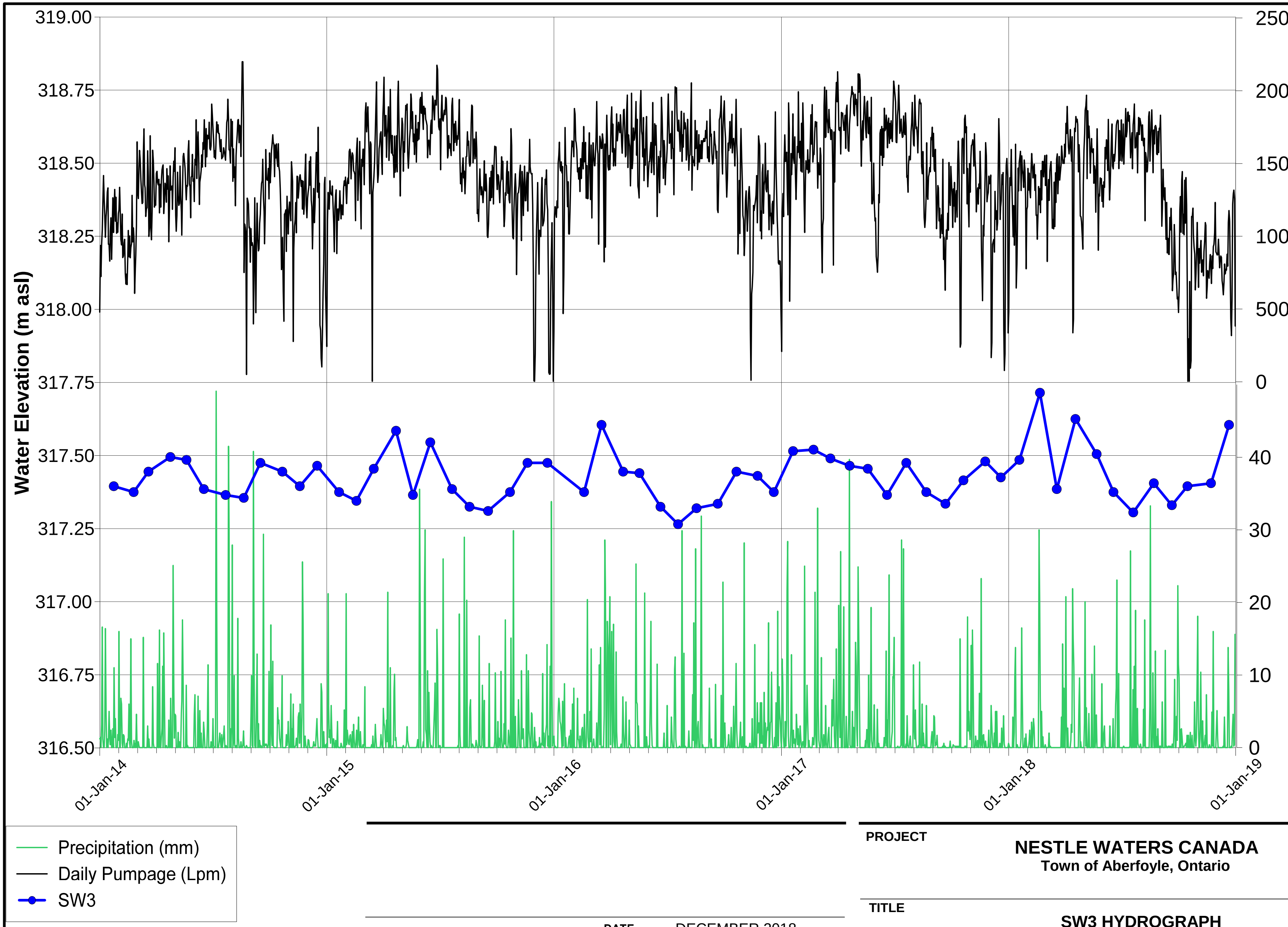
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

VERTICAL GRADIENT VERSUS TIME
MINI-PIEZOMETER NESTS (DOWNGRADIENT)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E11d



DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

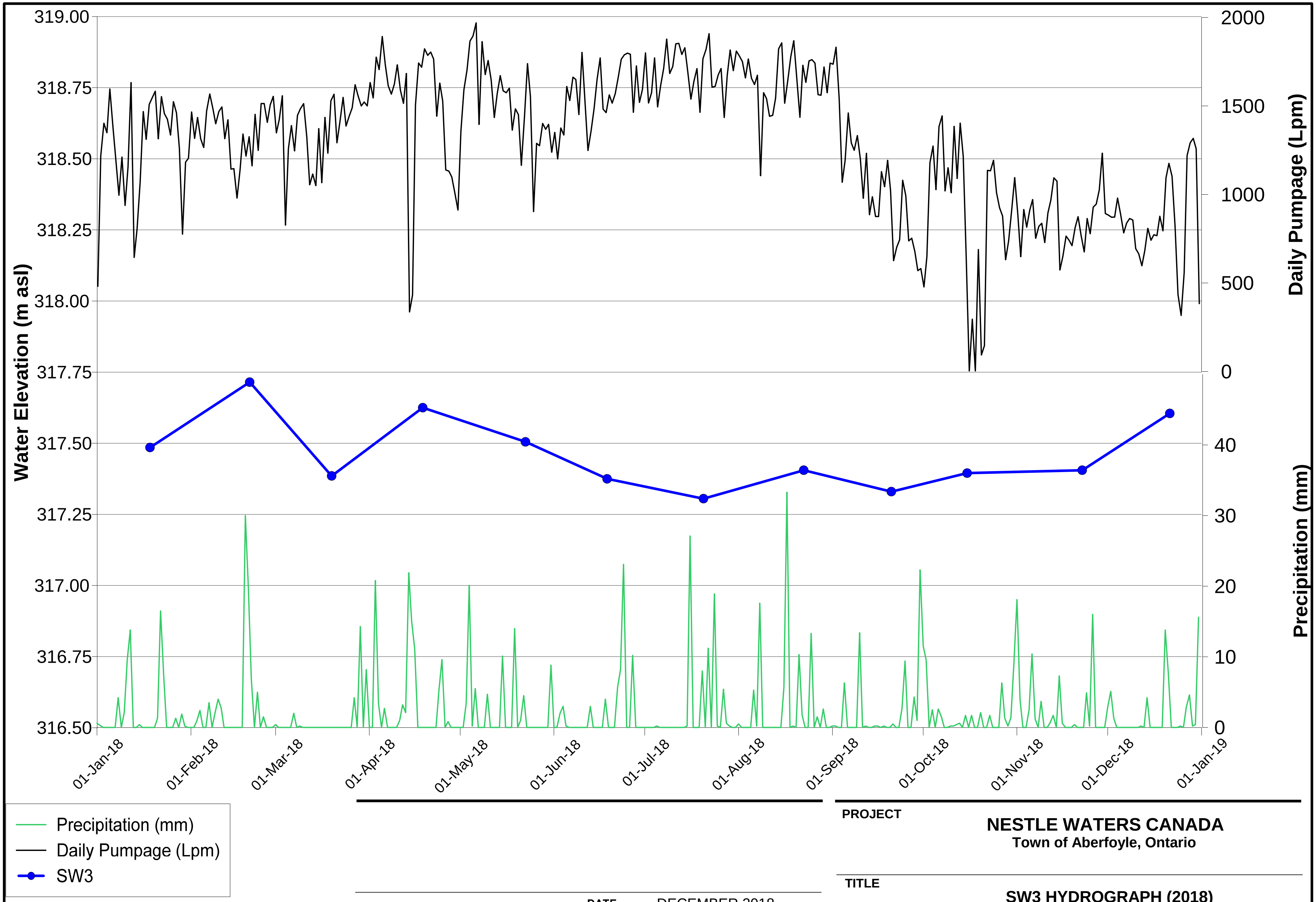
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW3 HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E12a



DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

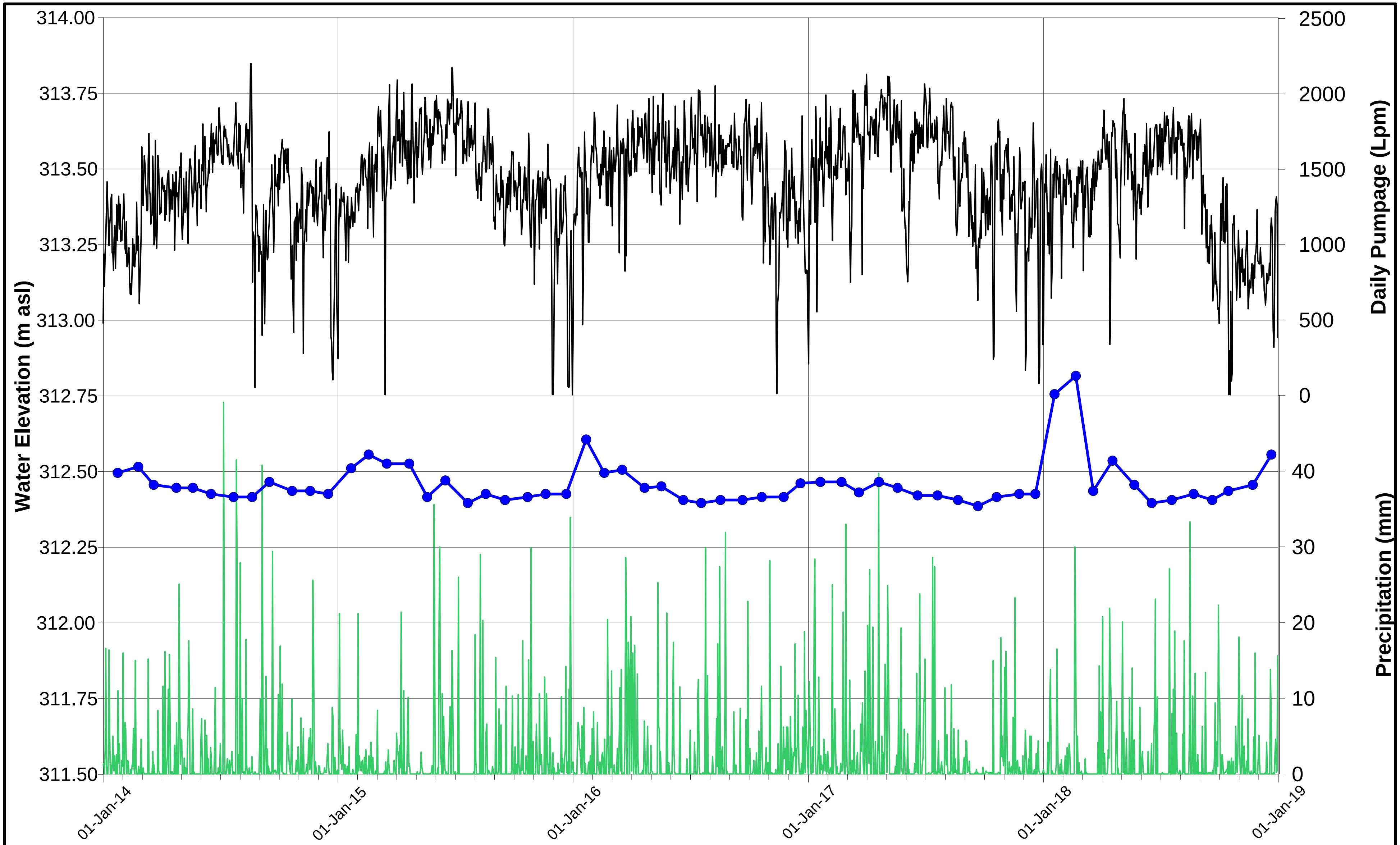
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW3 HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E12b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

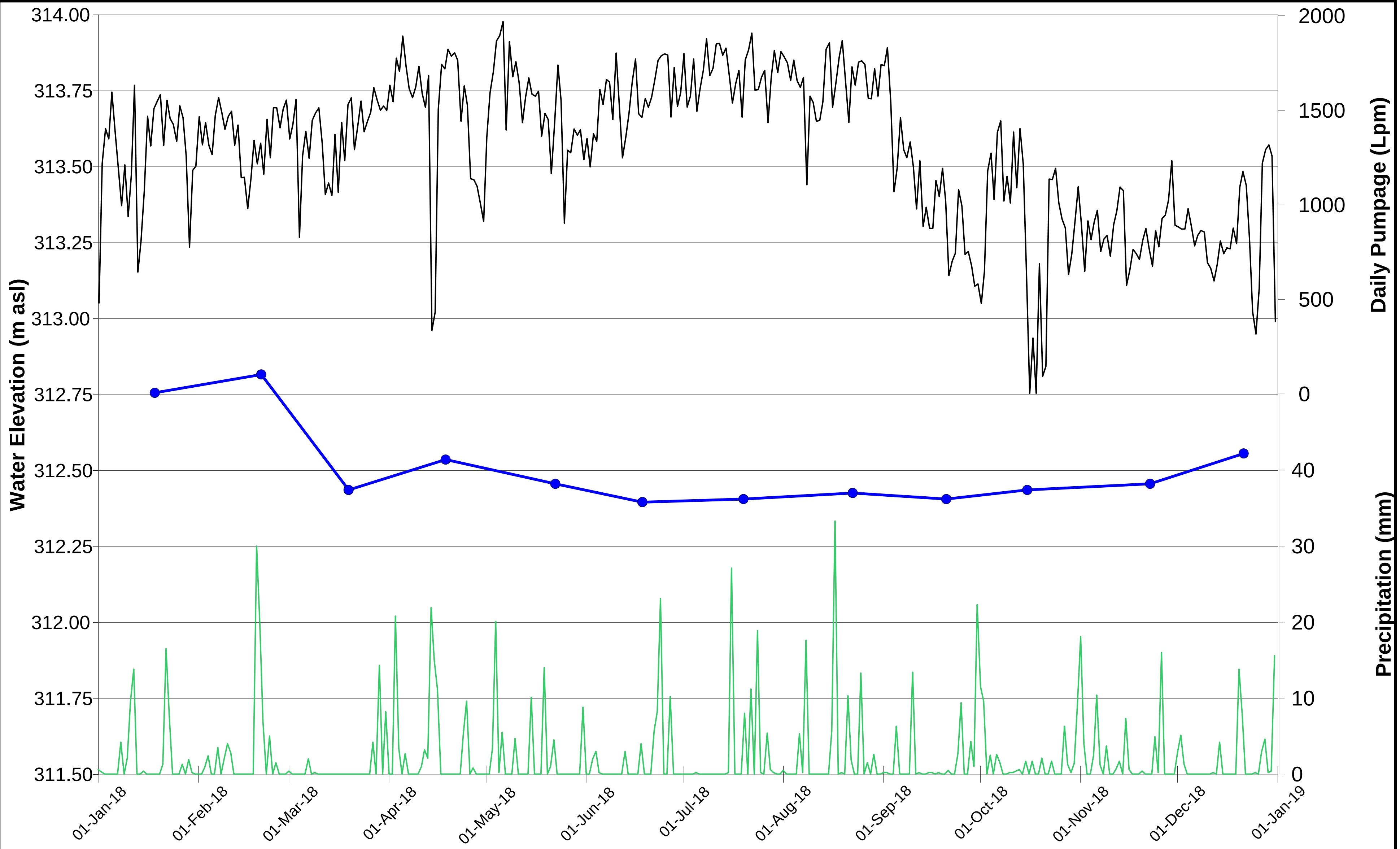
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW4 HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E13a



🟩	Precipitation (mm)
—	Daily Pumpage (Lpm)
●	SW4

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

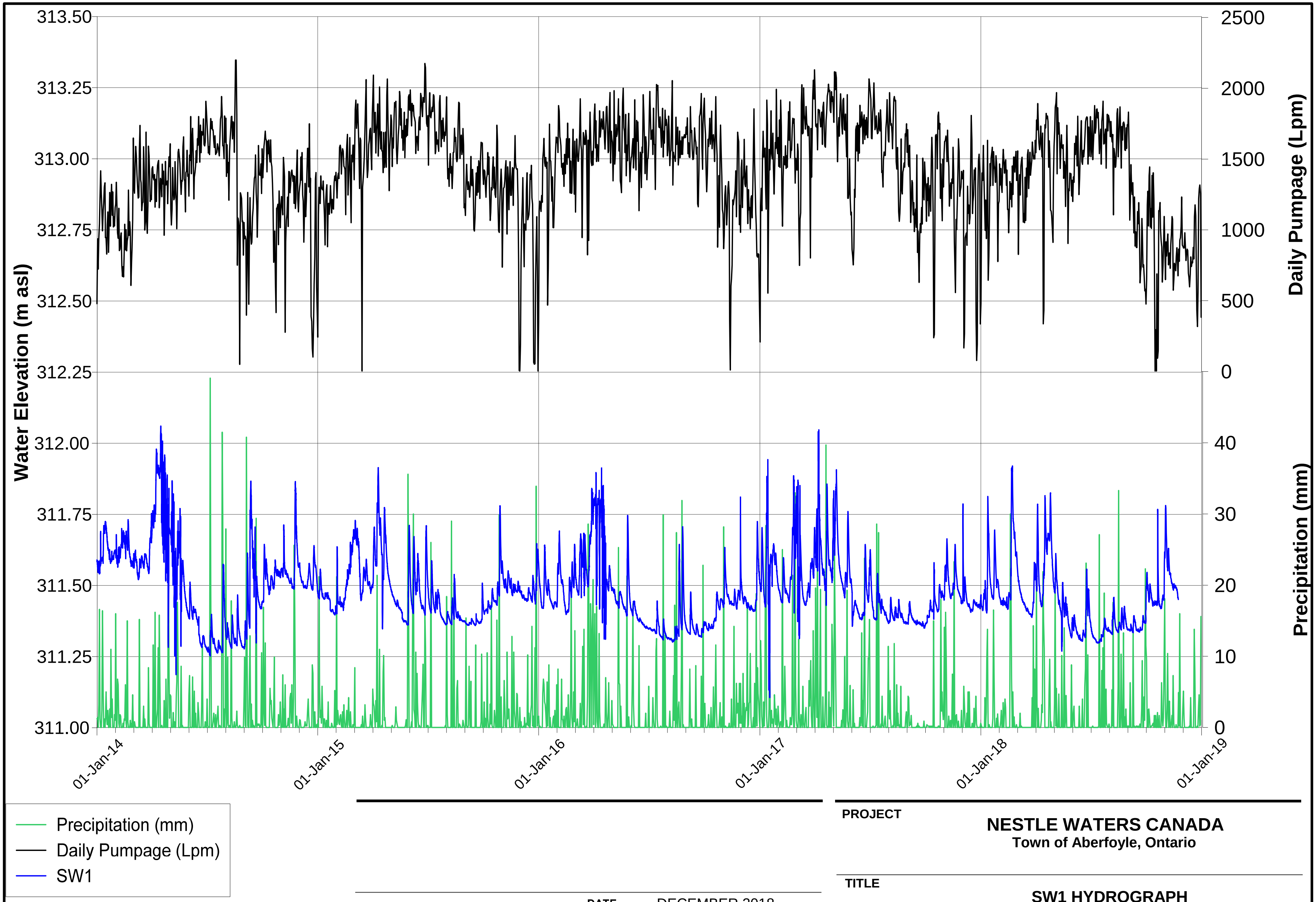
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW4 HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E13b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

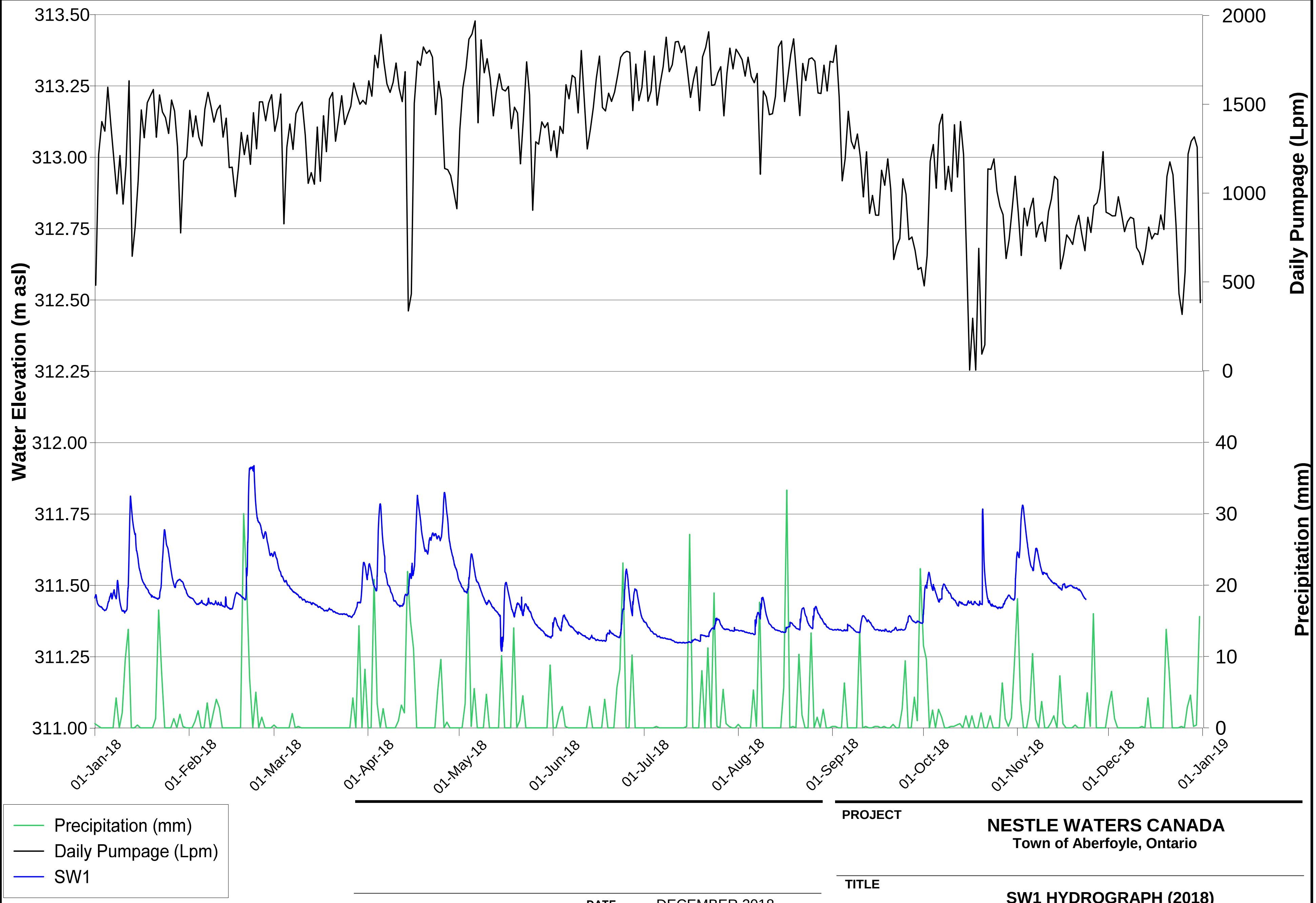
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW1 HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E14a



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

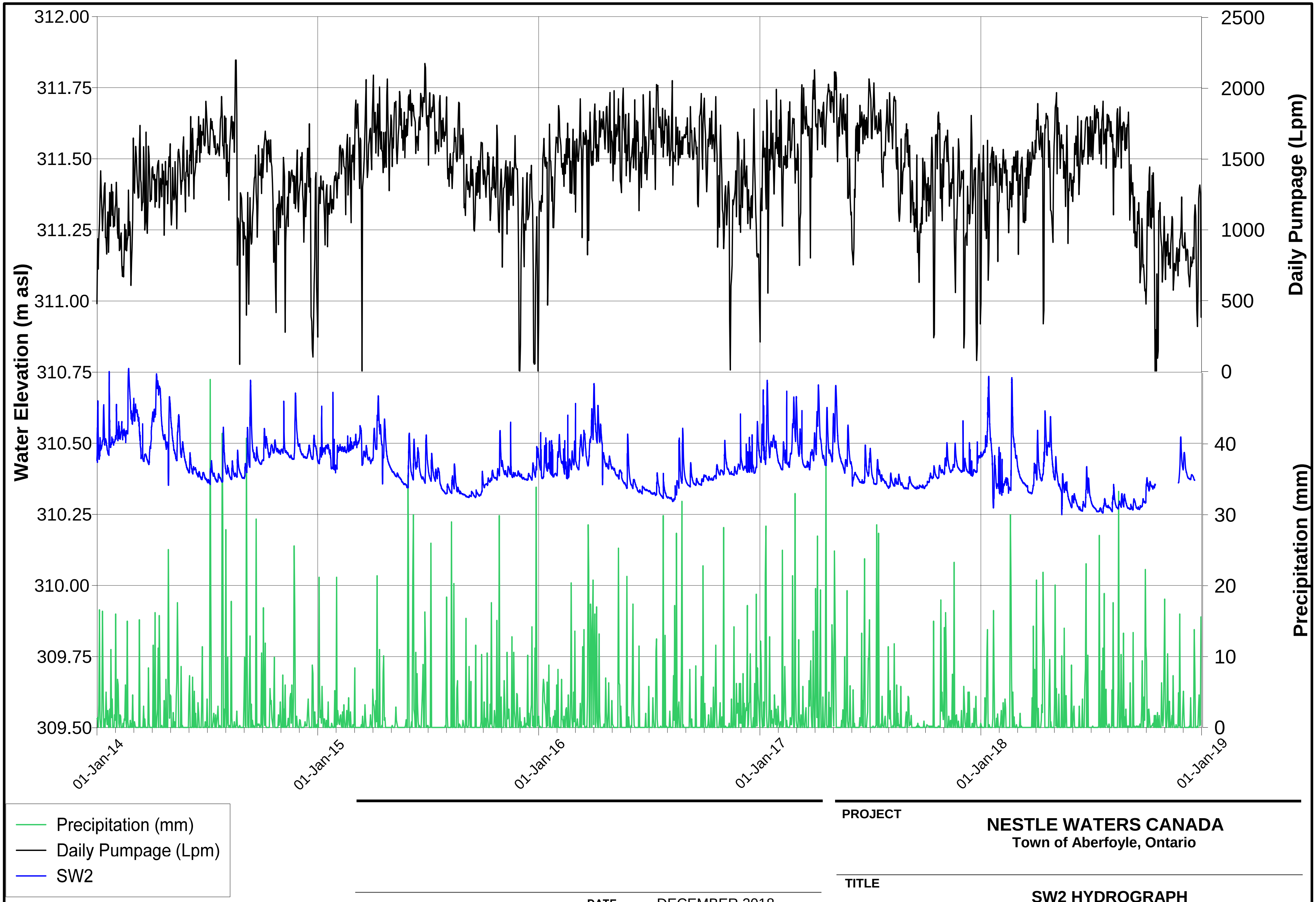
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW1 HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E14b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

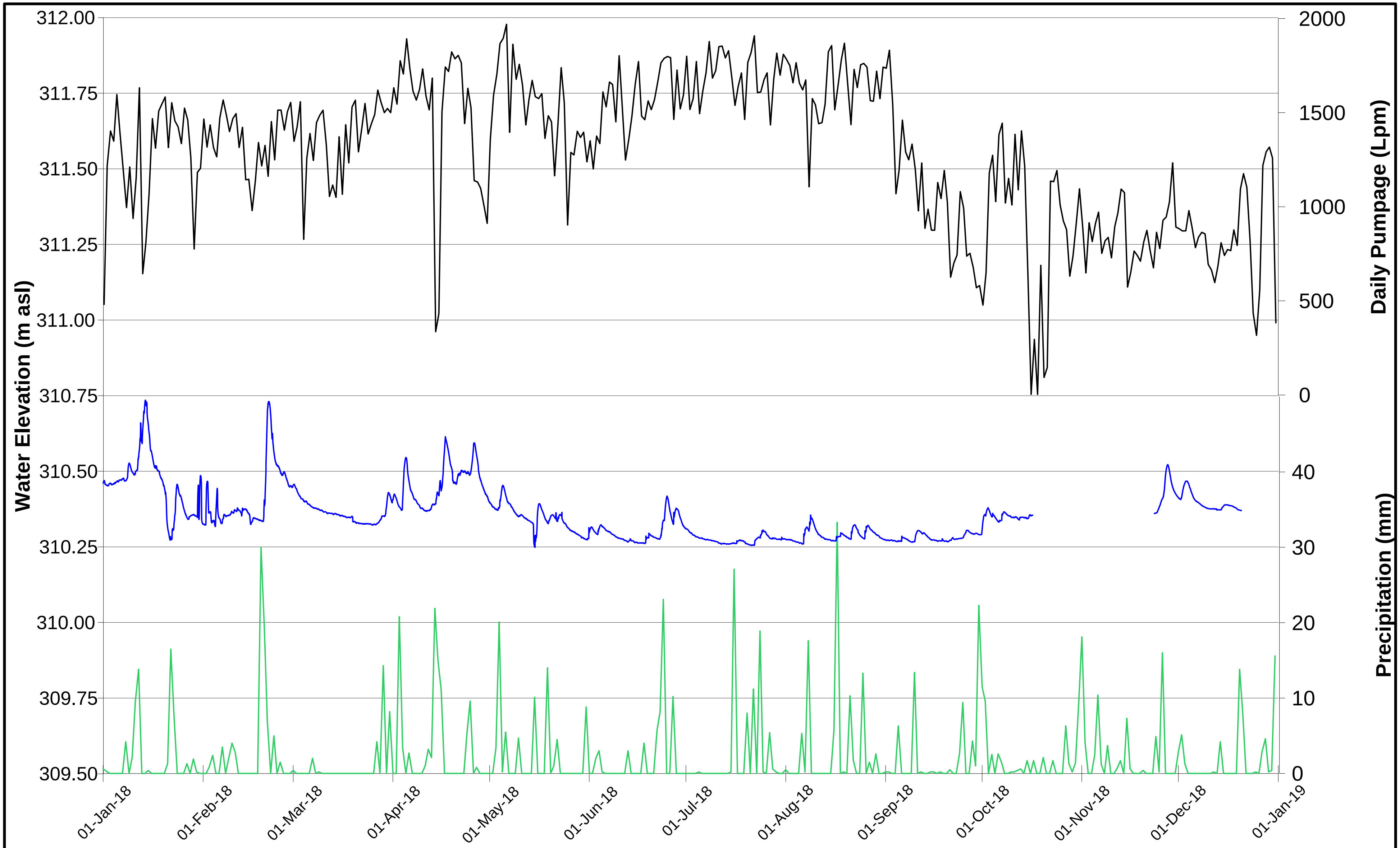
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW2 HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E15a



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

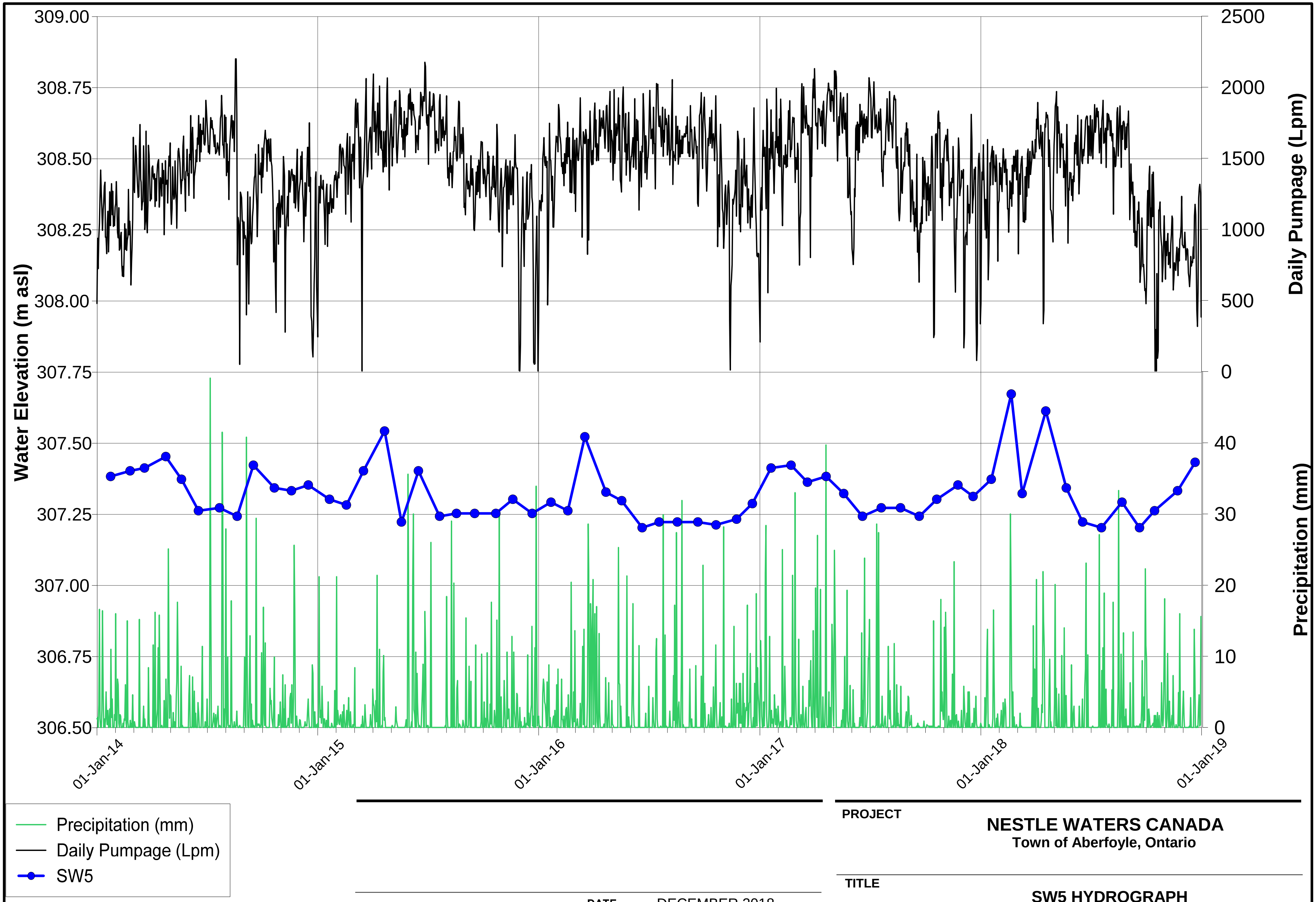
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW2 HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E15b



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

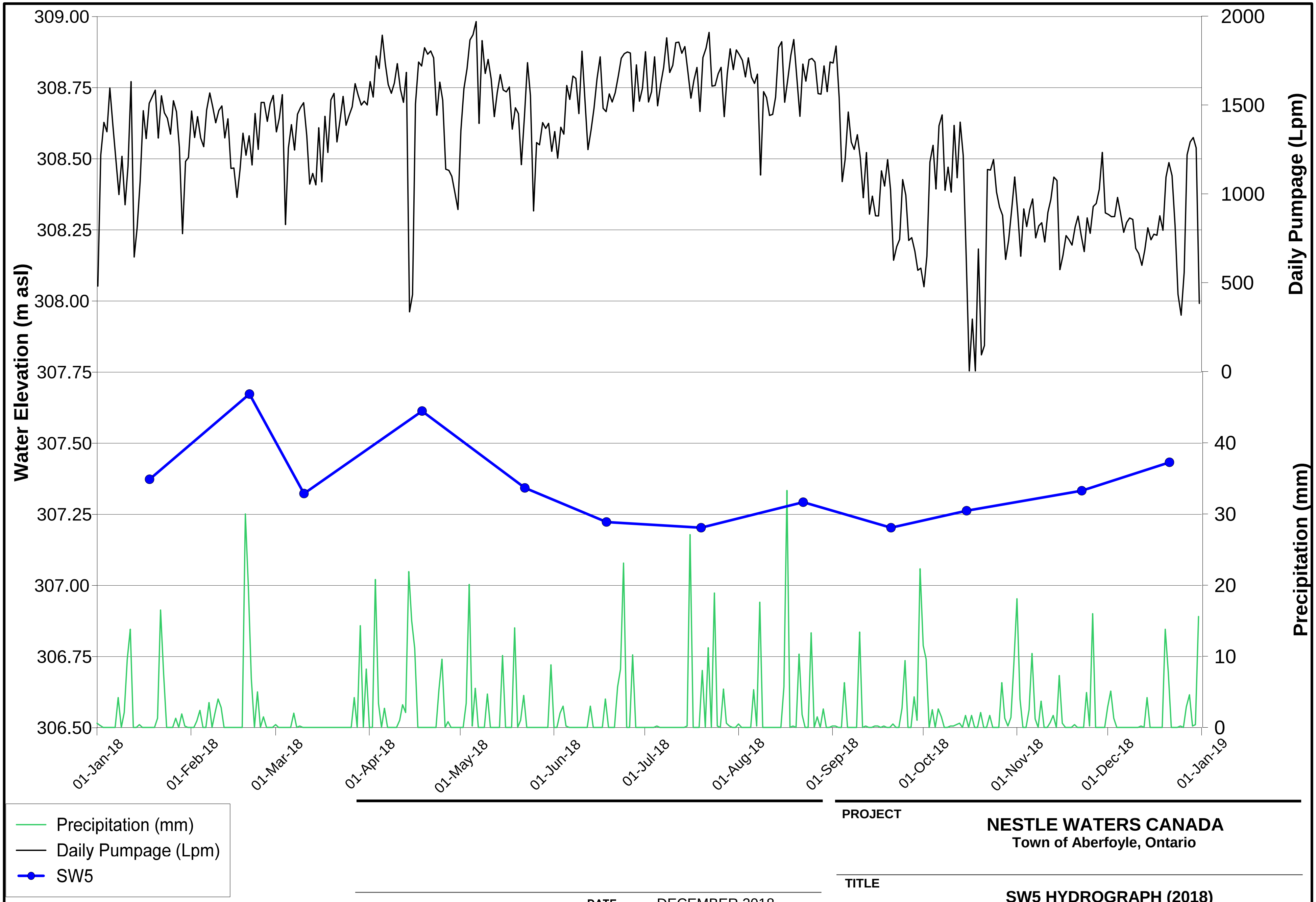
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW5 HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E16a



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

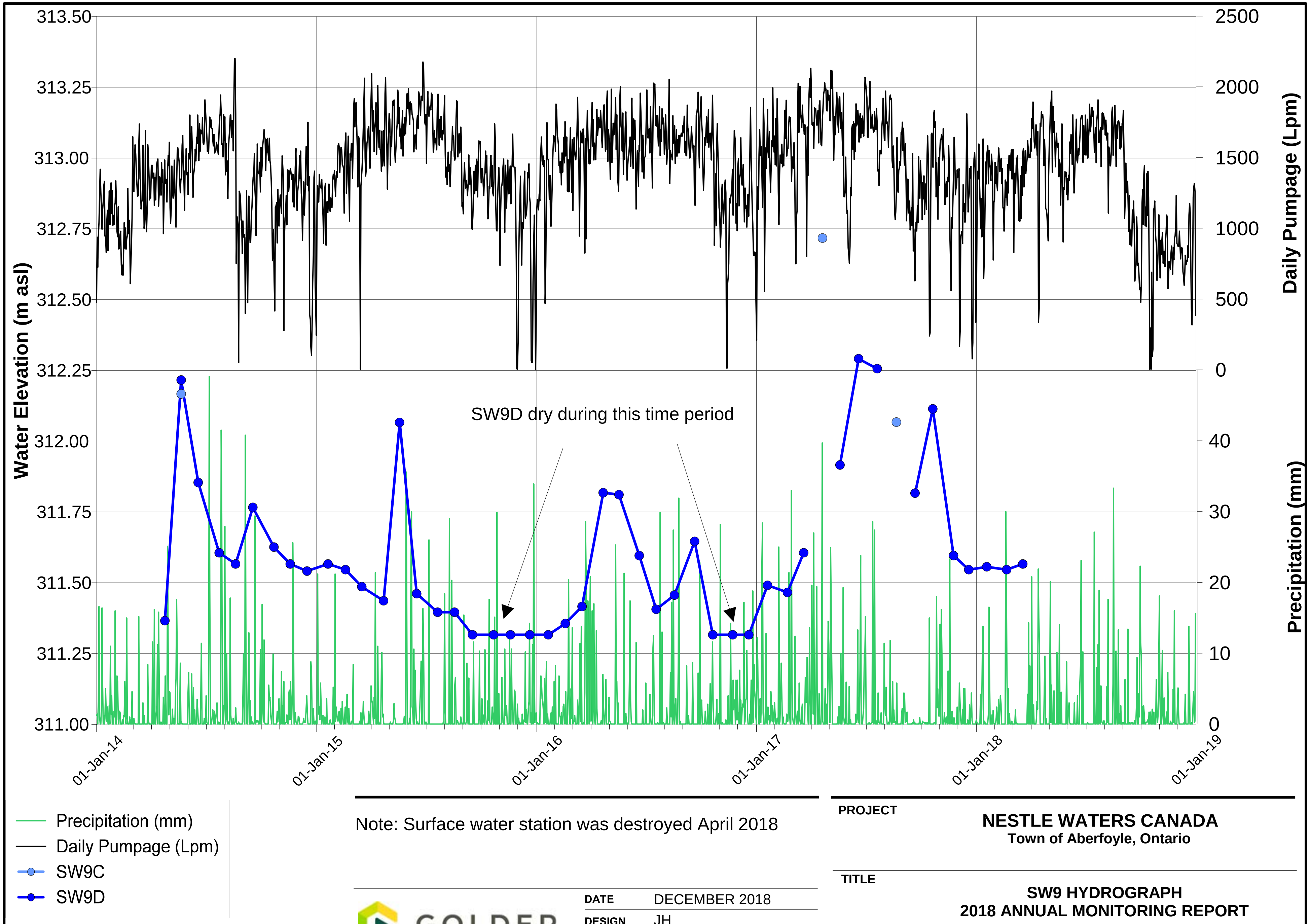
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW5 HYDROGRAPH (2018)
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E16b



Note: Surface water station was destroyed April 2018

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

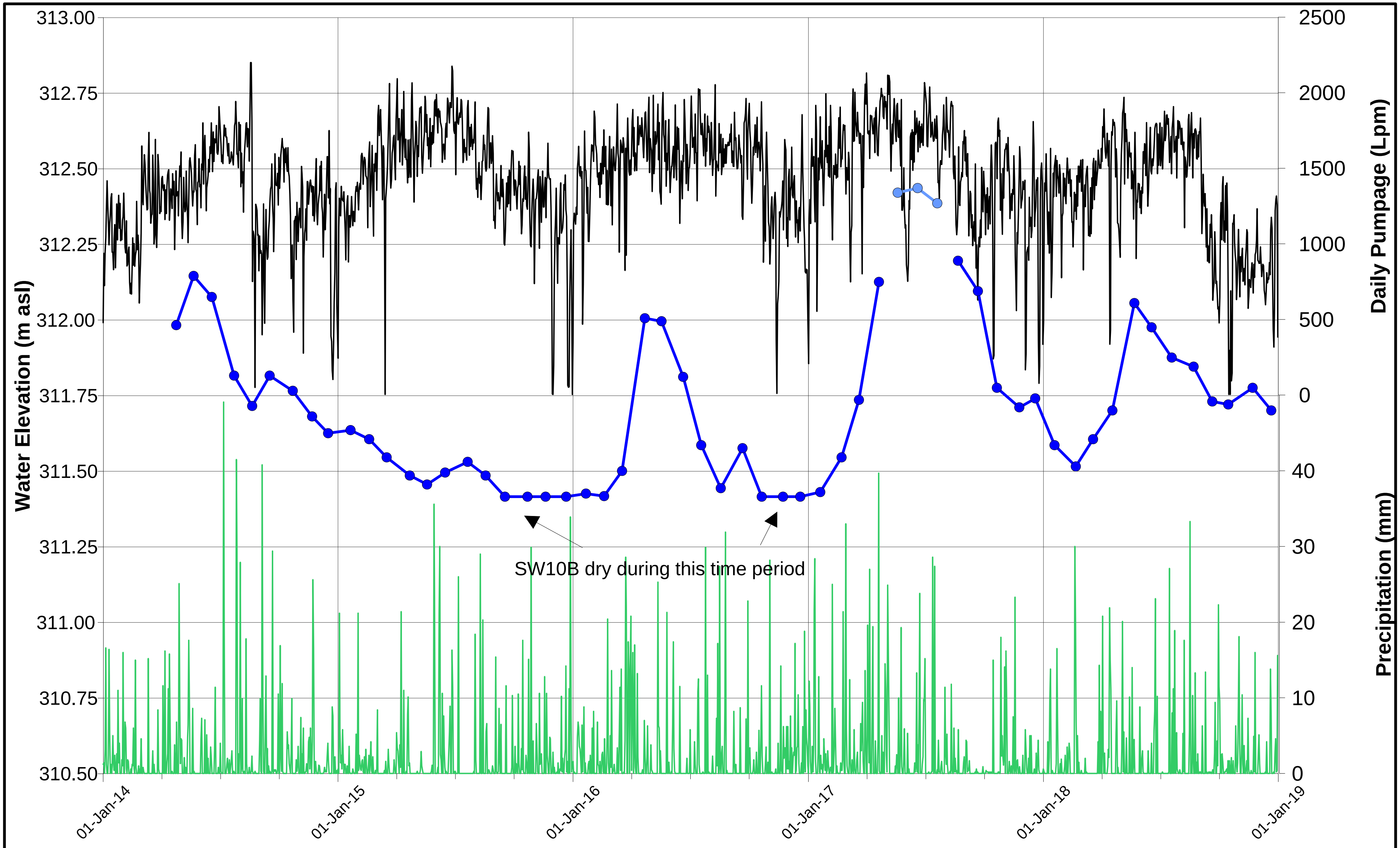
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW9 HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E17



DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW10 HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	E18

TABLE E1
Manual Surface Water Elevations (Mini Piezometers)
2018 Annual Report

Date	**Water Level (masl)**							
	MP1D-16	**MP1S-16**	**MP11D-04**	**MP11S-08**	**MP16D-08**	**MP16S-08**	**MP06D-04**	**MP06S-08**
18-Jan-18	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen
20/22/26-Feb-18	Frozen	318.49	317.96	317.79	312.64	312.65	311.97	311.98
19/20-Mar-18	Frozen	318.28	Frozen	317.76	312.15	312.18	311.45	311.44
18/19-Apr-18	Frozen	318.53	317.91	317.76	312.55	312.55	311.74	311.72
22/23-May-18	318.85	318.37	317.95	317.75	312.35	312.34	311.58	311.56
18/19-Jun-18	318.82	318.23	317.90	317.76	312.12	312.13	311.44	311.43
19/20-Jul-18	318.80	318.21	317.90	317.71	312.06	312.03	311.38	311.34
22/23-Aug-18	318.83	318.25	317.57	318.09	311.96	312.28	311.43	311.43
18/20-Sep-18	318.45	318.21	317.89	317.72	312.01	312.02	311.40	311.39
15/16-Oct-18	318.86	318.24	317.92	317.75	312.13	312.13	311.53	311.52
22/23-Nov-18	Frozen	Frozen	Frozen	317.73	Frozen	Frozen	Frozen	311.46
20/21-Dec-18	318.45	318.47	317.91	317.75	312.41	312.40	311.54	311.40

TABLE E1
Manual Surface Water Elevations (Mini Piezometers)
2018 Annual Report

Date	Water Level (masl)							
	MP12D-04	MP12S-04	MP14D-07	MP14S-07	MP08D-04	MP08S-04	MP17D-11	MP17S-11
18-Jan-18	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen
20/22/26-Feb-18	311.80	311.80	Frozen	311.50	311.00	310.33	310.16	309.72
19/20-Mar-18	Frozen	311.34	Frozen	Frozen	310.38	310.38	309.56	309.56
18/19-Apr-18	311.52	311.60	311.60	311.41	310.56	310.55	309.80	309.80
22/23-May-18	311.48	311.46	311.53	311.33	310.44	310.43	309.63	309.62
18/19-Jun-18	311.32	311.31	311.40	311.24	310.33	310.29	309.46	309.52
19/20-Jul-18	311.20	311.20	311.27	311.19	310.23	310.22	309.37	309.50
22/23-Aug-18	311.28	311.29	311.38	311.24	310.33	310.30	309.44	309.51
18/20-Sep-18	311.29	311.28	311.33	311.21	310.28	310.23	309.38	309.48
15/16-Oct-18	311.41	311.41	311.43	311.27	310.40	310.36	309.47	309.54
22/23-Nov-18	Frozen	311.44	Frozen	311.27	310.39	310.34	309.51	309.50
20/21-Dec-18	311.34	311.39	311.48	311.22	310.40	310.39	309.53	309.56

TABLE E1
Manual Surface Water Elevations (Mini Piezometers)
2018 Annual Report

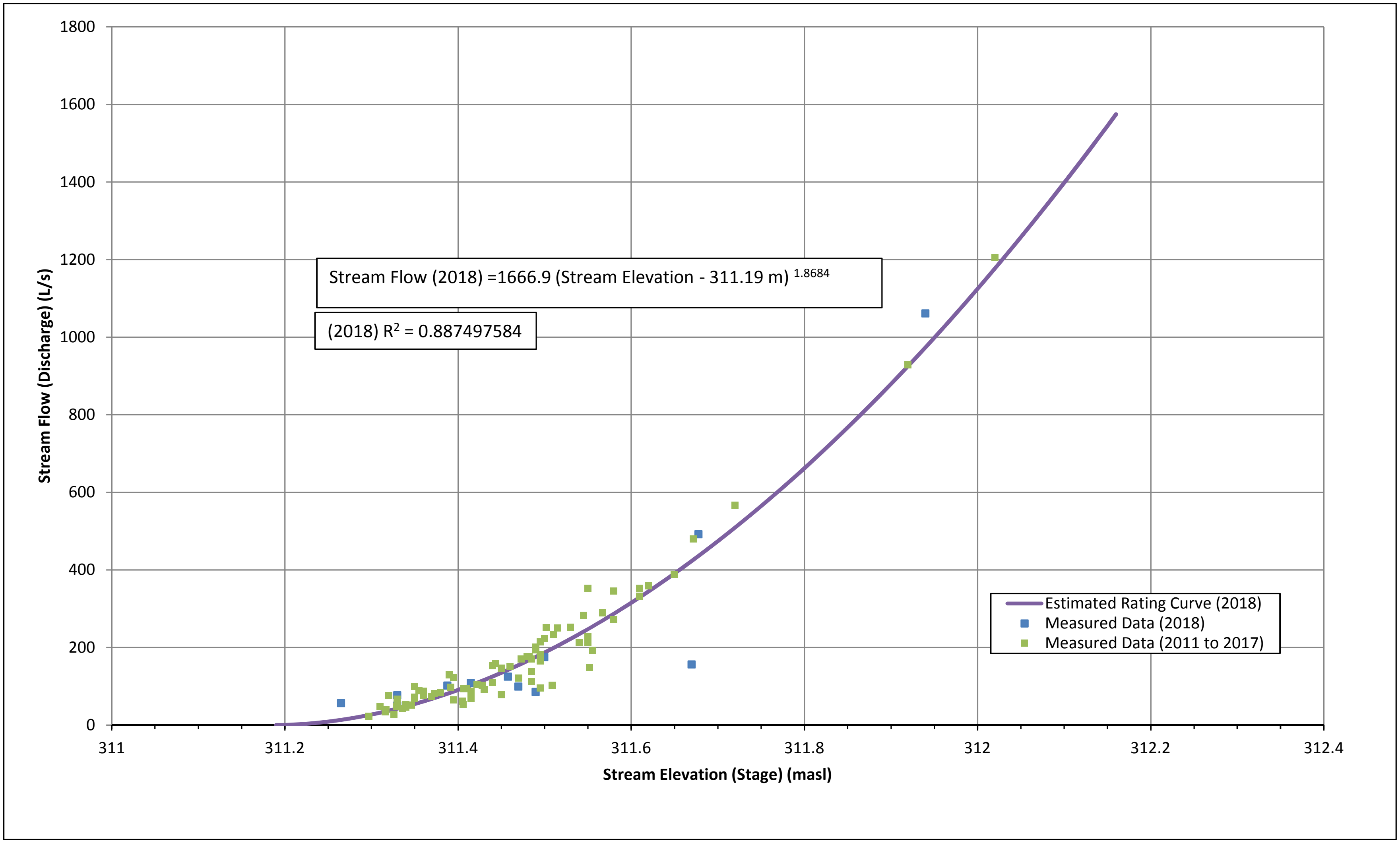
Date	Water Level (masl)			
	MP18D-11	MP18S-11	MP19D-12	MP19S-12
18-Jan-18	Frozen	Frozen	Frozen	Frozen
20/22/26-Feb-18	Frozen	308.65	310.80	310.73
19/20-Mar-18	308.24	308.31	Frozen	Frozen
18/19-Apr-18	308.56	308.50	310.79	310.71
22/23-May-18	308.39	308.35	310.66	310.58
18/19-Jun-18	308.24	308.26	310.46	310.43
19/20-Jul-18	308.17	308.21	310.23	310.21
22/23-Aug-18	308.17	308.23	310.39	310.39
18/20-Sep-18	308.11	308.18	310.26	310.25
15/16-Oct-18	308.12	308.21	310.73	310.48
22/23-Nov-18	308.17	308.24	310.51	310.52
20/21-Dec-18	308.20	308.27	310.60	310.55

TABLE E2
Manual Surface Water Elevations (Surface Water Stations)
2018 Annual Report

Date	Water Level (masl)						
	SW1	SW2	SW3	SW4	SW5	SW9	SW10
18-Jan-18	Frozen	Frozen	317.49	Frozen	307.37	Frozen	Frozen
20/22-Feb-18	311.94	310.61	317.72	312.82	307.67	311.09	311.52
19/20-Mar-18	311.42	Frozen	317.39	312.44	307.32	311.07	Frozen
18/19-Apr-18	311.68	310.48	317.63	312.54	307.61	Destroyed	311.70
22/23-May-18	311.50	310.36	317.51	312.46	307.34	Destroyed	312.06
18/19-Jun-18	311.33	310.28	317.38	312.40	307.22	Destroyed	311.98
19/20-Jul-18	311.33	310.27	317.31	312.41	307.20	Destroyed	311.88
22/23-Aug-18	311.39	310.31	317.41	312.43	307.29	Destroyed	311.85
18/20-Sep-18	311.27	310.27	317.33	312.41	307.20	Destroyed	311.73
15/16-Oct-18	311.49	310.36	317.40	312.44	307.26	Destroyed	311.72
22/23-Nov-18	311.47	310.34	317.41	312.46	307.33	Destroyed	Frozen
20/21-Dec-18	311.46	310.37	317.61	312.56	307.43	Destroyed	311.70

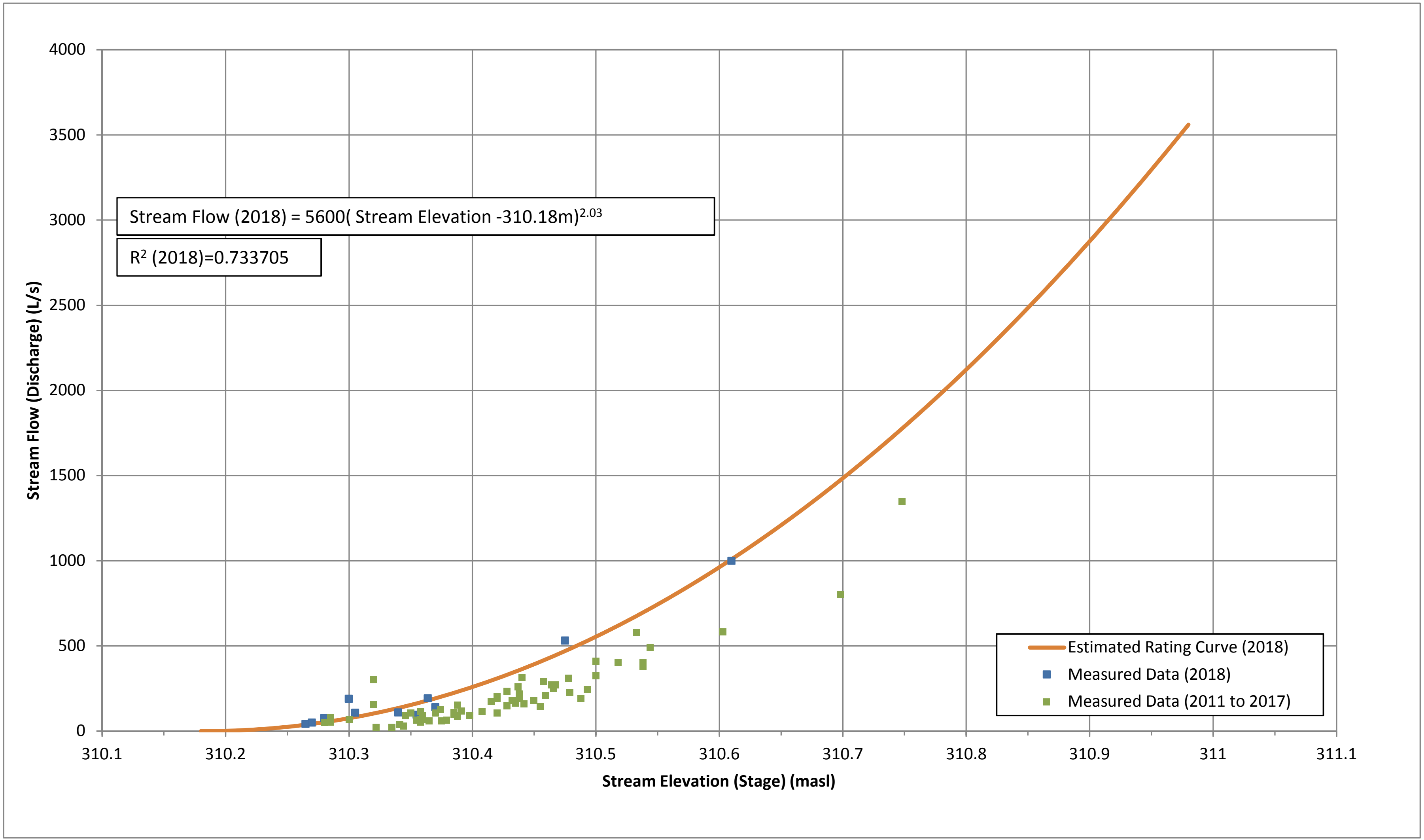
APPENDIX F

Surface Water Flow Monitoring



2018 Data Notes:
In 2018, the range of water levels recorded during manual flow measurements (and used to determine the stage-discharge relationship) = ~311.265 to 311.94 masl. The full range of water levels recorded in 2018 = ~311.27 to 311.94 masl.

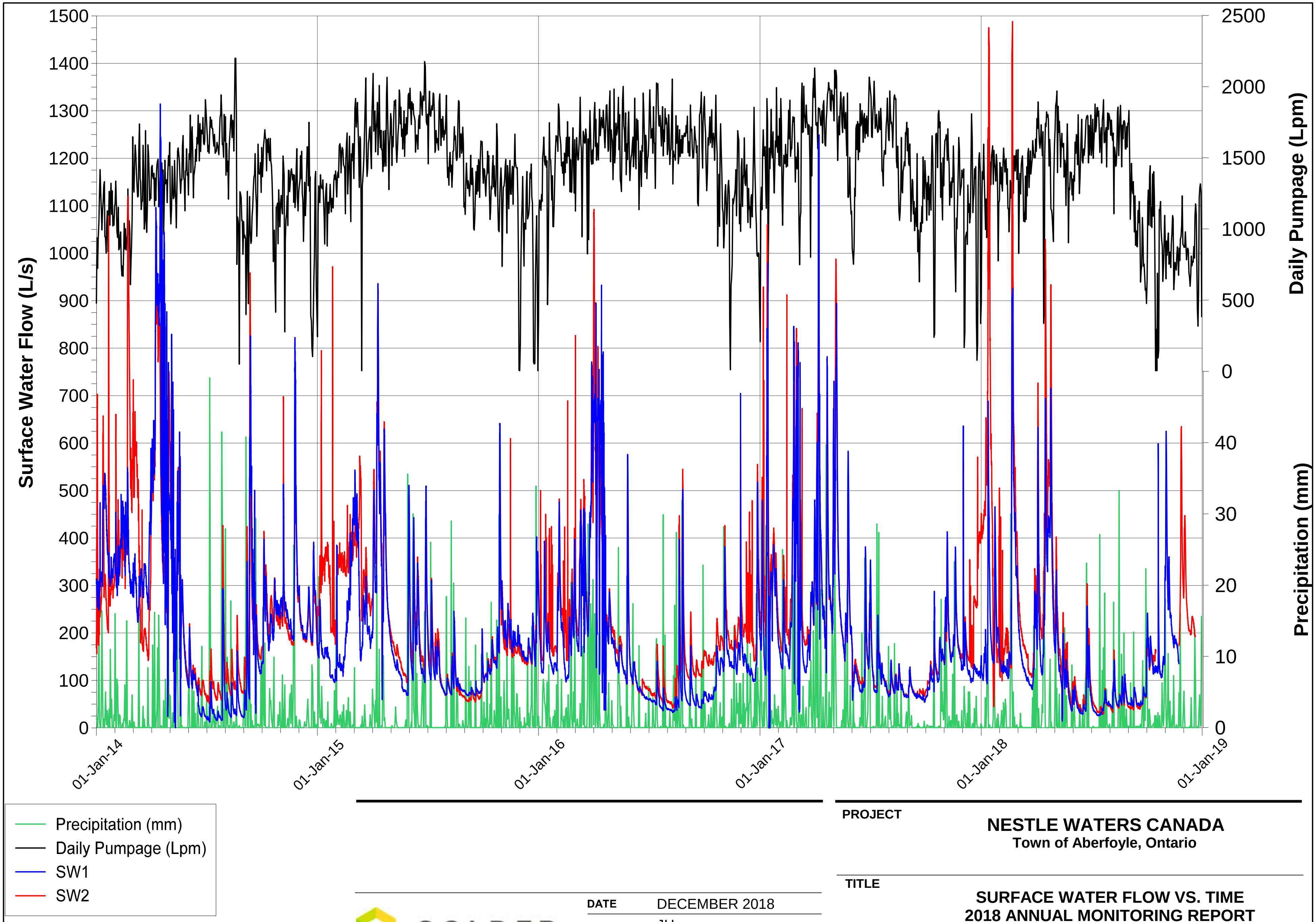
Figure. F1
STAGE-DISCHARGE MEASUREMENTS FOR SW1 (2018)
2018 ANNUAL MONITORING REPORT
NESTLE WATERS CANADA
Aberfoyle, Ontario



2018 Data Notes:
In 2018, the range of water levels recorded during manual flow measurements = 310.27 to 310.61 masl. The full range of water levels recorded in 2018 = ~310.25 to 310.73 masl.

GOLDER

Figure. F2
STAGE-DISCHARGE MEASUREMENTS FOR SW2 (2018)
2018 ANNUAL MONITORING REPORT
NESTLE WATERS CANADA
Aberfoyle, Ontario



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

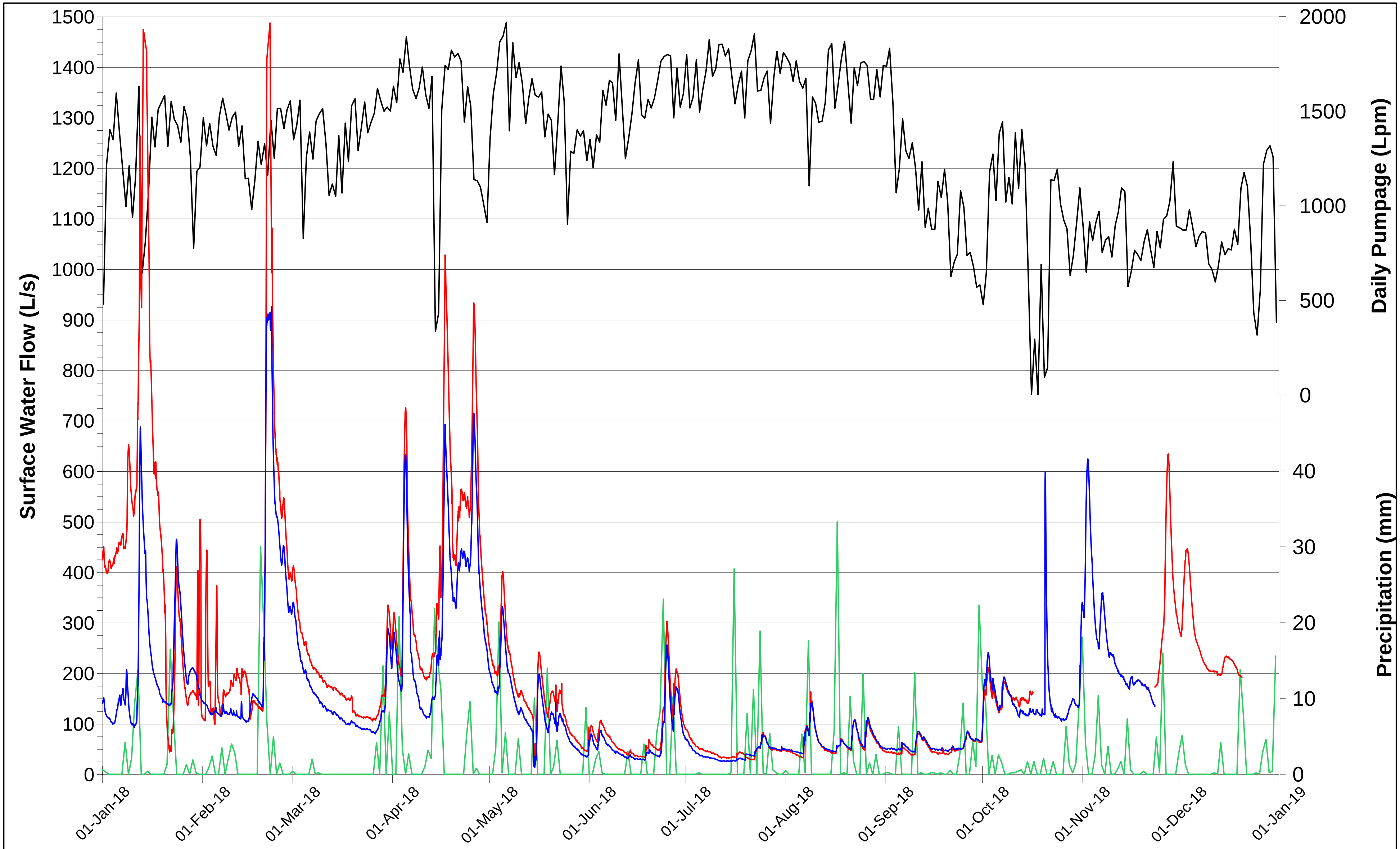
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SURFACE WATER FLOW VS. TIME
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	F3a



Precipitation (mm)
Daily Pumpage (Lpm)
SW1
SW2

GOLDER

DATE DECEMBER 2018
DESIGN JH
REVIEW GP
APPROVED GP

PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SURFACE WATER FLOW VS. TIME (2018)
2018 ANNUAL MONITORING REPORT

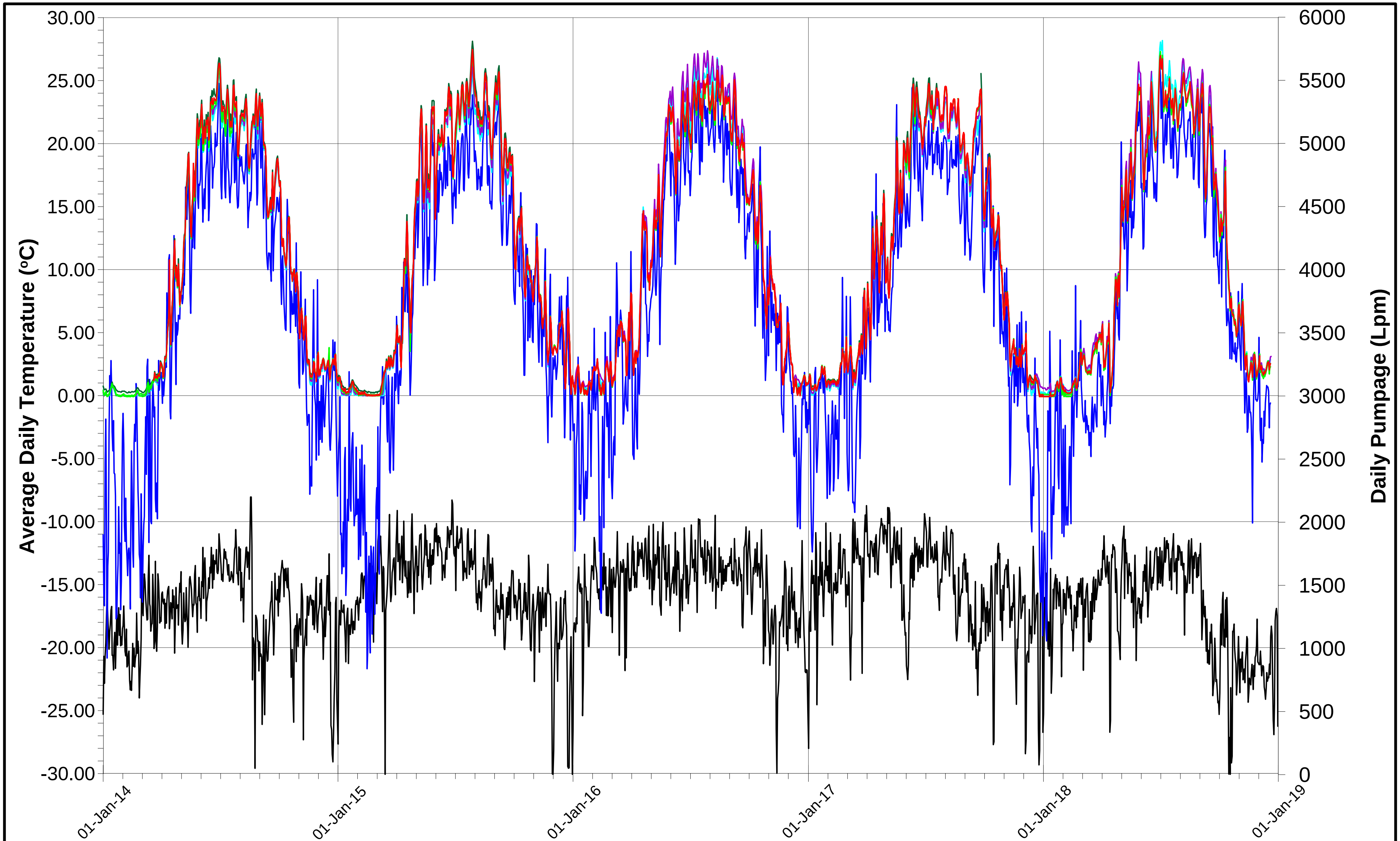
PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	F3b

TABLE F1
Surface Water Flow
2018 Annual Report

DATE	SW-1 Flow (L/sec)	SW-2 Flow (L/sec)	COMMENT
18-Jan-18	155.4	NA	Frozen channel at SW-2
22-Feb-18	1060.6	998.1	
19-Mar-18	107.5	188.7	
19-Apr-18	491.5	530.6	
24-May-18	174.7	192.3	
19-Jun-18	75.9	75.6	
19-Jul-18	50.1	41.5	
23-Aug-18	100.8	106.4	
18-Sep-18	55.8	49.6	
16-Oct-18	84.7	95.8	
23-Nov-18	98.5	108.4	
20-Dec-18	123.8	139.3	

APPENDIX G

Stream Temperature Monitoring



—	Daily Pumpage (Lpm)
—	AT1-05 (Air)
—	ST1-05
—	ST2-05
—	ST3-05
—	ST4-05
—	ST5-05
—	ST6-08

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

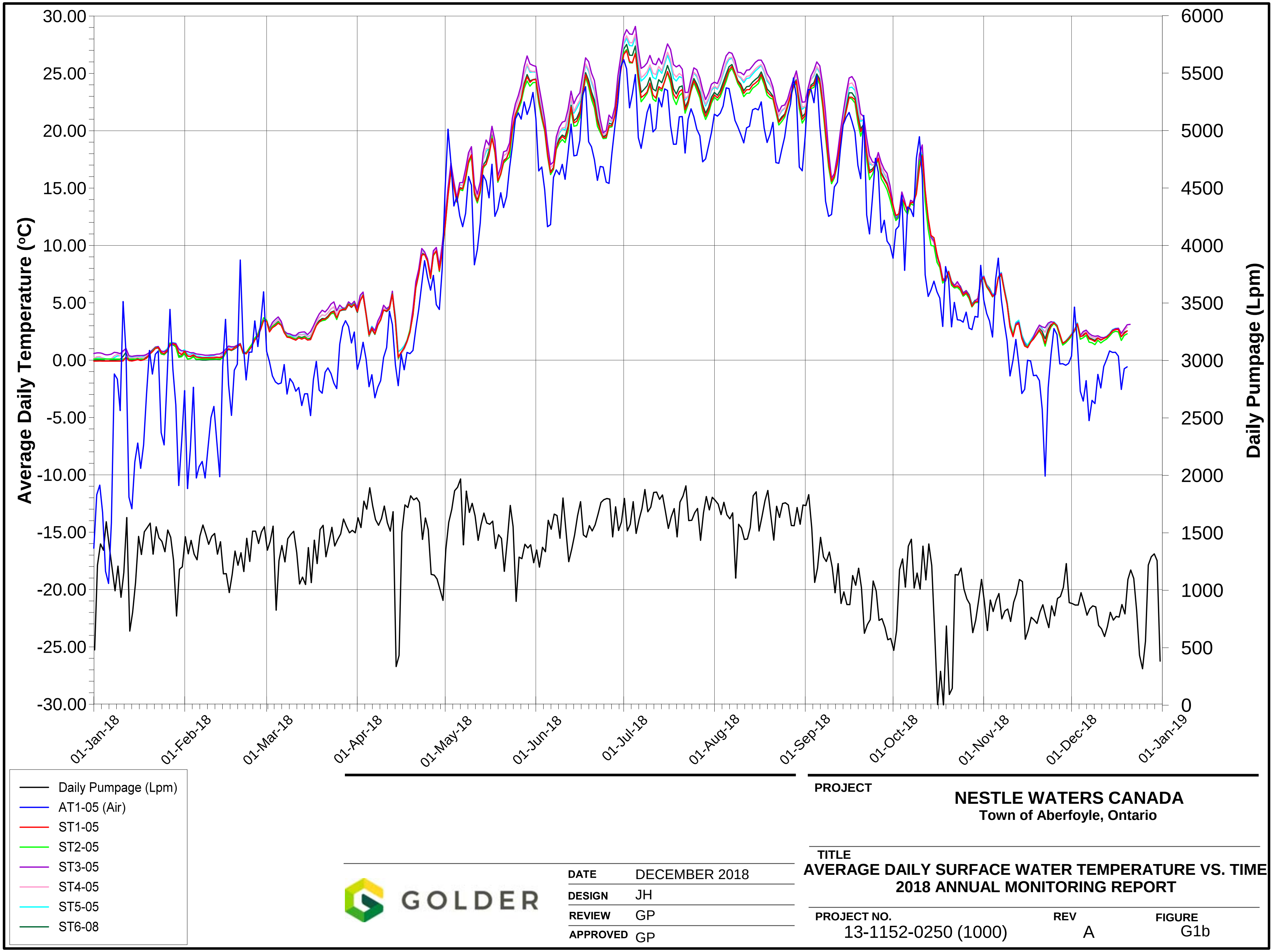
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

AVERAGE DAILY SURFACE WATER TEMPERATURE VS. TIME
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	G1a



GOLDER

DATE DECEMBER 2018
DESIGN JH
REVIEW GP
APPROVED GP

PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

AVERAGE DAILY SURFACE WATER TEMPERATURE VS. TIME
2018 ANNUAL MONITORING REPORT

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	G1b

Examination of the Temperature Suitability of Aberfoyle Creek for Resident Fishes: 2006-2018

Prepared for Nestlé Waters Canada

Prepared by Cam Portt and Jim Reid

C. Portt and Associates

February 2019

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Introduction

Condition 4.4 of the Permit to Take Water (PTTW Number 1763-8FXR29) issued to Nestlé Waters Canada (Nestlé) by the Ontario Ministry of Environment (MOE, now Ministry of Environment, Conservation and Parks) on April 29, 2011, required that Nestlé review the appropriateness of the methodology of their water temperature monitoring program in Aberfoyle Creek (the Nestlé program). C. Portt and Associates conducted that review for Nestlé and made a number of recommendations (Portt, 2011). The recommendations of the review were accepted by the MOE and were to be incorporated commencing in the 2012 field season (letter from Carl Slater, MOE, to Don DeMarco, Nestlé, October 26, 2011). One of those recommendations was that historical and future temperature data be analyzed using ThermoStat software that has been developed to evaluate the thermal suitability of Ontario streams for thermal guilds for individual species of fishes in order to provide insight into the ecological implications of the current temperature regime.

The analysis of the earlier data (2006-2012) was reported in Portt and Reid (2013). That analysis was conducted using ThermoStat Version 2 (Ontario Ministry of Natural Resources and the Institute for Watershed Science, Trent University, 2010 http://people.trentu.ca/ nicholasjones/tools.htm). The software was updated to Version 3.1 (Version 3.1, Jones and Schmidt, http://people.trentu.ca/nicholasjones/thermostat.htm) prior to the analysis of the 2013 data. The update corrected errors in the calculations by the previous version of the software and eliminated the calculation of the summer temperature suitability index. Therefore the 2006 – 2012 data were reanalyzed using ThermoStat Version 3.1 and subsequent years' data have been analyzed and reported annually using that version (Portt and Reid, 2014, 2015, 2016, 2017, 2018). This report presents the results of the analyses of the 2018 data, together with the data from previous years.

Methods

Water temperature is monitored at the sediment-water interface at six locations in Aberfoyle Creek (Figure 1) using Tidbit© V2 and MX2203 temperature loggers manufactured by Onset Computer Corporation. (http://www.onsetcomp.com/products/data-loggers/utbi-001 or mx2203). The loggers have an accuracy of ±0.2°C between 0°C and 50°C and drift is 0.1°C per year. Monitoring at Stations 1 – 5 began in 2005; monitoring at Station 6, which is the station furthest upstream, began in 2008.

Temperature is typically logged at 30 minute intervals, but was logged at 60 minute intervals for a period of time at some locations during some years. The ThermoStat software requires that the time interval be consistent during the period covered by each analysis. Therefore, in cases where temperature at a location was logged at half-hour intervals during part of the period and at one-hour intervals during another part, every second recorded temperature was deleted from the half-hour interval portion, so that the values were at one-hour intervals through the entire period. All of the 2018 data were logged at half-hour intervals.

The data were analyzed using ThermoStat Version 3.1 temperature analysis software. ThermoStat calculates the thermal suitability for individual fish species based on laboratory determined optimal and lethal temperatures, compiled by Hasnain et al. (2010), and the water temperature record.

Hasnain *et al*. (2010) provide the following definitions for the temperature criteria:

Optimum growth temperature (OGT)*: The optimum growth temperature is that which supports the highest growth rate in an experiment where separate groups of fish are exposed to one of a set of constant temperatures under ad libitum feeding conditions. The range of these constant temperatures is chosen so that reduced growth is observed at both extremes (McCauley and Casselman 1980 cited in Wismer and Christie 1987, Jobling 1981).*

Final temperature preferendum (FTP)*: Final temperature preferendum is that towards which fish gravitate when exposed to an 'infinite' temperature range (Giattina and Garton 1982 cited in Wismer and Christie 1987). Two methods are used to determine FTP: the gravitation method and the acclimation method (Jobling 1981). The gravitation method involves exposing fish to a temperature gradient until they gravitate towards a specific temperature. The acclimation method extends the gravitation method by carrying out repeated 'gravitation trials' with fish acclimated to progressively higher temperatures. The preferred temperature exhibited in each trial is then plotted against the acclimation temperature and the FTP is the temperature at which the best fit line for these data crosses the line of equality (Jobling 1981). An informal survey of a subset of the original sources indicated that most estimates were determined via the gravitation method. FTP estimates obtained using both methods were compiled in the database.*

Upper incipient lethal temperature (UILT)*: The upper incipient lethal temperature is that at which 50% of the fish in an experimental trial survive for an extended period (Spotila et al. 1979, Jobling 1981, Wismer and Christie 1987). Testing for UILT involves placing groups of fish in separate baths, each held at a different constant temperature, using a sufficiently wide range of constant temperatures that rapid mortality is observed in some baths whereas slow incomplete mortality occurs in others (Spotila et al. 1979).*

Critical thermal maximum (CTMax)*: The critical thermal maximum is an indicator of 'thermal resistance' and is defined as the temperature at which a fish loses its ability to maintain a 'normal' upright posture in the water (loss of equilibrium; Jobling 1981). It is determined by exposing fish in a tank to steadily increasing water temperatures (typically at a rate of 1 C° min-1) and noting the temperature at which the fish exhibit spasms and loss of equilibrium (Jobling 1981, Wismer and Christie 1987). Remaining at, or above, CTMax results in mortality (Jobling 1981, Wismer and Christie 1987).*

Thermal indices that reflect suitability are calculated based on the temperature record for a location and the laboratory derived criteria (Table 1). The proportion of the June through August temperature measurements that are within ±2 °C of the optimal or preferred temperature and the proportion of the June through August temperature measurements that equal or exceed the lethal threshold temperatures are expressed as a percentage of the total number of temperature measurements during this period. Because the temperature measurements occurred at fixed intervals, this percentage of measurements is equivalent to the percentage of the time from June 1st through August 31st that the temperature conditions are met.

Table 1. Indices used to evaluate the thermal suitability for individual fish species.

Optimal Range Indices	
%OGT	Percent of temperature measurements within ±2°C of the optimal growth temperature. Higher values indicate better conditions, to a theoretical maximum of 100%.
%FTP	Percent of temperature measurements within ±2°C of the final temperature preferendum. Higher values indicate better conditions, to a theoretical maximum of 100%.
Lethal Threshold Indices	
%>UILT	Percent of temperature measurements that equal or exceed the upper incipient lethal temperature. Lower values indicate better conditions. 0% is optimum.
%>CTmax	Percent of temperature measurements that equal or exceed the critical thermal maximum. Lower values indicate better conditions. 0% is optimum.

Not all of the temperature criteria are available from the scientific literature (Hasnain et al, 2010), and therefore some of the thermal suitability indices cannot be calculated for some species. The temperature criteria that were available and used by ThermoStat for the fish species that were captured in Aberfoyle Creek during electrofishing conducted in 2008 are presented in (Table 2), together with the number of individuals of each species that was captured on each of the two sampling dates.

Table 2. Number of individuals of each species that were captured by electrofishing Aberfoyle Creek on January 31 and September 24, 2008 and the temperature criteria that are available from the scientific literature, from Hasnain et al (2010), and are used by ThermoStat to calculate thermal indices.

		Number of individuals captured Sampling date		**Temperature criteria available from the scientific literature**			
Common name	**Scientific name**	**01/31/2008**	**09/24/2008**	**OGT**	**FTP**	**UILT**	**CTmax**
blacknose dace	*Rhinichthys atratulus*	25	29	na[1]	19.6	28.6	30.2
bluntnose minnow	*Pimephales notatus*	3	2	26.2	24.1	31.5	29.9
brook trout	*Salvelinus fontinalis*	1	0	14.2	14.8	24.9	29.3
brown trout	*Salmo trutta*	4	3	12.6	15.7	25.0	28.3
common shiner	*Luxilus cornutus*	96	36	22.0	21.9	30.4	31.2
common white sucker	*Catostomus commersonii*	49	76	25.5	23.4	27.8	31.6
creek chub	*Semotilus atromaculatus*	154	353	na	24.9	29.1	33.0
johnny darter	*Etheostoma nigrum*	59	52	na	na	na	na
largemouth bass	*Micropterus salmoides*	0	3	26.6	28.6	31.9	38.4
pumpkinseed	*Lepomis gibbosus*	2	10	25.0	27.7	31.7	37.6
rainbow darter	*Etheostoma caeruleum*	3	28	na	19.9	na	32.1
rock bass	*Ambloplites rupestris*	9	37	28.4	24.9	33.9	36.0

1. na indicates that the temperature metric was not available.

The water temperature data were analyzed for each year at each monitoring location, excluding cases for which a significant portion of the potential temperature measurements was missing for the June through

August period. Temperature logging at Sites 1 through 5 began on July 1, 2005; consequently 2006 is the first year for which thermal suitability indices were calculated. Temperature logging at Site 6 began on May 15, 2008, so there are no thermal suitability indices for that site prior to 2008. There are significant gaps in the summer temperature data for Site 4 in 2010, so the thermal suitability indices were not calculated. Approximately 3.5 days of data were missing for Sites 2 and 3, at the end of August in 2010, and 9.5 hours of data for June 1 were missing for Site 1 in 2010; it was assumed that these amounts of missing data would not materially alter the calculated thermal suitabilities.

The mean air temperature at the Guelph Turfgrass Institute, which is the closest Environment Canada weather station to the site, was calculated for the period June 1 through August 31 for the years 2007-2009 and 2011-2018. The weather station began operating during the summer of 2006, and there are missing data during June of 2010, so the June – August mean could not be calculated for those years. The relationship between mean June – August air temperature and mean June – August water temperature was explored graphically and using regression analyses.

Results

Graphs of the thermal suitability indices are presented in Figure 2 (%>UILT), Figure 3 (%>CTmax), Figure 4 (%FTP) and Figure 5 (%OTG). The indices values are presented in Appendix A. Summer water temperatures are highest at the most upstream location, which is closest to the Aberfoyle Mill pond, and decreases with distance downstream. This is reflected in the thermal indices, which improve from upstream to downstream for species that require cold temperatures and improve from downstream to upstream for species that require warm temperatures. Mean June – August air temperature was 19.51°C in 2018, which is the highest for the period 2007 – 2018 (Figure 6). This is also evident in the thermal suitability indices.

Lethal temperatures are arguably the most critical thermal factor in determining fish distributions. If lethality occurs, other factors such as growth are immaterial. It is clear from Figure 2 that brook trout and brown trout are the species whose upper incipient lethal temperature is equaled or exceeded most frequently; in the warmest years, at the warmest site (Site 6), the %>UILT exceeds 40% for those species. The upper incipient lethal temperature is also exceeded, but infrequently, for blacknose dace, creek chub and white sucker. In 2018, the upper incipient lethal temperature for brook trout and brown trout was exceeded more than 40% of the time at the farthest upstream station and 16% of the time for brook trout and 14% of the time for brown trout at the station farthest downstream. The *CTMax* was exceeded for brief periods for brook trout, brown trout, blacknose dace and bluntnose minnow, at some stations in 2018 (Figure 3).

The percentage of the time, from June 1st to August 31st, that water temperature is within 2C° of the final temperature preferendum (%FTP) is lowest for brown trout and brook trout (Figure 4) which have the lowest preferred temperatures (Table 2). The next lowest %FTP values are for pumpkinseed and largemouth bass, (Figure 4), which have the highest preferred temperatures (Table 2). As in past years, the %FTP was highest in 2018 for species with intermediate temperature requirements. In 2018, the %FTP was lower than it was in 2017 for species with cool preferred temperatures such as blacknose dace, rainbow darter, and common shiner, and higher for species with higher preferred temperatures such as largemouth bass, pumpkinseed, and rock bass.

The percentage of the time, from June 1st to August 31st, that water temperature was within 2C° of the optimal temperature for growth (%OGT) is presented in Figure 5. The lowest %OGT values are for brown trout and brook trout, which have the lowest optimum temperature for growth among the species that occur in this portion of Aberfoyle Creek (Table 2). The next lowest value is for rock bass, which is the species with the highest optimum temperature for growth (Table 2). The highest mean %OGT in 2018 was for pumpkinseed.

The mean June – August water temperature at each monitoring location is plotted versus mean June – August air temperature at the Guelph Turfgrass Institute in Figure 6. Mean June – August water temperature decreases in a downstream direction through the Nestlé property (Figure 6) and this is also evident in the plots of the temperature indices (Figures 2 – 5). For example, the percent of temperature measurements that exceed the ultimate upper incipient lethal temperature (%>UIL) for brook trout decreases with distance downstream (Figure 2). As Figure 6 illustrates, the mean June – August water temperature is highly correlated with the mean June – August air temperature. The best fit regressions are two-stage polynomials. At five of the six sites mean air temperature accounted for more than 90% of the variation in mean water temperature. The rate of increase in water temperature with air temperature tended to decrease in a downstream direction, as did the r^2. The 2018 mean air temperature was the highest for the period 2008-2018. The relationship between mean air temperature and mean water temperature was consistent with previous years and the r^2 of the relationship increased slightly at all six locations with the addition of the 2018 data.

Discussion

The data continue to demonstrate the strong correlation between mean June – August air temperature and mean water temperature for the same period in Aberfoyle Creek. It is clear that any study that attempts to link changes in water temperature over time to causative factors must take year-to-year differences in air temperature into account.

The 2018 results were consistent with those from previous years. In the reach of Aberfoyle Creek that flows through the Nestlé property, some species (i.e. largemouth bass, rock bass) are limited by low temperatures and the individuals that occur there probably originate from the mill pond that is just upstream. Brook trout and brown trout, on the other hand, are limited by high temperatures that exceed their upper incipient lethal temperature frequently during the summer (Figure 2) and often exceed their preferred temperature and their optimum temperature for growth (Figure 5), even in cool summers. The 2018 results continue to support the previously expressed opinion that water temperature is the principal factor limiting trout abundance in the Nestlé reach of Aberfoyle Creek, which was based on an analysis by C. Portt using the thermal suitability model of Wehrly et al. (2007), and presented in the Response to Technical Stakeholders' Comments on the TW3-80 Permit Renewal Application (Distributed: March 4, 2011).

The correlations between annual mean June - August air temperature at the Guelph Turf Grass Institute and the annual mean June - August water temperature in the Nestlé branch of Aberfoyle Creek remain high and were slightly higher for all of the six locations after the 2018 data were added, indicating that the 2018 data were consistent with the previously described relationships. The strength of the correlations is strongly influenced by the data from the coolest year (2009), but the relationships remain strong even if the 2009 data are removed.

Conclusions

In 2018, mean summer (June – August) air temperature and water temperatures were high relative to most other years in the period 2007 – 2017. The overall pattern of water temperature suitabilities for the fish species found in the Aberfoyle Branch of Mill Creek from Brock Road downstream through the Nestle property in 2018 are consistent with previous years. Water temperatures during the June 1 – August 31 period are usually too warm for coldwater species such as brook trout and brown trout and too cold for warmwater species such as largemouth bass. The water temperatures during this period are most favourable for species such as common shiner that have intermediate thermal requirements. During the summer, the water in the mill pond upstream from Brock Road becomes warm and, although the creek temperature decreases with distance downstream, it frequently exceeds the ultimate upper incipient lethal temperature for brook trout and brown trout at the furthest downstream temperature monitoring site.

The relationships between air temperature and water temperature were consistent with those observed in previous years.

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Figure 1. Temperature logging locations used in the Nestlé Waters Canada monitoring program in Aberfoyle Creek.

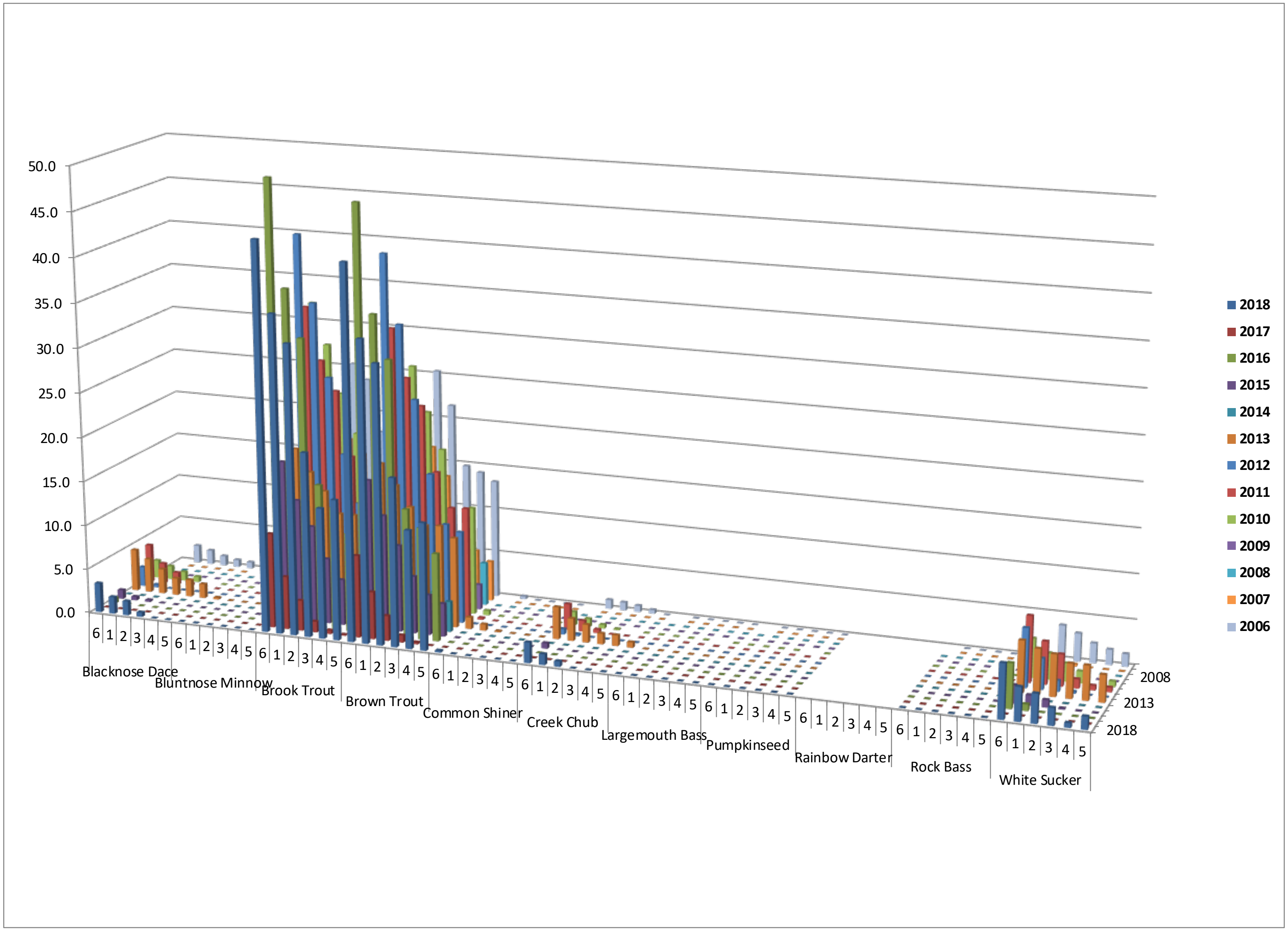

Figure 2. Percent of temperature measurements that exceed the ultimate upper incipient lethal temperature (%>UILT) during the period June 1 to August 31, by species, station and year.

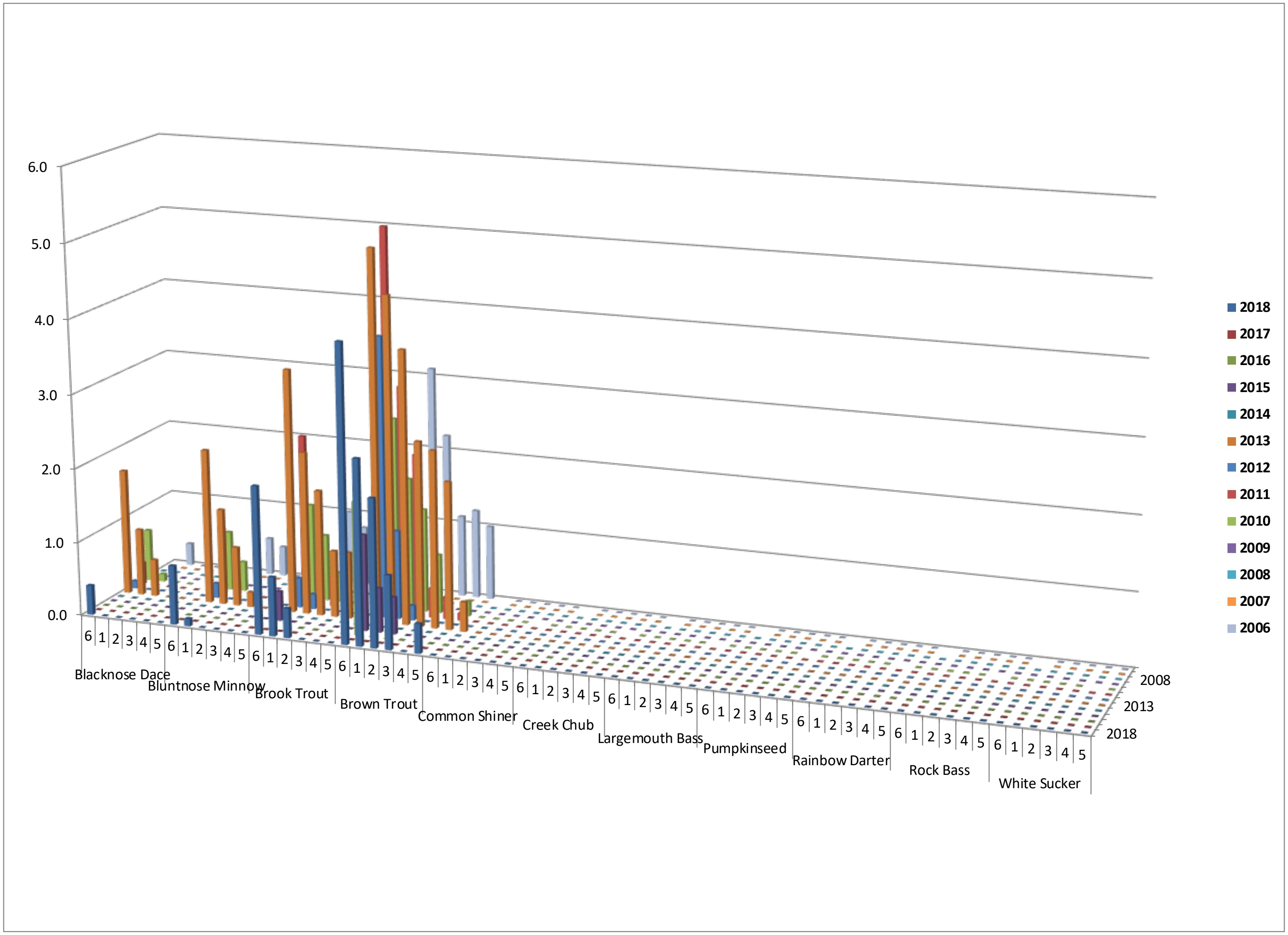

Figure 3. Percent of temperature measurements that exceed the critical thermal maximum temperature (%>CTmax) during the period June 1 to August 31, by species, station and year.

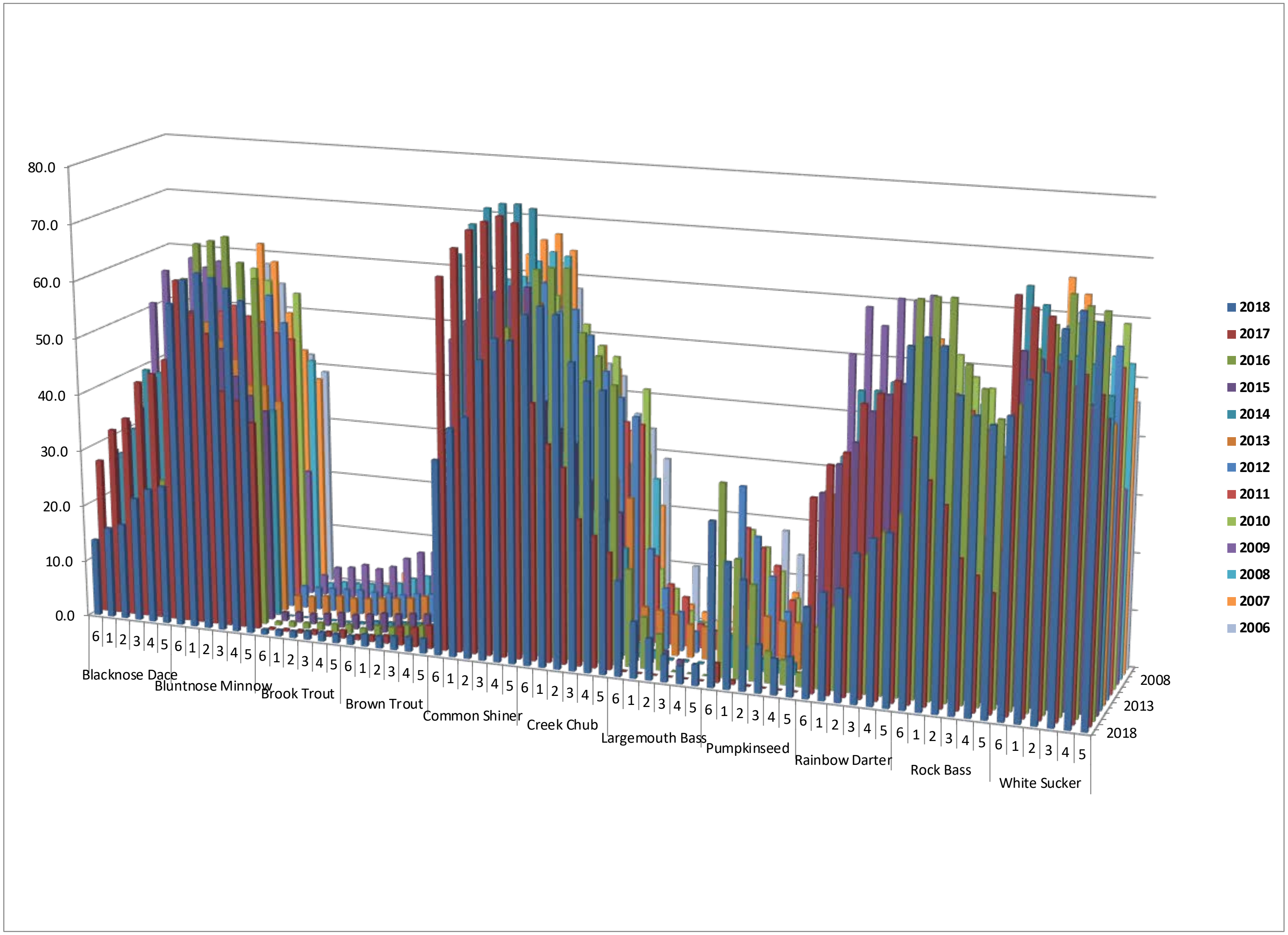

Figure 4. Percent of temperature measurements within ±2°C of the final temperature preferendum (%FTP) during the period June 1 to August 31, by species, station and year.

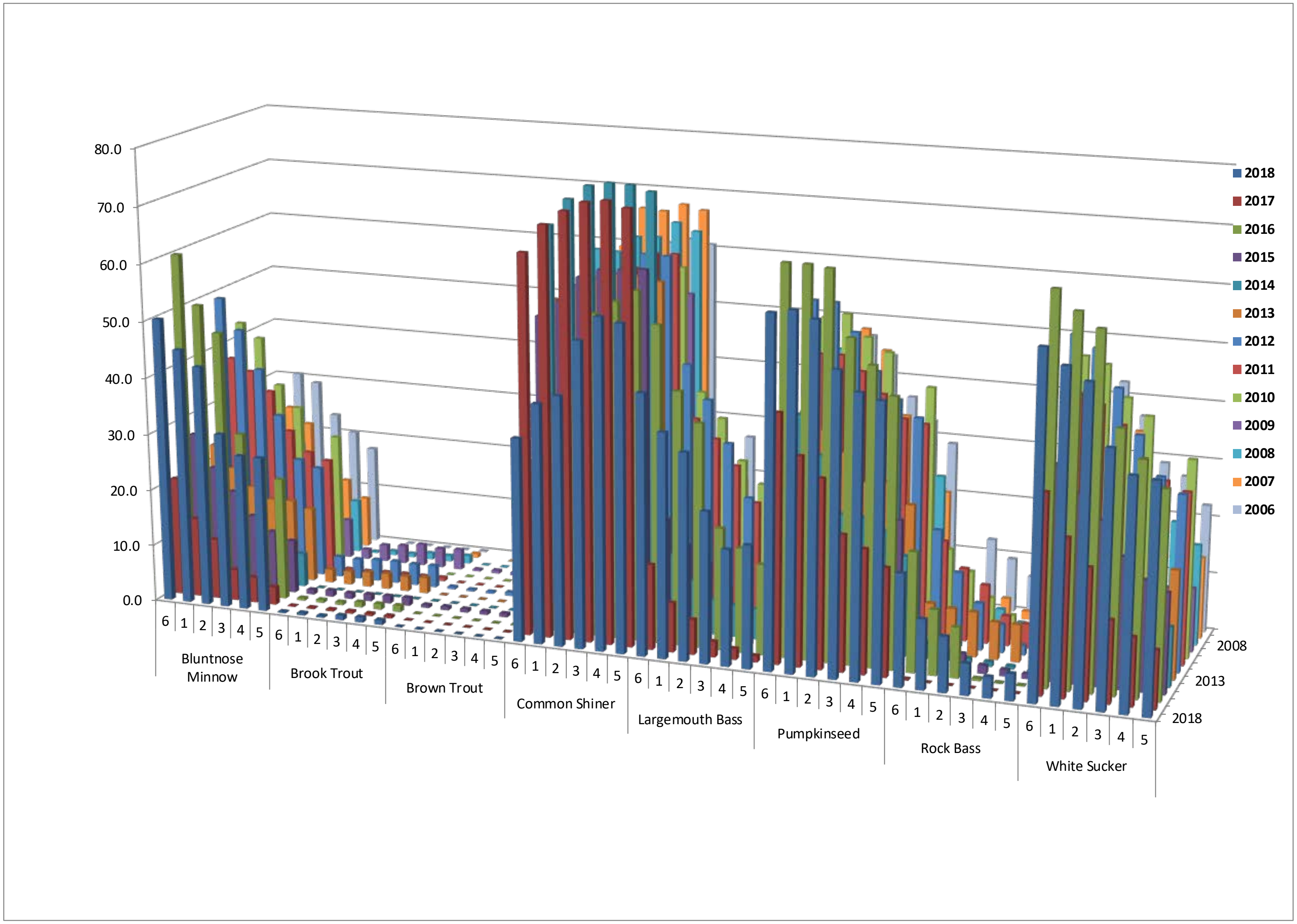

Figure 5. Percent of temperature measurements within ±2°C of the optimal temperature for growth (%OTG) during the period June 1 to August 31, by species, station and year.

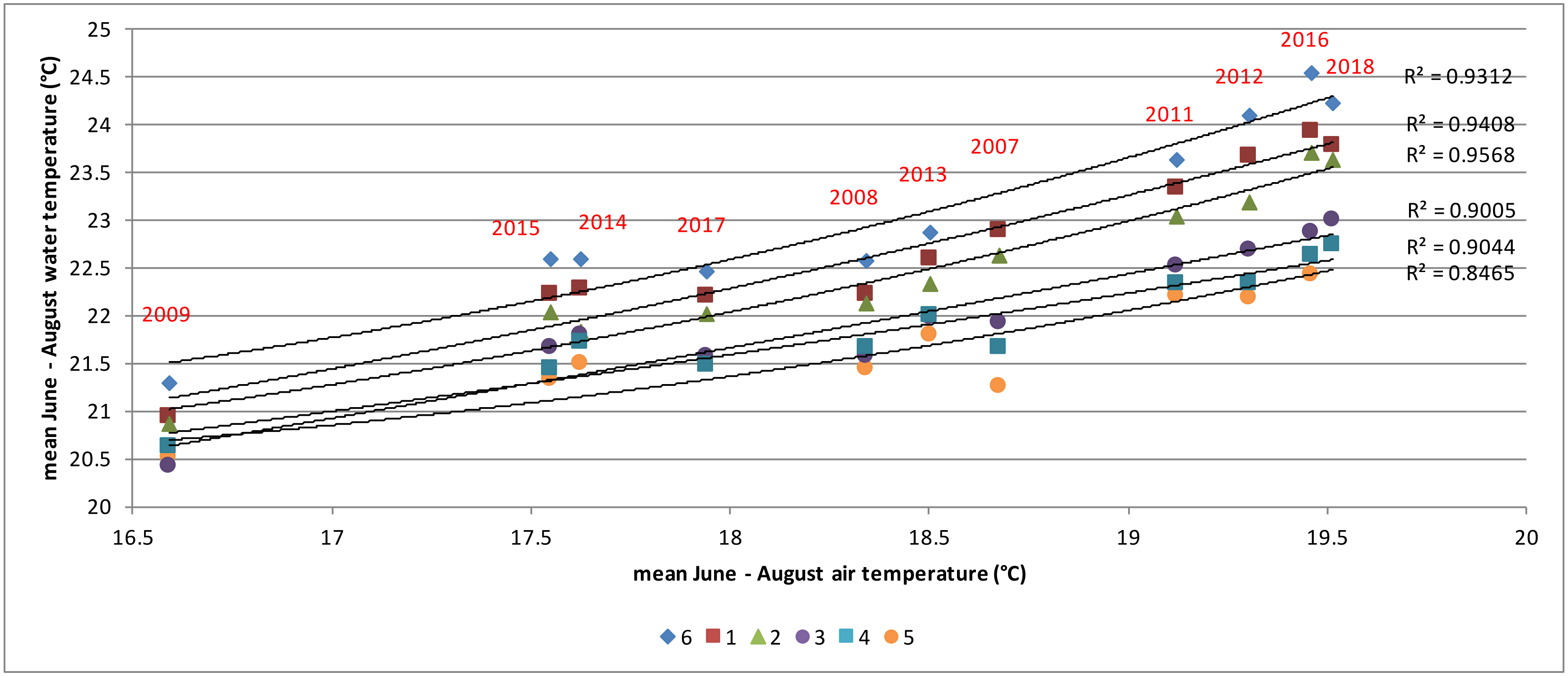

Figure 6. Plot of the mean June 1 - August 31 water temperature at each site versus mean June – August air temperature at the Guelph Turfgrass Institute, by year. The lines and R^2 values are for second order polynomial regressions.

APPENDIX A

Thermal suitability indices

Percent of temperature measurements within ±2°C of the optimum growth temperature (%OGT)

	Year														
Species	Station	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	Mean
Blunt-nose Minnow	6	50.3	20.9	60.1	27.0	18.2	23.2	49.2	37.4	43.1	12.3	26.2			34.9
	1	45.2	14.0	51.4	21.3	13.0	19.3	43.7	35.3	40.6	8.5	19.3	25.0	30.5	29.5
	2	42.5	10.6	46.8	17.3	8.5	16.2	36.8	31.9	32.2	7.2	19.3	22.2	29.1	25.9
	3	30.9	5.5	29.0	13.2	7.9	14.2	28.7	24.9	28.3	5.9	11.7	15.1	23.3	19.3
	4	27.4	4.5	24.9	10.7	7.0	14.3	20.9	21.3		7.0	11.9	12.1	20.3	16.1
	5	27.4	3.1	21.6	9.4	5.9	13.2	19.7	20.1	23.5	6.9	9.5	9.0	17.5	15.3
	Mean	37.3	9.8	39.0	16.5	10.1	16.7	33.2	28.5	33.5	8.0	16.3	16.7	24.1	23.3
Brook Trout	6	0.2	0.1	0.4	0.8	0.0	2.3	3.6	0.2	0.0	1.7	0.2			0.8
	1	0.4	0.2	0.5	1.1	0.0	2.4	3.5	0.2	0.0	2.9	0.7	0.0	0.0	0.9
	2	0.3	0.3	0.5	1.0	0.0	2.6	3.8	0.4	0.0	3.2	0.6	0.0	0.0	0.9
	3	0.8	0.4	0.9	1.2	0.0	2.7	3.9	0.5	0.0	3.8	1.1	0.1	0.0	1.2
	4	0.9	0.4	1.0	1.3	0.0	2.6	3.8	0.5		3.4	1.0	0.2	0.0	1.2
	5	0.8	0.4	1.1	1.4	0.0	2.8	3.9	0.6	0.0	3.6	1.4	0.7	0.1	1.3
	Mean	0.6	0.3	0.7	1.1	0.0	2.6	3.8	0.4	0.0	3.1	0.8	0.2	0.0	1.0
Brown Trout	6	0.0	0.0	0.0	0.5	0.0	0.0	0.4	0.0	0.0	0.3	0.0			0.1
	1	0.0	0.0	0.0	0.6	0.0	0.0	0.3	0.0	0.0	0.5	0.0	0.0	0.0	0.1
	2	0.0	0.0	0.0	0.6	0.0	0.0	0.3	0.0	0.0	0.5	0.0	0.0	0.0	0.1
	3	0.0	0.0	0.0	0.6	0.0	0.0	0.6	0.0	0.0	0.6	0.0	0.0	0.0	0.1
	4	0.0	0.0	0.0	0.6	0.0	0.0	0.3	0.0		0.6	0.0	0.0	0.0	0.1
	5	0.0	0.0	0.2	0.6	0.0	0.0	0.5	0.0	0.0	0.6	0.1	0.0	0.0	0.1
	Mean	0.0	0.0	0.0	0.6	0.0	0.0	0.4	0.0	0.0	0.5	0.0	0.0	0.0	0.1
Common Shiner	6	35.4	66.0	29.5	53.7	68.5	55.0	36.4	47.3	44.8	63.9	60.0			49.7
	1	41.6	70.9	38.8	56.7	73.1	57.7	43.1	51.0	47.0	60.8	59.8	60.1	56.3	54.2
	2	43.3	73.4	42.4	60.9	75.6	59.1	51.8	53.4	54.8	62.8	62.7	67.1	61.5	58.0
	3	52.9	75.1	55.8	62.4	76.3	60.1	56.8	59.7	56.7	51.4	62.9	66.8	60.5	60.7
	4	57.2	75.6	58.1	62.7	76.2	60.1	63.1	62.5		57.9	65.7	68.2	61.4	63.5
	5	56.4	74.6	60.2	63.0	75.3	59.4	63.0	62.6	59.6	54.2	64.4	67.4	60.7	62.7

	Mean	47.8	72.6	47.5	59.9	74.2	58.6	52.4	56.1	52.6	58.5	62.6	65.9	60.1	58.3
Large-mouth Bass	6	45.1	14.8	54.8	20.6	13.4	17.5	44.6	34.2	38.0	9.0	19.6			29.7
	1	38.8	8.6	43.9	16.5	9.1	15.1	38.8	31.0	33.7	6.8	15.1	19.9	26.6	24.5
	2	35.8	6.1	38.8	13.6	6.2	13.4	31.5	26.6	26.5	4.4	14.8	18.7	25.5	21.3
	3	26.2	2.7	21.2	9.5	5.6	11.3	22.3	20.4	22.7	4.3	8.9	12.1	20.2	15.3
	4	20.1	1.9	18.1	7.7	5.3	11.3	15.8	16.9		5.2	8.9	9.3	17.6	12.2
	5	21.2	1.1	15.7	6.4	4.7	10.2	15.0	16.3	18.0	4.6	7.0	6.4	15.3	11.7
	Mean	31.2	5.9	32.1	12.4	7.4	13.1	28.0	24.2	27.8	5.7	12.4	13.3	21.0	18.9
Pumpkin-seed	6	60.2	42.9	66.8	42.5	39.8	39.5	57.5	47.5	53.0	23.4	45.8			48.3
	1	60.9	36.0	66.8	38.3	33.2	36.5	57.4	47.6	53.8	18.3	38.3	48.8	46.8	46.0
	2	59.7	32.6	66.4	35.8	23.5	33.0	52.6	45.1	50.1	15.4	38.2	45.3	43.6	42.9
	3	51.8	23.5	55.3	29.3	23.3	28.2	46.3	41.5	47.8	13.7	29.0	34.1	36.5	36.6
	4	48.4	21.5	51.1	26.6	21.4	28.6	41.8	37.6		14.4	29.5	27.2	32.6	33.0
	5	47.4	18.7	46.3	24.6	17.4	25.1	39.0	37.0	42.4	14.2	25.0	21.2	28.9	31.0
	Mean	54.7	29.2	58.8	32.9	26.4	31.8	49.1	42.7	49.4	16.6	34.3	35.3	37.7	39.5
Rock Bass	6	19.3	0.2	20.7	5.5	3.1	8.5	20.1	17.1	14.6	1.6	5.4			11.3
	1	12.0	0.0	11.3	3.3	1.9	8.0	13.1	12.7	11.1	1.0	2.5	3.8	12.4	7.5
	2	9.5	0.0	8.7	3.0	1.0	7.8	8.2	10.2	6.9	0.8	2.5	3.3	9.3	5.8
	3	5.4	0.0	0.4	1.4	0.8	6.5	4.9	5.2	4.2	0.2	0.5	1.4	6.5	3.1
	4	3.6	0.0	0.1	1.1	0.5	6.5	1.7	4.2		0.3	0.5	0.6	6.0	2.2
	5	4.6	0.0	0.1	0.8	0.2	5.7	2.3	3.3	2.5	0.3	0.2	0.1	4.7	2.1
	Mean	9.1	0.0	6.9	2.5	1.3	7.2	8.4	8.8	7.9	0.7	1.9	1.8	7.8	5.2
White Sucker	6	58.3	34.0	65.9	36.6	30.4	33.6	55.3	44.6	50.0	18.0	37.3			43.5
	1	55.6	26.9	62.6	32.0	23.7	30.0	53.3	43.0	48.9	15.0	27.5	37.0	42.4	39.5
	2	53.4	22.4	60.1	28.0	15.7	25.8	47.0	39.9	43.6	12.8	28.5	35.1	36.8	35.9
	3	43.2	14.1	44.4	22.4	14.9	20.8	39.5	34.6	40.8	9.5	19.4	21.9	29.0	28.4
	4	39.1	11.7	39.7	18.9	12.8	21.1	32.9	31.2		10.8	21.1	18.9	27.0	24.9
	5	38.7	10.0	35.3	17.2	10.3	18.7	30.3	29.7	34.2	11.1	17.5	14.2	22.3	23.4
	Mean	48.1	19.9	51.3	27.6	18.0	25.0	43.1	37.2	43.5	12.9	25.2	25.4	31.5	32.5

Percent of temperature measurements within ±2°C of the final temperature preferendum (%FTP)															
		Year													
Species	Station	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	Mean
Black-nose Dace	6	13.7	27.4	9.2	28.0	26.7	26.9	10.2	21.6	21.1	51.1	30.5			23.3
	1	16.1	33.2	12.0	33.3	31.4	30.7	12.9	24.7	22.5	57.2	35.1	24.9	24.8	26.8
	2	17.0	35.5	13.6	36.1	42.3	34.0	17.1	28.4	24.8	53.2	34.1	26.7	26.5	29.0
	3	22.0	42.2	20.6	41.7	42.0	38.9	22.9	34.1	29.2	59.9	40.2	37.8	37.7	35.1
	4	23.9	43.9	24.1	45.0	43.9	38.6	27.4	36.4		58.4	39.6	41.2	42.2	37.6
	5	24.7	46.6	26.9	46.9	48.7	42.1	30.9	38.9	34.1	59.7	43.3	49.8	48.4	40.4
	Mean	19.6	38.1	17.7	38.5	39.2	35.2	20.2	30.7	26.3	56.6	37.1	36.1	35.9	32.2
Blunt-nose Minnow	6	57.3	60.8	60.5	54.3	58.7	51.1	57.0	52.0	57.4	33.9	56.3			54.7
	1	61.6	55.3	66.8	50.5	52.9	48.1	60.7	53.2	58.8	28.9	53.8	62.2	58.0	55.2
	2	63.0	51.8	67.5	48.0	43.0	44.9	59.9	51.5	59.5	26.6	52.5	59.1	54.6	53.2
	3	62.4	41.9	68.4	43.3	42.3	40.5	57.6	50.7	57.5	23.6	47.4	50.0	47.6	49.7
	4	60.7	40.5	64.1	40.1	40.9	40.7	56.2	48.9		23.4	46.1	43.4	42.0	46.7
	5	58.8	36.9	61.5	37.6	37.1	38.0	51.5	48.0	55.6	22.6	42.3	38.3	39.0	44.7
	Mean	60.6	47.9	64.8	45.6	45.8	43.9	57.2	50.7	57.8	26.5	49.7	50.6	48.2	50.7
Brook Trout	6	0.9	0.3	0.6	1.5	0.0	2.9	3.9	0.8	0.0	3.5	1.2			1.4
	1	1.1	0.4	0.9	1.8	0.0	3.0	3.9	0.8	0.0	5.2	1.7	0.2	0.0	1.4
	2	1.2	0.5	1.0	1.8	0.0	3.4	4.0	1.0	0.0	5.5	1.6	0.3	0.0	1.5
	3	1.5	0.8	1.3	2.1	0.1	3.7	4.1	1.2	0.0	6.3	1.9	0.5	0.1	1.8
	4	1.6	0.8	1.4	2.6	0.1	3.6	4.3	1.2		5.8	1.8	1.7	0.2	2.1
	5	1.6	1.4	1.6	2.5	0.3	3.8	4.2	1.2	0.0	6.5	2.6	3.8	0.4	2.3
	Mean	1.3	0.7	1.1	2.1	0.1	3.4	4.1	1.0	0.0	5.5	1.8	1.3	0.1	1.7
Brown Trout	6	1.6	0.8	1.2	2.9	0.8	4.2	4.3	2.3	0.7	8.3	3.8			2.7
	1	2.1	1.1	2.0	3.4	0.9	4.4	4.3	2.3	0.6	9.7	4.5	2.6	0.2	2.9
	2	2.1	1.4	2.0	3.5	1.2	4.8	4.8	2.6	1.1	10.1	4.7	2.8	0.4	3.1
	3	2.4	3.2	2.7	3.9	1.4	5.4	5.0	3.1	1.4	11.6	5.6	4.0	1.0	3.8
	4	2.6	3.4	2.9	4.1	1.4	5.4	5.4	3.1		10.5	5.1	5.0	1.6	4.1
	5	2.6	4.1	3.4	4.4	1.8	5.9	5.3	3.3	2.1	11.8	5.9	6.6	2.8	4.5

	Mean	2.2	2.3	2.4	3.7	1.3	5.0	4.9	2.8	1.2	10.3	4.9	4.2	1.2	3.5
Common Shiner	6	34.3	65.0	28.1	53.2	67.2	54.2	34.8	46.0	43.9	62.5	57.2			48.4
	1	40.0	70.0	37.1	56.6	72.5	56.9	41.5	50.3	46.2	60.8	59.8	60.1	56.3	53.4
	2	42.1	73.2	40.7	60.5	75.4	59.1	50.7	52.6	53.0	62.8	60.5	63.9	58.9	56.8
	3	52.1	74.8	54.0	62.0	76.3	60.4	55.9	59.1	55.7	56.5	63.4	66.6	61.4	60.7
	4	56.0	75.9	56.6	63.1	76.4	60.3	61.9	62.0		60.5	65.2	67.8	62.2	63.4
	5	55.8	74.9	59.0	63.1	75.8	59.3	62.1	62.1	58.9	56.3	64.6	65.1	57.9	62.2
	Mean	46.7	72.3	45.9	59.8	73.9	58.4	51.2	55.4	51.5	59.9	61.8	64.7	59.3	57.6
Creek Chub	6	60.4	44.9	66.8	43.9	42.1	40.5	57.4	47.9	53.6	23.3	45.2			48.9
	1	62.0	38.1	67.3	39.4	34.8	37.7	58.0	48.4	54.3	18.1	38.3	48.8	45.0	46.6
	2	60.8	34.3	67.4	37.1	25.3	33.9	53.8	45.8	50.8	19.2	38.0	44.9	43.0	43.9
	3	53.1	25.7	56.8	30.9	24.9	29.4	47.8	42.9	49.1	13.7	29.0	34.1	36.5	37.6
	4	50.1	23.1	53.1	27.8	23.3	30.0	43.5	38.6		16.2	32.1	30.1	34.1	34.8
	5	48.8	20.5	48.4	25.9	18.9	26.9	40.4	38.4	43.9	14.9	26.7	21.2	28.9	32.3
	Mean	55.9	31.1	60.0	34.2	28.2	33.1	50.2	43.7	50.3	17.6	34.9	35.8	37.5	40.6
Large-mouth Bass	6	16.7	0.1	17.1	4.8	2.4	8.0	17.5	15.4	12.4	1.1	4.4			9.7
	1	9.9	0.0	9.0	2.9	1.4	7.7	10.8	10.7	9.1	0.5	2.5	3.8	10.0	6.3
	2	7.3	0.0	6.3	2.5	0.3	7.2	6.9	8.7	5.4	0.5	1.8	2.7	8.3	4.7
	3	4.8	0.0	0.1	1.2	0.3	5.8	3.7	4.2	3.6	0.2	0.5	1.4	6.5	2.7
	4	3.1	0.0	0.0	0.7	0.2	5.7	1.1	3.3		0.2	0.2	0.4	5.4	1.8
	5	3.7	0.0	0.0	0.5	0.0	5.1	1.5	2.6	2.1	0.1	0.2	0.1	4.7	1.7
	Mean	7.6	0.0	5.4	2.1	0.8	6.6	6.9	7.5	6.5	0.4	1.6	1.7	7.0	4.4
Pumpkinseed	6	28.6	3.4	33.6	9.8	5.4	10.0	30.1	22.1	21.0	3.6	9.4			17.1
	1	21.9	0.7	20.8	6.3	3.9	9.7	21.6	18.9	18.2	2.7	5.6	8.1	18.1	12.7
	2	19.2	0.1	16.7	5.2	2.2	8.7	14.9	16.0	14.2	2.3	5.9	8.0	14.0	10.5
	3	8.4	0.0	5.5	2.9	2.1	8.2	9.0	10.2	9.7	0.7	2.2	3.1	9.8	5.7
	4	6.3	0.0	4.3	2.1	2.0	8.2	5.3	7.7		0.9	2.5	2.4	9.1	4.4
	5	6.9	0.0	2.4	1.6	1.6	7.8	5.7	6.3	5.5	0.6	1.0	0.8	6.8	3.9
	Mean	15.2	0.7	13.9	4.7	2.9	8.8	14.4	13.5	13.7	1.8	4.4	4.5	11.6	8.9
Rainbow Darter	6	15.7	33.4	10.6	32.7	32.2	31.0	12.9	25.4	23.7	52.3	31.5			26.4
	1	18.5	39.1	14.4	37.8	38.4	34.7	15.9	28.1	25.6	60.5	37.5	29.1	29.4	30.5
	2	19.4	41.4	16.3	41.7	49.7	38.2	21.0	32.5	28.8	57.5	36.8	31.4	31.9	33.3
	3	25.6	49.7	23.9	47.1	49.9	43.6	27.9	38.4	33.7	62.3	45.2	42.5	42.7	39.9
	4	28.4	51.6	28.0	50.1	51.5	43.3	31.9	41.1		62.2	43.7	46.5	46.8	42.6
	5	29.6	53.9	31.3	52.1	55.6	45.7	35.6	42.9	37.4	63.2	49.0	54.7	52.3	45.2

	Mean	22.9	44.9	20.8	43.6	46.2	39.4	24.2	34.7	29.8	59.7	40.6	40.8	40.6	36.5
Rock Bass	6	60.4	44.9	66.8	43.9	42.1	40.5	57.4	47.9	53.6	23.3	45.2			48.9
	1	62.0	38.1	67.3	39.4	34.8	37.7	58.0	48.4	54.3	18.1	38.3	48.8	45.0	46.6
	2	60.8	34.3	67.4	37.1	25.3	33.9	53.8	45.8	50.8	19.2	38.0	44.9	43.0	43.9
	3	53.1	25.7	56.8	30.9	24.9	29.4	47.8	42.9	49.1	13.7	29.0	34.1	36.5	37.6
	4	50.1	23.1	53.1	27.8	23.3	30.0	43.5	38.6		16.2	32.1	30.1	34.1	34.8
	5	48.8	20.5	48.4	25.9	18.9	26.9	40.4	38.4	43.9	14.9	26.7	21.2	28.9	32.3
	Mean	55.9	31.1	60.0	34.2	28.2	33.1	50.2	43.7	50.3	17.6	34.9	35.8	37.5	40.6
White Sucker	6	50.5	69.2	51.1	59.1	69.0	57.1	52.3	54.7	56.2	43.5	59.9			56.1
	1	56.5	67.4	60.2	57.9	66.1	55.5	57.5	56.1	58.4	38.1	58.2	66.7	60.3	58.2
	2	57.8	66.2	64.3	56.9	58.3	52.8	61.7	55.4	61.1	35.8	57.6	64.1	59.3	57.8
	3	65.0	59.3	69.4	53.9	58.3	49.7	62.7	56.1	61.6	32.2	55.3	58.5	54.7	57.3
	4	68.1	57.4	67.7	51.3	57.2	50.0	62.7	57.0		33.6	54.8	54.0	49.7	56.3
	5	66.5	54.4	67.1	49.3	52.3	47.1	59.1	55.0	61.6	33.4	53.8	49.0	46.1	54.4
	Mean	60.7	62.3	63.3	54.7	60.2	52.0	59.3	55.7	59.8	36.1	56.6	58.5	54.0	56.7

Percent of temperature measurements that exceed the ultimate upper incipient lethal temperature (%>UILT)

		Year													
Species	Station	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	Mean
Black-nose Dace	6	3.3	0.0	0.6	1.0	0.0	4.7	2.2	4.3	2.0	0.0	0.0			1.8
	1	1.9	0.0	0.0	0.4	0.0	3.8	0.3	2.3	1.5	0.0	0.0	0.0	2.0	1.0
	2	1.6	0.0	0.0	0.2	0.0	2.8	0.0	1.4	1.0	0.0	0.0	0.0	1.6	0.7
	3	0.5	0.0	0.0	0.0	0.0	1.9	0.0	0.3	0.6	0.0	0.0	0.0	1.1	0.4
	4	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0		0.0	0.0	0.0	0.8	0.2
	5	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.2
	Mean	1.2	0.0	0.1	0.3	0.0	2.8	0.4	1.4	1.0	0.0	0.0	0.0	1.2	0.7
Blunt-nose Minnow	6	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brook Trout	6	43.4	10.6	49.4	17.8	9.9	18.4	42.0	33.6	33.7	7.9	17.7			27.3
	1	35.5	5.9	37.5	13.6	7.1	15.9	34.5	27.7	29.1	4.9	11.6	17.1	25.4	21.5
	2	32.4	3.4	32.2	10.8	5.0	13.9	26.3	24.4	23.7	3.5	11.2	15.5	23.7	18.5
	3	20.6	1.2	16.1	7.3	4.8	11.5	17.8	17.1	19.3	3.1	7.2	9.8	17.8	12.4
	4	14.6	0.4	13.8	5.1	4.5	11.5	12.4	13.1		3.4	7.0	6.8	15.4	9.4
	5	15.7	0.1	11.0	4.1	3.9	10.5	11.2	13.3	13.0	2.9	5.3	4.5	13.3	8.9
		27.0	3.6	26.7	9.8	5.9	13.6	24.0	21.5	23.8	4.3	10.0	10.7	19.1	16.2
Brown Trout	6	41.7	9.2	47.4	16.7	9.1	17.7	40.6	32.0	31.7	7.0	15.6			25.9
	1	33.6	5.3	35.5	12.9	6.5	15.4	32.9	26.6	27.5	4.9	11.6	17.1	25.4	20.6
	2	31.1	2.8	30.7	9.7	4.6	13.1	24.7	23.6	22.5	3.5	10.0	13.9	21.6	17.4
	3	18.8	0.8	14.4	6.4	4.4	11.2	16.5	16.3	18.4	2.2	5.3	7.0	14.8	11.1
	4	13.2	0.2	12.5	4.5	4.3	11.3	11.0	12.4		2.9	6.0	5.6	14.2	8.6
	5	14.2	0.0	9.8	3.7	3.4	10.1	10.3	12.5	12.1	2.8	4.8	4.5	13.3	8.3

	Mean	25.4	3.1	25.1	9.0	5.4	13.1	22.7	20.6	22.4	3.9	8.9	9.6	17.9	15.1
Common Shiner	6	0.2	0.0	0.0	0.0	0.0	1.3	0.0	0.2	0.5	0.0	0.0			0.2
	1	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1
	2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0
Creek Chub	6	2.3	0.0	0.0	0.6	0.0	3.6	0.6	2.9	1.5	0.0	0.0			1.2
	1	1.2	0.0	0.0	0.0	0.0	2.5	0.2	1.2	0.9	0.0	0.0	0.0	1.0	0.6
	2	0.6	0.0	0.0	0.0	0.0	2.0	0.0	0.4	0.4	0.0	0.0	0.0	0.9	0.4
	3	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.1	0.0	0.0	0.0	0.7	0.1
	4	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0		0.0	0.0	0.0	0.4	0.1
	5	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.7	0.0	0.0	0.1	0.0	1.9	0.1	0.8	0.6	0.0	0.0	0.0	0.6	0.4
Large-mouth Bass	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pumpkin-seed	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rock Bass	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
White Sucker	6	6.0	0.0	4.9	2.0	0.0	5.7	6.5	7.3	4.3	0.0	0.4			3.6
	1	3.7	0.0	0.7	1.1	0.0	5.0	3.4	4.7	2.9	0.0	0.0	0.3	3.8	2.1
	2	3.2	0.0	0.0	0.8	0.0	4.6	1.2	3.5	2.0	0.0	0.0	0.2	3.1	1.6
	3	1.9	0.0	0.0	0.1	0.0	3.8	0.2	1.0	1.3	0.0	0.0	0.0	2.2	0.9
	4	0.5	0.0	0.0	0.0	0.0	3.8	0.0	0.5		0.0	0.0	0.0	1.7	0.5
	5	1.4	0.0	0.0	0.0	0.0	3.0	0.0	0.5	0.6	0.0	0.0	0.0	1.4	0.6
	Mean	2.8	0.0	0.9	0.7	0.0	4.3	1.9	2.9	2.2	0.0	0.1	0.1	2.4	1.5

Percent of temperature measurements that exceed the critical thermal maximum temperature (%>Ctmax)															
		Year													
Species	Station	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	Mean
Black-nose Dace	6	0.4	0.0	0.0	0.0	0.0	1.7	0.1	0.3	0.7	0.0	0.0			0.3
	1	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.1
	2	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.1	0.0	0.0	0.0	0.0	0.5	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.1
Blunt-nose Minnow	6	0.8	0.0	0.0	0.0	0.0	2.1	0.2	0.9	0.8	0.0	0.0			0.5
	1	0.1	0.0	0.0	0.0	0.0	1.3	0.0	0.2	0.4	0.0	0.0	0.0	0.5	0.2
	2	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.1
	3	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.2	0.0	0.0	0.0	0.0	0.7	0.0	0.2	0.2	0.0	0.0	0.0	0.2	0.1
Brook Trout	6	2.0	0.0	0.0	0.4	0.0	3.3	0.4	2.3	1.3	0.0	0.0			1.0
	1	0.8	0.0	0.0	0.0	0.0	2.2	0.2	0.6	0.9	0.0	0.0	0.0	1.0	0.5
	2	0.4	0.0	0.0	0.0	0.0	1.7	0.0	0.4	0.4	0.0	0.0	0.0	0.8	0.3
	3	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1
	4	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0		0.0	0.0	0.0	0.1	0.1
	5	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.5	0.0	0.0	0.1	0.0	1.6	0.1	0.6	0.5	0.0	0.0	0.0	0.4	0.3
Brown Trout	6	4.0	0.0	1.8	1.3	0.0	5.0	3.8	5.2	2.6	0.0	0.0			2.3
	1	2.5	0.0	0.0	0.6	0.0	4.4	1.2	3.1	1.8	0.0	0.0	0.0	3.1	1.4
	2	2.0	0.0	0.0	0.5	0.0	3.7	0.2	2.2	1.4	0.0	0.0	0.0	2.2	1.0
	3	1.0	0.0	0.0	0.0	0.0	2.5	0.0	0.4	0.8	0.0	0.0	0.0	1.1	0.5
	4	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.3		0.0	0.0	0.0	1.2	0.3
	5	0.4	0.0	0.0	0.0	0.0	2.0	0.0	0.1	0.2	0.0	0.0	0.0	1.0	0.3

	Mean	1.7	0.0	0.3	0.4	0.0	3.3	0.9	1.9	1.4	0.0	0.0	0.0	1.7	0.9
Common Shiner	6	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Creek Chub	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Largemouth Bass	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pumpkinseed	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rainbow Darter	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rock Bass	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
White Sucker	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX H

Biological Monitoring

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GUIDING SOLUTIONS IN THE
NATURAL ENVIRONMENT

2018 Biological Monitoring Program
Nestlé Waters Canada
Aberfoyle Property

Prepared For:

Nestlé Waters Canada

Prepared By:

Beacon Environmental Limited
C. Portt and Associates

Date: *Project:*

February, 2019 **216114**

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Figures

Tables

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A. Breeding Bird Checklist
B. Breeding Bird Field Notes

1. Introduction

Beacon Environmental Limited (Beacon) and C. Portt and Associates were retained by Nestlé Waters Canada (NWC) to undertake terrestrial and aquatic monitoring at the company's Aberfoyle property located at 101 Brock Road South in the Township of Puslinch (**Figure 1**). The biological monitoring program for the property was initiated in 2007 as a condition of a Ministry of Environment, Conservation and Parks (MECP) Permit to Take Water (PTTW) (#7043-74BL3K) for the onsite wells that service their bottling operations. Biological monitoring remains a condition of the current PTTW (#1381-95ATPY).

Condition 4.4 of the PTTW states:

> *The Permit Holder shall undertake wetland monitoring and redd surveys as recommended in "2010 Biological Monitoring Program Final Report" by C. Portt and Associates* dated January 28, 2011. Results from the wetland and redd surveys shall be submitted to the Director as a part of the annual monitoring report…*
>
> **Note: Authorship of the 2010 report should be attributed to Dougan & Associates and C. Portt and Associates.*

The objectives of the biological monitoring program are to:

1. Characterize existing aquatic, wetland and terrestrial resources; and
2. Document potential long-term changes to the site's biological resources.

Existing or baseline biological conditions on the Aberfoyle property were established through surveys and inventories completed between 2007 and 2009 which fulfilled the first objective. To achieve the second objective, there has been ongoing biological monitoring with annual reports submitted to the MOECP as per the PTTW conditions. The type and frequency of biological monitoring is variable and based on the recommendations provided in each year's annual monitoring report.

Between 2007 and 2018, biological monitoring has included the following:

- Electrofishing surveys of Aberfoyle Creek;
- Salmonid spawning (redd) surveys of Aberfoyle Creek;
- Ecological Land Classification (ELC);
- Vascular plant surveys;
- Permanent vegetation monitoring plot surveys;
- Amphibian call survey;
- Breeding bird surveys;
- Odonate (dragonfly/damselfly) surveys;
- Owl surveys;
- Turtle surveys;
- Marsh surveys (assessment of surface hydrology); and
- Invasive species mapping - Common Reed.

A summary of all biological monitoring activities completed on the property between 2007 and 2018 is presented in **Table 1**.

Table 1. Summary of Biological Monitoring Program (2007-2018)

Year	**Aquatic**			**Vegetation**				**Wildlife**				
	Electrofishing	Habitat characterization	Spawning (*i.e.* Redd) surveys	Ecological Land Classification (ELC) mapping	Vegetation plot sampling	Marsh surveys	Invasive species mapping	Nocturnal amphibian call monitoring	Breeding bird surveys	Owl surveys	Basking Turtle surveys	Odonate surveys
2007			**X**	**X**								
2008	**X**		**X**	**X**	**X**			**X**	**X**			
2009		**X**	**X**	**X**		**X**	**X**	**X**	**X**			
2010			**X**		**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
2011			**X**			**X**	**X**	**X**	**X**	**X**	**X**	**X**
2012			**X**								**X**	**X**
2013			**X**		**X**	**X**	**X**					
2014			**X**		**X**							
2015			**X**					**X**	**X**		**X**	
2016			**X**		**X**		**X**	**X**	**X**		**X**	
2017			**X**				**X**	**X**	**X**		**X**	
2018			**X**					**X**	**X**		**X**	

The 2017 Aberfoyle Biological Monitoring Program Report (Beacon 2018) recommended that the following biological monitoring be undertaken on the property in 2018:

1. Salmonid spawning (redd) surveys in Aberfoyle Creek; and
2. Core wildlife monitoring (amphibian, reptiles and birds).

All of the recommended biological monitoring activities listed above were completed in 2018 and are discussed in this report. C. Portt and Associates was responsible for completing aquatic monitoring, consisting of salmonid spawning (redd) surveys. Beacon was responsible for the terrestrial monitoring which included wildlife monitoring.

This report summarizes the methods and findings of the 2018 biological monitoring program and compares and contrasts the data with previous years to identify changes or trends in selected monitoring parameter or indicators over the long term.

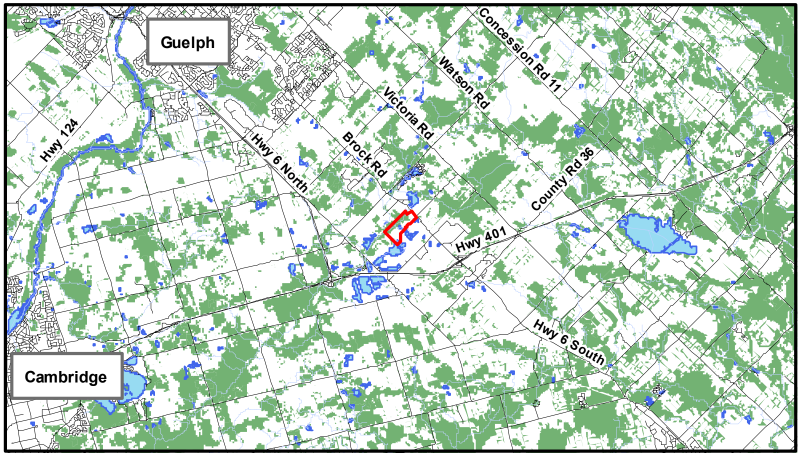

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Figure 1

Site Location

Aberfoyle 2018 Biological Monitoring Program

Client: Nestlé Waters Canada

First Base Solutions
Web Mapping Service 2010

UTM Zone 17 N, NAD 83

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Project 216114
December, 2018

2. Methods

2.1 Aquatic Survey

C. Portt and Associates surveyed Aberfoyle Creek for evidence of Brown Trout (*Salmo trutta*) or Brook Trout (*Salvelinus fontinalis*) spawning, from its confluence with Mill Creek upstream to the limit of the Nestlé property (**Figure 2**), on October 25, 2018, and November 12, 2018. On these dates, this entire reach of the creek was walked and searched for areas of disturbed substrate that could be indicative of salmonid spawning.

2.2 Amphibian Surveys

Amphibian call surveys were undertaken to document species richness and abundance of frog and toad populations associated with the subject property. Because there is variation in the breeding periods during which different frog and toad species frogs are calling and detectable, surveys were completed at three different periods between April and June to ensure coverage of the full range of early to late breeding species.

Call surveys were performed on April 30th, May 16th, and June 26th, 2018 using the survey protocols developed for the Marsh Monitoring Program (MMP) (Bird Studies Canada, 2009). On each occasion the subject property was visited at least ½ hour after sunset during suitable weather conditions to listen for calling frogs and toads using three permanent monitoring stations that were established in 2008. The locations of these amphibian monitoring stations are illustrated in **Figure 2**. Amphibians observed or heard calling in other locations on the property during these and other surveys were also recorded as incidental observations.

Surveys were conducted using the point count method whereby the surveyor stands at a set point or station for a specific period of time and records all species that can be heard calling within the sample area. A minimum of three minutes was spent listening at each station. The approximate locations of calling amphibians were noted on a standard MMP data sheet and chorus activity for each species was assigned a call code as follows:

0 - no calls;
1 - individuals of one species can be counted, calls not simultaneous;
2 - calls of one species simultaneous, numbers can be reliably estimated; and
3 - full chorus, calls continuous and overlapping, individuals indistinguishable.

In addition to recording species and call levels, weather conditions (i.e., air temperature, precipitation, wind speed, and cloud cover) at the time of survey were also recorded. Weather conditions for the 2018 surveys are summarized in **Table 2**.

Table 2. Amphibian Survey Details

	Survey 1	Survey 2	Survey 3
Date:	April 30, 2018	May 16, 2018	June 26, 2018
Start time:	21:48	22:08	22:31
Temperature (° C):	11 °C	16 °C	17-18 °C
Wind speed (km/h):	1-11 km/h	0-5	6-11 km/h
Cloud cover (%):	<5%	5%	100%
Precipitation	None	None	None

2.3 Breeding Bird Surveys

Breeding bird surveys were undertaken in 2018 by Beacon to document the diversity and abundance of avian populations associated with the subject property. Previous surveys were completed in 2008, 2009, 2010, 2011, 2015, 2016 and 2017. There are five permanent point count stations that were established in 2008 that provide coverage for the majority of the property. Each point count station is positioned so the observer can detect calling birds up to a distance of 125 m. The locations of the point count stations are illustrated in **Figure 2**. A handheld GPS was used to locate the plots.

A modified point count methodology, based on protocols established for the Ontario Breeding Bird Atlas for point counts (Cadman *et al.* 2007), Forest Bird Monitoring Program (CWS, 2006) and a standard method recommended for monitoring songbird populations in the Great Lakes Region (Howe *et al.* 1997), was utilized to complete breeding bird surveys. The following is a detailed description of the modified approached utilized to complete these surveys:

- Surveys should be conducted a minimum of one week apart (CWS 2006).
- Point count stations will be at least 250 m apart (Howe *et al.* 1997 & CWS 2006).
- Since the Nestlé Waters Canada property in Aberfoyle is relatively small, a randomized site selection approach will not be required. The majority of natural features are covered by the 5- point count station survey areas.
- Survey duration for each point count will be 10 minutes, consistent with the Forest Bird Monitoring Program (CWS 2006) and Howe *et al.* (1997) and will not be restricted to forested habitats.
- The location of each individual adult bird will be recorded on a field sheet as per the layout and symbols used by the Forest Bird Mapping Protocol (CWS 2006) or Howe *et al.* (1997). Bird flying overhead (i.e. not directly associating with the survey area) or otherwise not showing any breeding evidence will be distinguished from the other breeding birds.
- Observations recorded on the field maps will be transferred into a summary table. All birds observed or heard within suitable habitat were assumed to be breeding.
- Breeding evidence is to be documented according to the Ontario Breeding Bird Atlas protocols (Cadman *et al.* 2007).

Birds that were observed between the point count surveys were noted separately on a field map to help ensure that no bird species present on the property were missed as the point count circles do not cover the entire property.

Figure 2 Monitoring Station and Survey Locations

Aberfoyle 2018 Biological Monitoring Program

Legend

- 🟥 Subject Property
- ― Watercourse
- ① Amphibian Call Monitoring Station (with 250 m radius)
- ② Breeding Bird Monitoring Station (with 125 m radius)
- ▭ Salmonid Spawning Survey

Client: Nestlé Waters Canada

First Base Solutions
Web Mapping Service 2010

UTM Zone 17 N, NAD 83

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Project 216114
January, 2019

Weather conditions (i.e., air temperature, precipitation, wind speed, and cloud cover) at the time of survey were recorded (see **Table 3**).

Table 3. Breeding Bird Survey Details

	Survey 1	**Survey 2**
Date:	June 8, 2018	June 21, 2018
Start time:	7:00	5:50
End Time:	9:30	7:15
Temp (° C):	14 °C	16 °C
Wind (km/h):	0-5 km/h	1-11 km/h
Cloud cover (%):	10%	0%
Precipitation	None	None

2.4 Basking Turtle Survey

The subject property is known to support populations of Midland Painted Turtle (*Chrysemys picta marginata*) and Snapping Turtle (*Chelydra serpentina*). Snapping Turtle was assigned "Special Concern" status in Canada in 2008 and Ontario in 2009. Snapping Turtle was originally observed in the large pond near the western property boundary in 2008, which is labelled as Pond 1 on **Figure 2**. Surveys were completed in 2010, 2015, 2016 and 2017 to determine the level of use of this habitat by Snapping Turtle. No Snapping Turtles were observed in 2010. One Snapping Turtle was observed on two separate occasions in 2015. In 2016, four Snapping Turtles were seen in May, and one was seen in June. Snapping Turtle was observed three times over the course of the 2017 monitoring program. Once during basking turtle surveys and twice during the completion of other surveys.

Basking turtle surveys on the property focus on Pond 1. The surveys consist of slowly travelling along the outer edge of the pond using binoculars to scan its perimeter and other potential basking sites within the pond. Surveys were completed between 8:00 am and 5:00 pm during sunny periods when the air temperature was greater than water temperature and after inclement weather. Brief surveys of the other ponds on the subject property were also completed at the time of this survey. Details of these surveys, including weather conditions, are included in **Table 4.**

Table 4. Basking Turtle Survey Details

	Survey 1	**Survey 2**	**Survey 3**
Date:	May 1, 2018	June 5, 2018	Sept.13, 2018
Start time:	10:30	15:00	14:45
End time:	11:30	16:00	15:45
Temp (° C):	20 °C	15 °C	23 °C
Wind (km/h):	1-11 km/h	1-5 km/h	6-11 km/h
Cloud cover (%):	25-50%	90%	40%
Precipitation	None	None	None

2.5 Other Wildlife Observations

Other wildlife and habitat structures encountered over the course of the 2018 field season were recorded as incidental observations. When encountered, the species and locations of the wildlife were noted.

3. Results

3.1 Aquatic Survey

No evidence of salmonid spawning was observed between the confluence of the Aberfoyle Branch and the upstream limit of the Nestlé property in 2018. This is consistent with the 2007 – 2017 results for this reach of Aberfoyle Creek.

3.2 Breeding Amphibians

A total of three frog and one toad species were recorded on the subject property during the 2018 nocturnal amphibian call surveys. These species included American Toad (*Anaxyrus americanus*), Gray Tree Frog (*Hyla versicolor*), Green Frog (*Rana clamitans*) and Spring Peeper (Pseudacris crucifer).

The primary amphibian breeding areas on the property are: Pond 1 at west end of the property and the group of three small ponds/shallow aquatic features (“fire ponds”) located just west of the parking lot. The general locations of calling frogs are illustrated in **Figure 3**.

The findings of the amphibian breeding surveys are summarized in **Table 5**. The 2018 amphibian breeding surveys are generally comparable to those of previous years (2008-2011 and 2015-2017). Spring Peeper, Gray Tree Frog, and Green Frog have been observed each year monitoring has been completed. Wood Frog, previously heard only in 2008, was detected again in 2015 and 2017, but not in 2018. Northern Leopard Frog (*Lithobates pipiens*) was observed incidentally on the property in 2010, 2016 and 2018 and was documented calling during the nocturnal amphibian surveys at Pond 1 in 2017. American Bullfrog (*Lithobates catesbeianus*), was heard calling during the third 2017 breeding survey within the pond just east of the property, and incidental observations were recorded in 2015 and 2018.

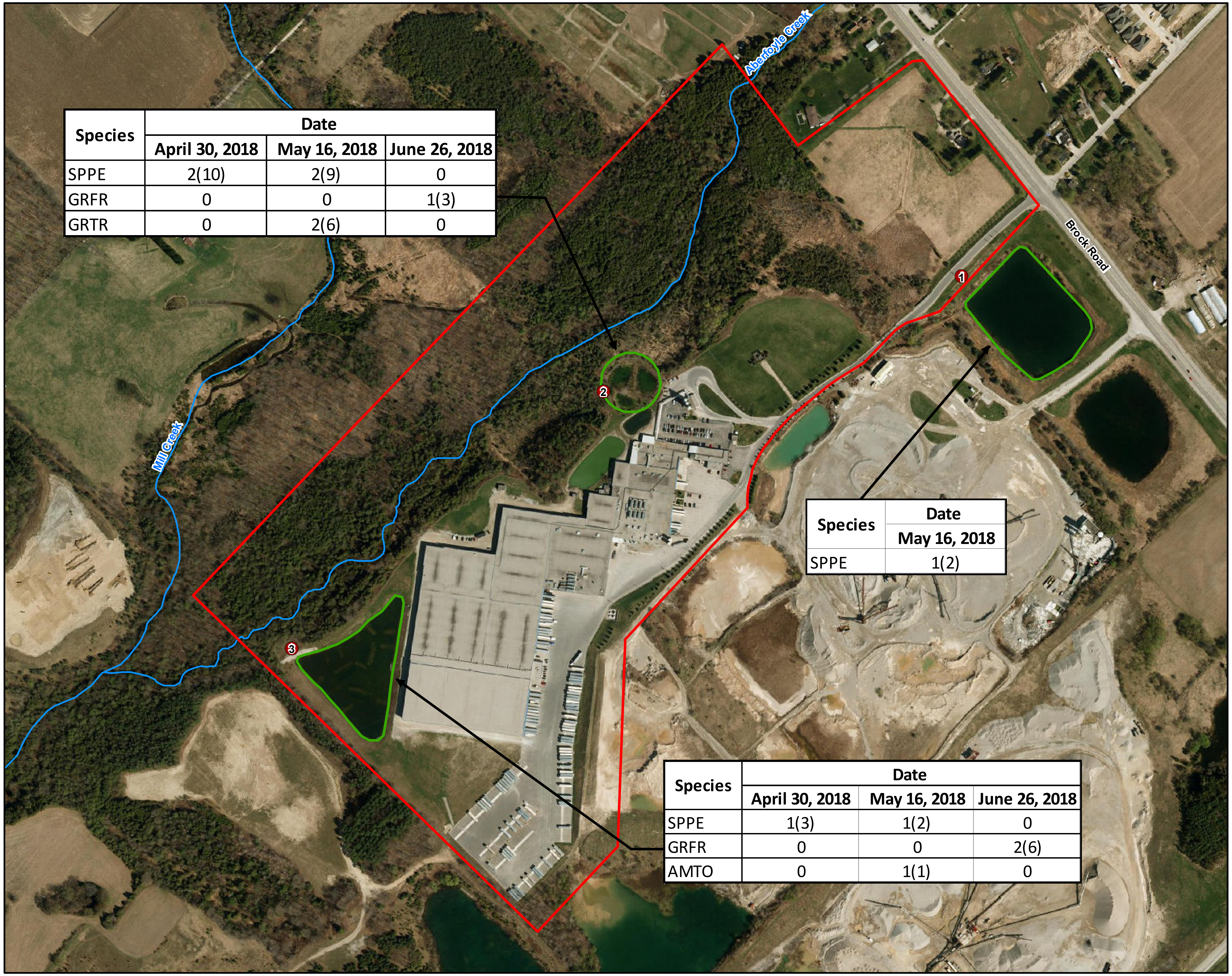
Amphibians observed during other field surveys included: Green Frog, American Toad, Northern Leopard Frog, American Bullfrog and amphibian egg masses.

Differences in the results of these surveys from year to year are minor and can be attributed to daily and annual species variations that can likely be associated with seasonal temperature variations.

Figure 3

Nocturnal Amphibian Call Survey Locations

Aberfoyle 2018 Biological
Monitoring Program



Species	Date		
	April 30, 2018	May 16, 2018	June 26, 2018
SPPE	2(10)	2(9)	0
GRFR	0	0	1(3)
GRTR	0	2(6)	0

Species	Date
	May 16, 2018
SPPE	1(2)

Species	Date		
	April 30, 2018	May 16, 2018	June 26, 2018
SPPE	1(3)	1(2)	0
GRFR	0	0	2(6)
AMTO	0	1(1)	0

Legend

- 🟥 Subject Property
- 🟩 Nocturnal Amphibian Call Survey Observations
- ② Amphibian Call Monitoring Station
- — Watercourse

Species Codes:
WOFR - Wood Frog
SPPE - Spring Peeper
GRTR - Grey Treefrog
GRFR - Green Frog
AMTO - American Toad
BULL - Bull Frog
NLFR - Northern Leopard Frog

Abundance Codes:
- First number is is Call Level Code.
- Second number (in brackets) is number of individuals recorded.

Call Level Codes:
1 - Calls not simultaneous, number of individuals can be accurately counted.
2 - Some calls simultaneous, number of individuals can be reliably estimated.
3 - Full chorus, call continuously overlapping, number of individuals cannot be reliably estimated.

Client: Nestlé Waters Canada

First Base Solutions
Web Mapping Service 2010

UTM Zone 17 N, NAD 83

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Project 216114
December, 2018

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Table 5. Breeding Amphibian Survey Results

Location (Figure 2)	Round 1 (April 30, 2018)	Round 2 (May 16, 2018)	Round 3 (June 26, 2018)
1	SPPE - 1(3) (Offsite)	SPPE - 1(2) GRTR - 2(3) (Offsite)	0
2	SPPE - 2(10)	SPPE - 2(9) GRTR - 2(6)	GRFR - 1(3)
3	SPPE - 1(3)	AMTO - 1(1) SPPE - 1(2) GRTR (Offsite)	GRFR - 2(6)

SPPE = Spring Peeper, GRTR = Gray Tree Frog, GRFR = Green Frog, AMTO = American Toad
Code 0 - No calling
Code 1 - Individuals can be counted; calls not simultaneous. Estimated number of individuals indicated in brackets
Code 2 - Calls distinguishable; some simultaneous calling. Estimated number of individuals indicated in brackets
Code 3 - Full chorus; calls continuous and overlapping.

3.3 Breeding Birds

A total of 39 species of birds (**Appendix A**) were documented on and directly adjacent to the subject property in 2018. Of the 39 species documented, 32 exhibited evidence of breeding and are considered to be breeding on the subject property. These numbers, which are similar those obtained from 2008 (40 total / 34 breeding) and 2015 (39 total / 33 breeding) breeding bird surveys, are at the lower end of the range of birds that have been recorded / recorded as breeding on the property since the implementation of the wildlife monitoring program in 2008. A detailed comparison of number of birds recorded each year on and directly adjacent to he subject property is shown in **Table 6**.

Table 6. Breeding Bird Monitoring Results (2008-2018)

Monitoring Year	Number of Total Bird Species	Number of Breeding Bird Species
2008	40	34
2009	45	39
2010	48	36
2011	50	38
2015	39	33
2016	48	40
2017	51	37
2018	39	32

The lower number of total birds is due to a decrease in incidental observations of migrating waterfowl and foraging swallow species from what was observed in previous years. Breeding bird species that were not recorded this year were primarily woodland species that breed in the forested habitat north of the plant. Birds in this area can be difficult to hear from the point count stations if wind levels are towards the higher end of what is permitted for breeding bird surveys. In addition to this construction near point count stations 4 during the surveys made it difficult to hear birds calling from at or beyond the outer edge of the point count station.

In 2018, species that were observed flying or foraging over the property, or observed during migration and not considered to be breeding on the property, included: Common Loon (*Gavia immer*), Double-crested Cormorant (*Phalacrocorax auritus*), Great Blue Heron (*Ardea Herodias*), Osprey (*Pandion haliaetus*), Red-tailed Hawk (*Buteo jamaicensis*), Ring-billed Gull (*Larus delawarensis*), Ruby-crowned Kinglet (*Regulus calendula*) and Bank Swallow (*Riparia riparia*). These species were either observed flying overhead or were using the property to forage (e.g. swallow species).

Of the 32 species that exhibited breeding evidence, there is one species that has conservation status. Eastern Wood-Pewee (*Contopus virens*) which is designated as Special Concern under the federal Species at Risk Act (2002) and provincial Endangered Species Act (2007). No other breeding species are designated as Special Concern, Threatened or Endangered. All have a conservation rank of S5 (Secure) or S4 (Apparently Secure) (NHIC 2019).

Four of the 32 bird species that displayed some level of breeding evidence on the property are considered to be “priority landbird species” in Bird Conservation Region (BCR) 13, the Lower Great Lakes – St. Lawrence Plain. Priority species are those that meet Partners in Flight criteria for Species of Continental or Regional Importance, because of high conservation concern / vulnerability and/or high stewardship responsibility scores (OPIF 2008). Species include:

1. Eastern Wood-Pewee;
2. Eastern Kingbird (*Tyrannus tyrannus);*
3. Black-and-white Warbler (*Mniotilta varia*); and
4. Baltimore Oriole (*Icterus galbula*).

One Eastern Wood-Pewee was incidentally noted during breeding bird surveys in the forest west of the subject property. One Eastern Kingbird was recorded near breeding bird monitoring station 3. Three Black-and-white Warblers were noted during breeding bird surveys at station 2 and 3. Three Baltimore Orioles were noted incidentally at station 5.

Five of the 32 breeding bird species are considered significant in Wellington County (D&A 2008). These species included:

1. Eastern Wood-Pewee;
2. Eastern Kingbird;
3. Black-and-white Warbler;
4. American Redstart (*Setophaga ruticilla*); and
5. Baltimore Oriole.

Three American Redstarts were documented on the property at breeding bird monitoring stations 1 and 4.

Three of the 32 breeding bird species observed in 2018 are considered area-sensitive. These species included:

1. White-breasted Nuthatch (*Sitta carolinensis*);
2. Black-and-white Warbler; and
3. American Redstart.

Area-sensitive species require larger areas of suitable habitat in order to sustain their populations (OMNR 2000) and are therefore considered more sensitive to habitat loss and fragmentation. Both species are associated with the forested habitats on the site.

The results of the breeding bird surveys in 2018 are similar to the results of breeding bird surveys that were completed in previous years at the site. Differences in the results of these surveys can be attributed to minor variations in survey techniques, daily and annual species variations.

3.4 Basking Turtle Survey

The results of the basking turtle surveys are shown below in **Table 7**.

Table 7. Basking Turtle Survey Results

	Survey 1 (May 1, 2018)		Survey 2 (June 5, 2018)		Survey 3 (Sept 13, 2018)	
	Pond 1	*Pond 2*	*Pond 1*	*Pond 2*	*Pond 1*	*Pond 2*
Midland Painted Turtle	13	0	10	0	7	0
Snapping Turtle	0	0	0	1	0	0

The majority of the turtles that were observed on the subject property were Midland Painted Turtle, all of which were observed in Pond 1 (**Figure 2**). This species is not considered significant at the local (Dougan & Associates 2009), regional (Plourde et al. 1989), or provincial (NHIC 2018) level., In April 2018, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) updated this species' status to Special Concern due to loss of wetlands in Ontario; the Species at Risk Act has not created a schedule yet for Midland Painted Turtle.

Snapping Turtle was observed once over the course of the 2018 monitoring program during basking turtle surveys on June 5, 2018. It was seen swimming near the surface in Pond 2 near the central, northern section of the subject property. This is typical basking behaviour for Snapping Turtles, which typically only leave the water to migrate between suitable habitats or to lay their eggs. An area of predated Snapping Turtle nests was located during basking turtle surveys in 2018 adjacent this pond. Staff at Nestlé had stated they often saw Snapping Turtles within the areas of these predated nests. On June 21, 2018, another Snapping Turtle nest was located closer to Pond 1.

3.5 Other Wildlife Species Observations

Other wildlife that were recorded on the subject property, during the 2018 field season included:

- Coyote - (*Canis latrans*);
- Eastern Cottontail - (*Sylvilagus floridanus*);
- Eastern Gartersnake (*Thamnophis sirtalis*):
- Eastern Brown Snake (*Pseudonaja textilis*);
- Largemouth Bass (*Micropterus salmoides*); and
- Racoon (*Procyon lotor*).

The Coyote, Eastern Cottontail, Eastern Gartersnake and Eastern Brown Snake were noted incidentally on the subject property during basking turtle surveys on May 1, 2018. The Racoon was an incidental observation during breeding bird surveys on June 8, 2018. It was located near breeding bird monitoring station 3.

Largemouth Bass was noted within Pond 2 that is located centrally north on the subject property during the basking turtle survey on September 13, 2018.

4. Conclusion and Recommendations

The 2018 annual monitoring report describes the methods and summarizes the findings of aquatic and terrestrial monitoring completed during the 2018 season at Nestlé Waters Canada's property in Aberfoyle. Monitoring completed in 2018 included salmonid spawning (redd) surveys in Aberfoyle Creek, nocturnal amphibian surveys, breeding bird surveys, and basking turtle surveys.

Consistent with the recommended aquatic monitoring program, salmonid spawning surveys were completed along Aberfoyle Creek in 2018 by C. Portt and Associates. The 2018 results are consistent with the 2007 – 2017 outcomes for this reach of Aberfoyle Creek.

Three nocturnal amphibian surveys were conducted in 2018. Four species were recorded on the subject property during the amphibian monitoring, including American Toad, Spring Peeper, Gray Tree Frog, and Green Frog. Green Frog, American Toad, Northern Leopard Frog and American Bullfrog were also observed during basking turtle surveys. The results are consistent with previous surveys.

Two breeding bird surveys were completed in 2018. Thirty-nine species of birds were recorded, 32 of which were breeding on the property. These numbers, which are similar those obtained from 2008 (40 total / 34 breeding) and 2015 (39 total / 33 breeding) breeding bird surveys, are at the lower end of the range of birds that have been recorded / recorded as breeding on the property since the implementation of the wildlife monitoring program in 2008. The variation in the number of bird species documented on the subject property from year to year is not considered to be significant.

Three basking surveys for turtles were completed in 2018. Two species, Painted Turtle and Snapping Turtle were recorded. Thirteen (13) Midland Painted Turtles were observed in the Pond 1 during the first spring survey. One Snapping Turtle was observed on the property in 2018 within Pond 2 located north/central on the subject property. The number of Midland Painted Turtles observed in the pond was lower than the number observed during the 2017 survey (25 Painted Turtles observed during a single visit) but was higher than what was recorded during the 2010 monitoring (5 Painted Turtle observed during a single visit). The number of Snapping Turtles observed was lower than 2016 and 2017 (4 and 3 Snapping Turtles, respectively), but was similar to the number observed in 2008 and 2015 (1 Snapping Turtle observed). The variation in the number of turtles documented on the subject property from year to year is not considered to be significant.

In summary, the results of the biological monitoring at the Aberfoyle property to date indicate that there have not been any significant changes to the terrestrial and aquatic monitoring parameters that would suggest altered hydrology. The species richness, abundance, and distribution are generally within the range expected and attributable to natural variation and succession. The subject property continues to support high quality terrestrial and wetland habitats that support a diverse range of native wildlife.

Based on findings of the 2018 biological monitoring program, we recommend that the following monitoring activities be completed in 2019:

1. Salmonid spawning surveys in Aberfoyle Creek (C. Portt and Associates);
2. Core wildlife monitoring (amphibian, reptiles and birds);
3. Vegetation Plot Sampling; and
4. Flora survey and Ecological Land Classification (ELC) review/update.

Prepared by:
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Appendix A

Breeding Bird Checklist

Appendix A

Breeding Bird Checklist

Common Name	Scientific Name	Status					May 1, 2018 Incidentals	June 5, 2018 Incidentals	June 8, 2018						June 21, 2018					
		National Species at Risk COSEWIC[a]	Species at Risk in Ontario Listing [b]	Provincial breeding season SRANK[c]	Wellington Regional Status[d]	Area-sensitive (OMNR)[e]			PCS #1	PCS #2	PCS #3	PCS #4	PCS #5	Incidentals	PCS #1	PCS #2	PCS #3	PCS #4	PCS #5	Incidentals
Common Loon	*Gavia immer*			S5		A											F			
Double-crested Cormorant	*Phalacrocorax auritus*			S5					F											
Great Blue Heron	*Ardea herodias*			S4	S,R															F
Canada Goose	*Branta canadensis*			S5			1													
Mallard	*Anas platyrhynchos*			S5																F
Osprey	*Pandion haliaetus*			S5	S,R															F
Red-tailed Hawk	*Buteo jamaicensis*			S5										F						
Killdeer	*Charadrius vociferus*			S5							1	F	1	F						F
Ring-billed Gull	*Larus delawarensis*			S5	S,R		x						F							
Rock Pigeon	*Columba livia*			SNA											F					
Downy Woodpecker	*Picoides pubescens*			S5			1													
Eastern Wood-Pewee	*Contopus virens*	SC	SC	S4	S									1						
Great Crested Flycatcher	*Myiarchus crinitus*			S4							1								1	
Eastern Kingbird	*Tyrannus tyrannus*			S4	S															1
Bank Swallow	*Riparia riparia*	THR	THR	S4	S									F						F
Blue Jay	*Cyanocitta cristata*			S5					1		1		1				1	1	1	
American Crow	*Corvus brachyrhynchos*			S5			x		1	F					1	1				
Black-capped Chickadee	*Poecile atricapillus*			S5			x			1				1		1	2	1		
White-breasted Nuthatch	*Sitta carolinensis*			S5		A		x			1		1							
Ruby-crowned Kinglet	*Regulus calendula*			S4	S,R		x													
American Robin	*Turdus migratorius*			S5			x	x	1		1	1			1		1	2		
Gray Catbird	*Dumetella carolinensis*			S4					1		1									
Cedar Waxwing	*Bombycilla cedrorum*			S5					F		1		1		1					
European Starling	*Sturnus vulgaris*			SE			x							2	F			F		
Red-eyed Vireo	*Vireo olivaceus*			S5							1		1							
Yellow Warbler	*Setophaga petechia*			S5			x		3					1	2	1				
Black-and-white Warbler	*Mniotilta varia*			S5	S	A				1						1	1			
American Redstart	*Setophaga ruticilla*			S5	S	A			1						1			1		
Northern Waterthrush	*Parkesia noveboracensis*			S5			x										1	1	1	
Common Yellowthroat	*Geothlyphis trichas*			S5					1	1			1		3	2	2		1	
Northern Cardinal	*Cardinalis cardinalis*			S5			x			1				1			1	1		1
Chipping Sparrow	*Spizella passerina*			S5			1													
Song Sparrow	*Melospiza melodia*			S5			x		1				1		3	1		1	1	
Swamp Sparrow	*Melospiza georgiana*			S5							1	1	1							
Red-winged Blackbird	*Agelaius phoeniceus*			S4			x	x	6	1	2	1	1		4	1	1		2	
Brown-headed Cowbird	*Molothrus ater*			S4			x		1	1			1						1	1
Baltimore Oriole	*Icterus galbula*			S4	S			x						1					1	

Common Name	Scientific Name	Status					May 1, 2018 Incidentals	June 5, 2018 Incidentals	June 8, 2018						June 21, 2018					
		National Species at Risk COSEWIC[a]	Species at Risk in Ontario Listing [b]	Provincial breeding season SRANK[c]	Wellington Regional Status[d]	Area-sensitive (OMNR)[e]			PCS #1	PCS #2	PCS #3	PCS #4	PCS #5	Incidentals	PCS #1	PCS #2	PCS #3	PCS #4	PCS #5	Incidentals
House Finch	*Haemorhous mexicanus*			SNA			1													
American Goldfinch	*Spinus tristis*			S5					2	1	1				1	1	1	1	1	

KEY

a - COSEWIC = Committee on the Status of Endangered Wildlife in Canada

b - Species at Risk in Ontario List (as applies to ESA) as designated by COSSARO (Committee on the Status of Species at Risk in Ontario) END = Endangered, THR = Threatened, SC = Special Concern

c - SRANK (from Natural Heritage Information Centre) for breeding status if: S1 (Critically Imperiled), S2 (Imperiled),S3 (Vulnerable), S4 (Apparently Secure), S5 (Secure) SNA (Not applicable…'because the species is not a suitable target for conservation activities'; includes non-native species)

e - Significant Wildlife List for Wellington County from the City of Guelph Natural Heritage Strategy, Volume 2 (Dougan & Associates with Snell and Cecile 2009), last updated by the City of Guelph 2012. Status only shown if: S = Significant, R = Rare

Note that the following designations were excluded from this list:

** = Only habitats that support or have recently supported active nests should be considered significant;

† = Bank Swallow: Significant only when found nesting in colonies equal to or greater than 100. However, recent OBBA data for Wellington County should be reviewed to see if this is appropriate.

† = Cliff Swallow: Significant only when found nesting in colonies equal to or greater than 8. However, recent OBBA data for Wellington County should be reviewed to see if this is appropriate.

‡ = Being small and secretive, these species are often overlooked. When more information is collected, it is possible that they may not merit significant species status in the future.

o= Habitat protection should be considered only when larval habitat is present at or in close proximity to where adults were documented.

Δ = Considered significant at present, but may prove to be too common to be so regarded in the future.

d - Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide (Appendix G). 151 p plus appendices.

Beacon Breeding Status classifications:

- # - breeding pair
- F- foraging/flyover
- x- Species observed not breeding

Appendix B

Breeding Bird Field Notes

Project #: 216122
Project Name: Nestle Aberfoyle
Project Manager: KU

Time on site:
7:00am - 9:30

Weather:
14°C, cc 10%,
Wind 0-1, no ppt

BEACON
ENVIRONMENTAL

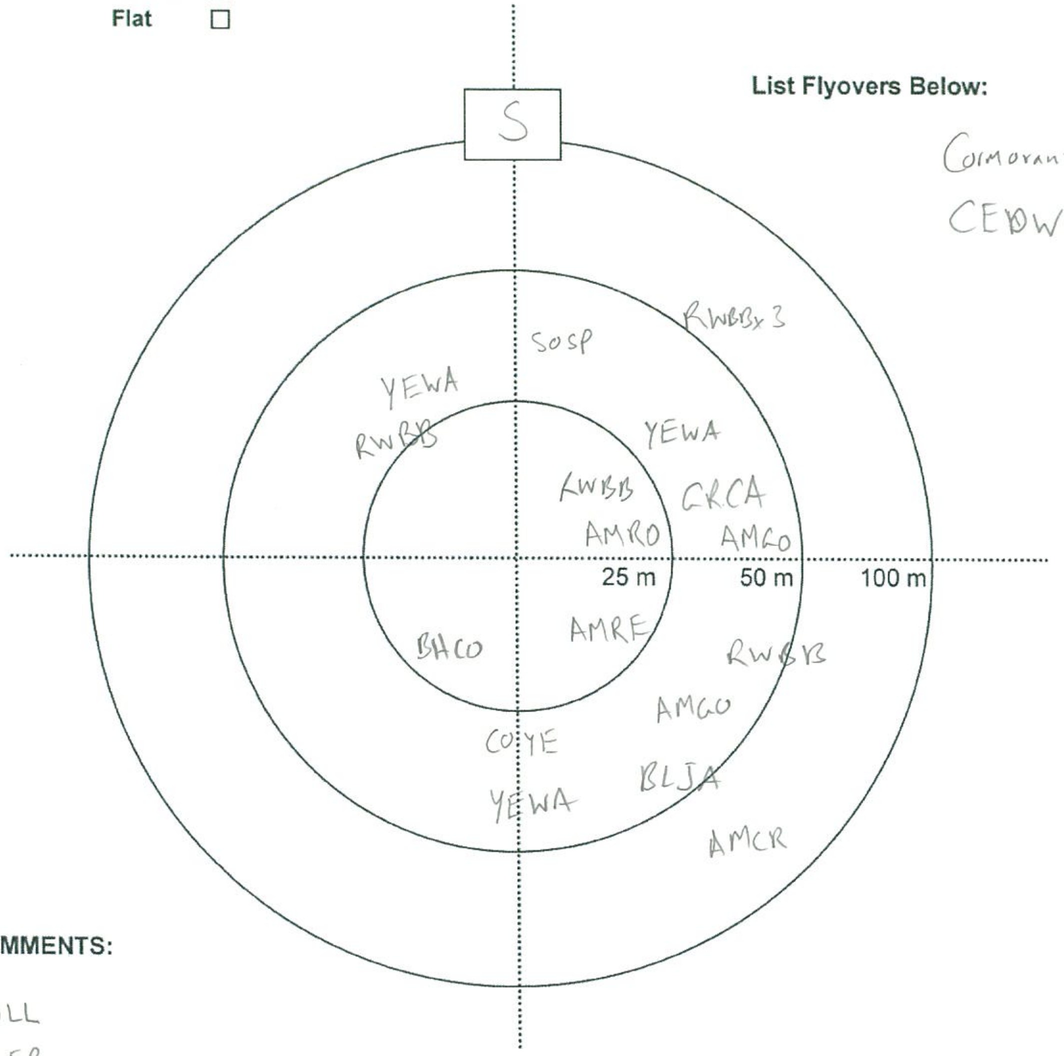
Breeding Bird Station Mapping Card

Project #: 216114
Date: June 8, 2018
Time Started: 7:12
Project Name: Nestle Aberfoyle
Surveyor: RA, AC
Time Ended: 7:22
GPS Co-ord.: see map
Point Number: 1

Slope:
Vertical ☐
Steep ☐
Gentle ☐
Flat ☐

Direction slope faces (Aspect) (ex. NE): ____________

Background
Noise -> 3



List Flyovers Below:

Cormorant
CEDW

COMMENTS:

BULL
GRFR

CLASSIFY HABITAT (within 100 m):

Breeding Bird Station Mapping Card

Project #: 216114
Project Name: Nestle Aberfoyle
GPS Co-ord.: see map
Date: June 8, 2019
Surveyor: RA, AC
Time Started: 7:30
Time Ended: 7:40
Point Number: 2

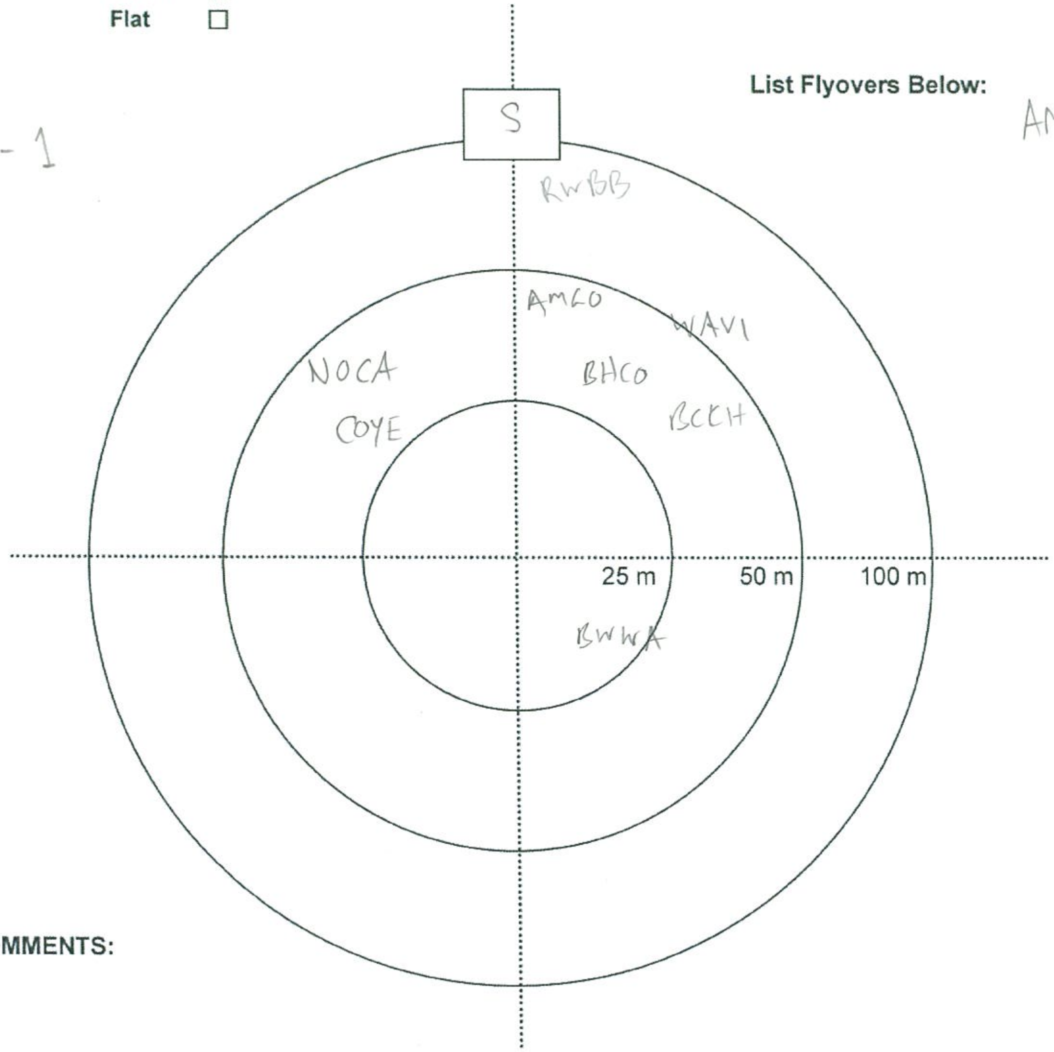
Slope:
Vertical ☐
Steep ☐
Gentle ☐
Flat ☐

Direction slope faces (Aspect) (ex. NE): ____________

Background Noise - 1

List Flyovers Below:

AMCR



COMMENTS:

CLASSIFY HABITAT (within 100 m):

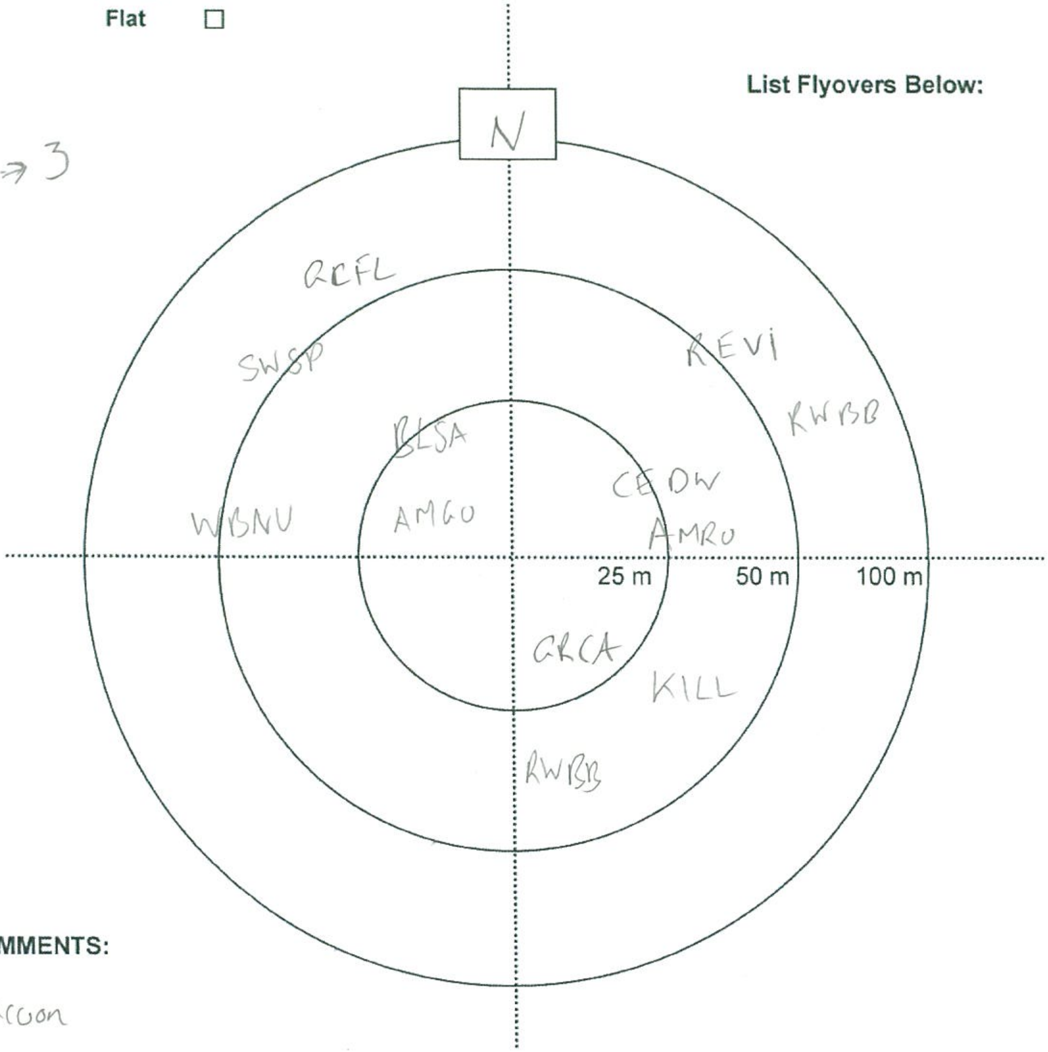
BEACON
ENVIRONMENTAL

Breeding Bird Station Mapping Card

Project #: 216114 **Project Name:** Nestle Aberfoyle **GPS Co-ord.:** see map
Date: June 8, 2018 **Surveyor:** RA, AC
Time Started: 7:54 **Time Ended:** 8:04 **Point Number:** 3
Slope: Vertical ☐
Steep ☐ **Direction slope faces (Aspect)** (ex. NE): ____________
Gentle ☐
Flat ☐

List Flyovers Below:

Background Noise ⇒ 3



COMMENTS:

Racoon

CLASSIFY HABITAT (within 100 m):

BEACON ENVIRONMENTAL

Breeding Bird Station Mapping Card

Project #: 216114
Project Name: Nestle Aberfoyle
GPS Co-ord.: See map
Date: June 8, 2018
Surveyor: RA, AC
Time Started: 8:44
Time Ended: 8:54
Point Number: 4

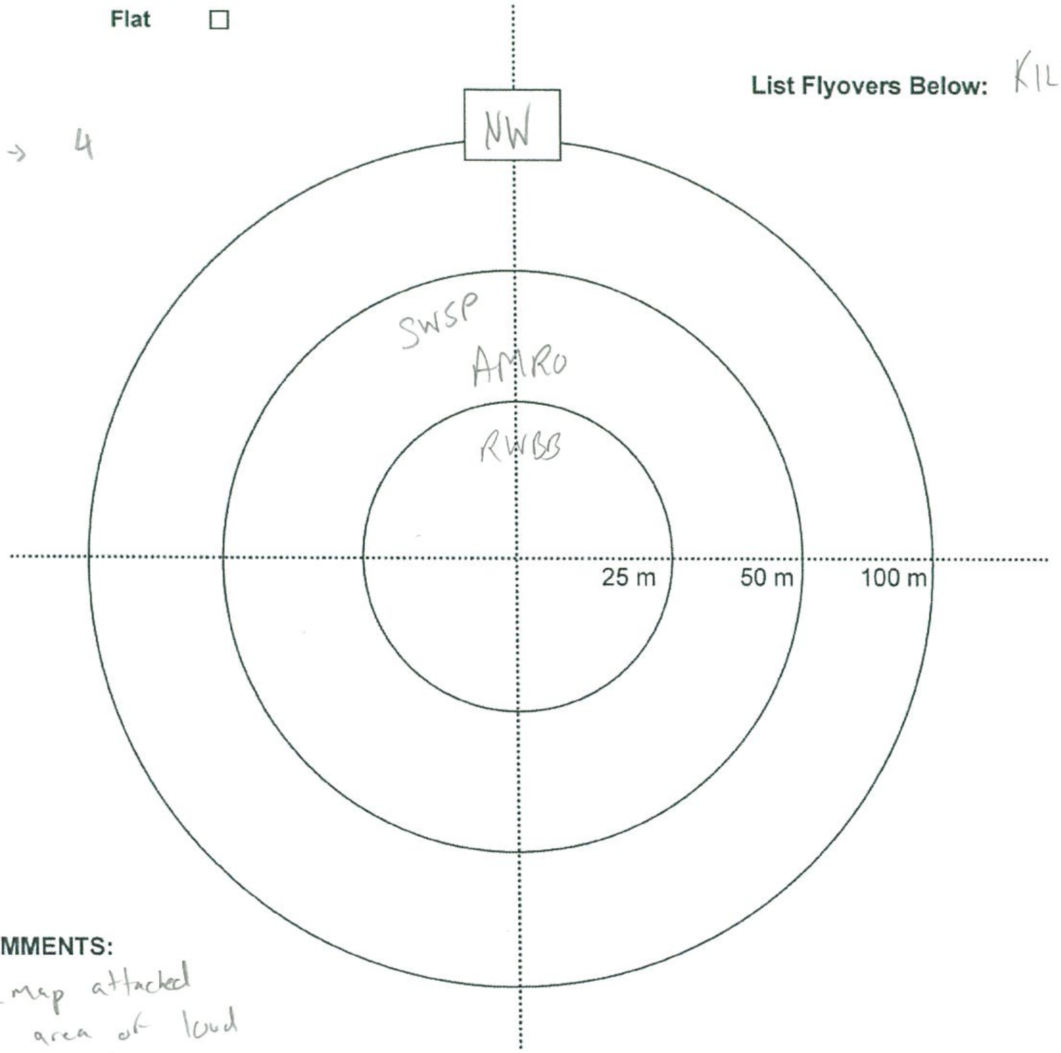
Slope:
- **Vertical** ☐
- **Steep** ☐
- **Gentle** ☐
- **Flat** ☐

Direction slope faces (Aspect) (ex. NE): ____________

List Flyovers Below: KILL

Background Noise -> 4

Active Construction



COMMENTS:

see map attached
for area of loud
construction

CLASSIFY HABITAT (within 100 m):

BEACON ENVIRONMENTAL

Breeding Bird Station Mapping Card

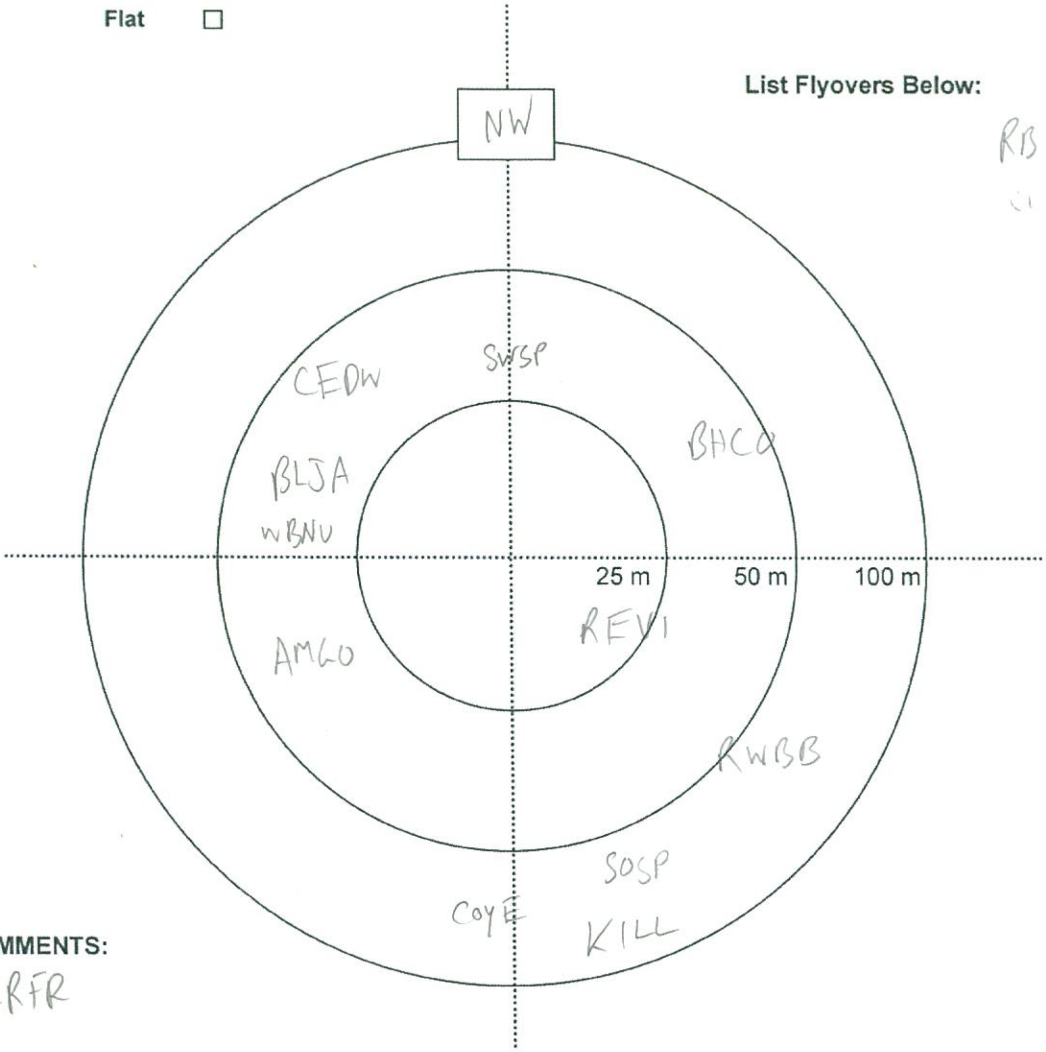
Project #: 216114
Project Name: Nestle Aberfoyle
GPS Co-ord.: See map
Date: June 8, 2018
Surveyor: RA, AC
Time Started: 8:58
Time Ended: 9:08
Point Number: 5

Slope:
- Vertical ☐
- Steep ☐
- Gentle ☐
- Flat ☐

Direction slope faces (Aspect) (ex. NE): ____________

List Flyovers Below:

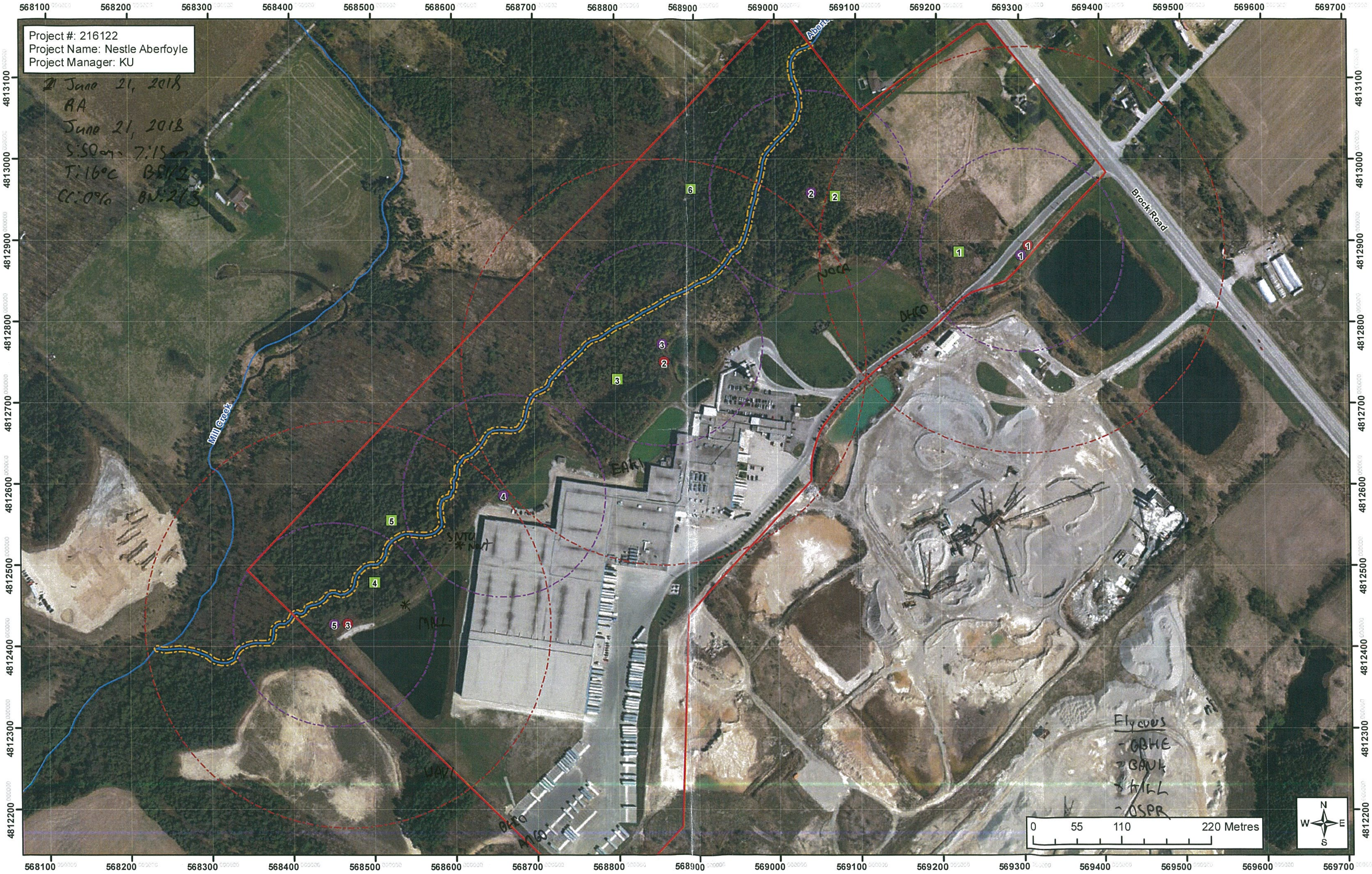
RBGU



COMMENTS:

GRFR

CLASSIFY HABITAT (within 100 m):



Project #: 216122
Project Name: Nestle Aberfoyle
Project Manager: KU

~~2~~ June 21, 2018
RA
June 21, 2018
5:50am 7:15am
T:16°C BF1/2
CC:0% BN:2/3

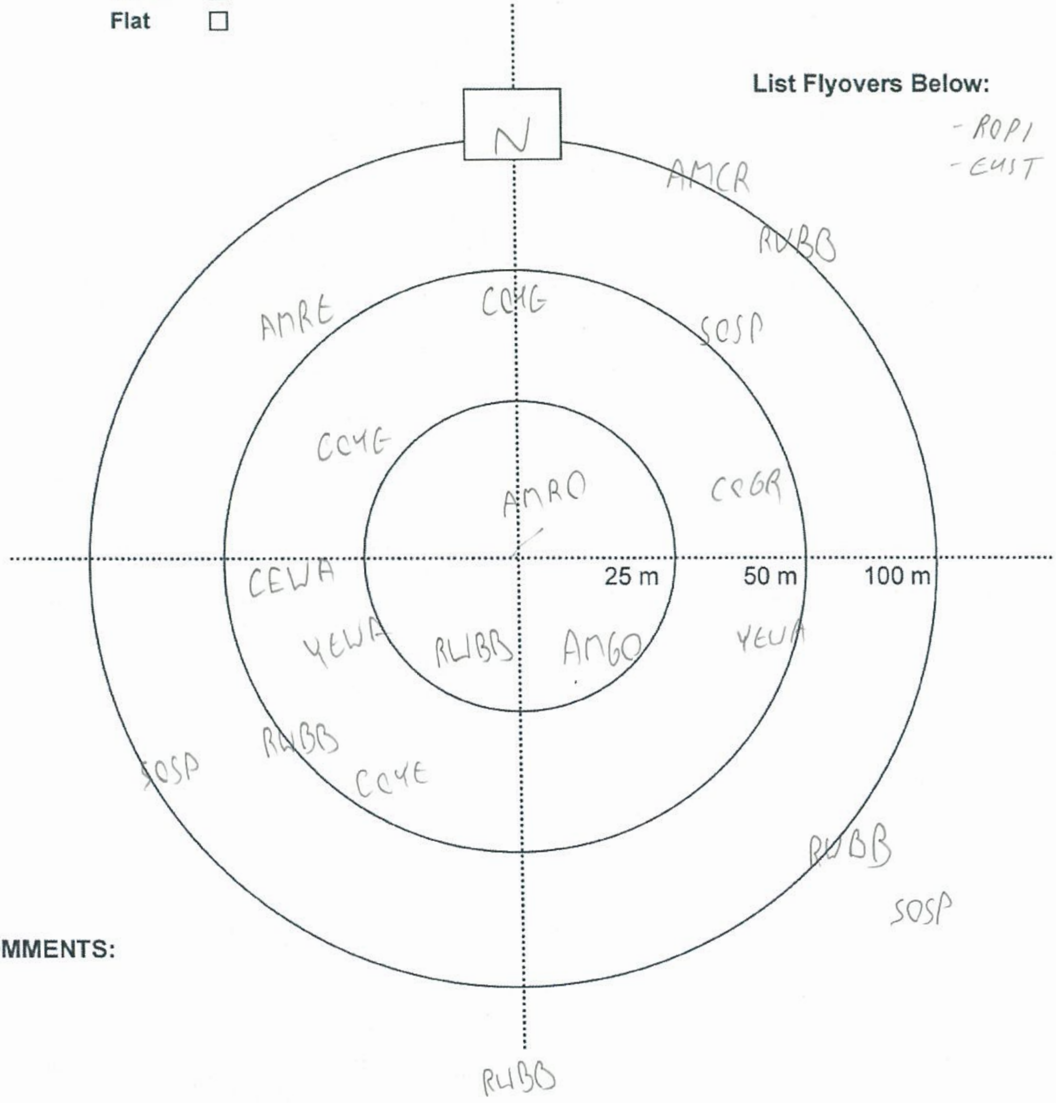
Flyovers
- GBHE
- BANK
- KILL
- OSPR

BEACON ENVIRONMENTAL

Breeding Bird Station Mapping Card

Project #: 216114 **Project Name:** Aberfoyle **GPS Co-ord.:** See Map
Date: June 21, 2018 **Surveyor:** RA, GC
Time Started: 5:59 **Time Ended:** 6:09 **Point Number:** 1

Slope: Vertical ☐
Steep ☐ Direction slope faces (Aspect) (ex. NE): ____________
Gentle ☐
Flat ☐



List Flyovers Below:
- ROPI
- EUST

COMMENTS:

CLASSIFY HABITAT (within 100 m):

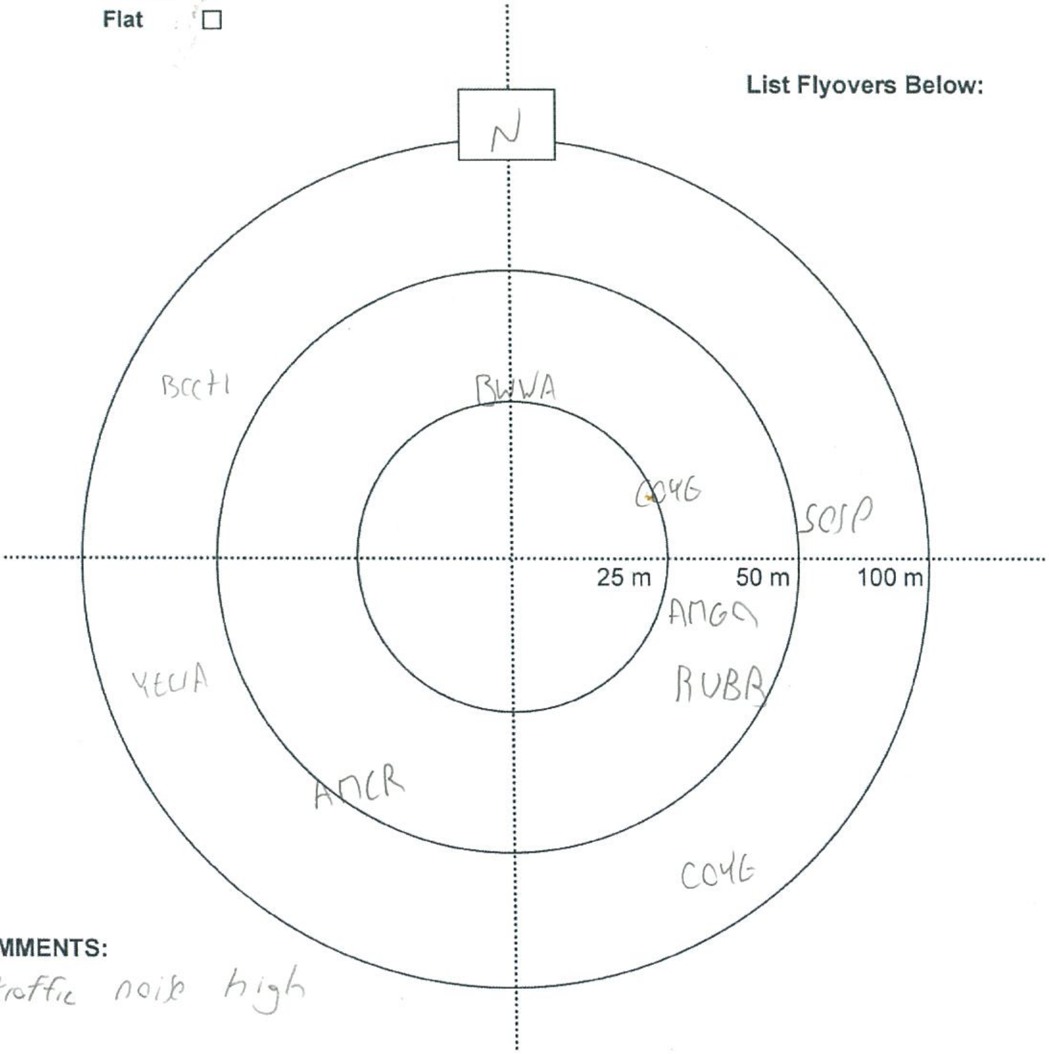
Breeding Bird Station Mapping Card

Project #: 216114
Project Name: Aberfolye
GPS Co-ord.: See Map
Date: June 21, 2018
Surveyor: RA, GC
Time Started: 6:17
Time Ended: 6:27
Point Number: 2

Slope:
- Vertical ☐
- Steep ☐
- Gentle ☐
- Flat ☐

Direction slope faces (Aspect) (ex. NE): ____________

List Flyovers Below:



COMMENTS:
-traffic noise high

CLASSIFY HABITAT (within 100 m):

BEACON ENVIRONMENTAL

Breeding Bird Station Mapping Card

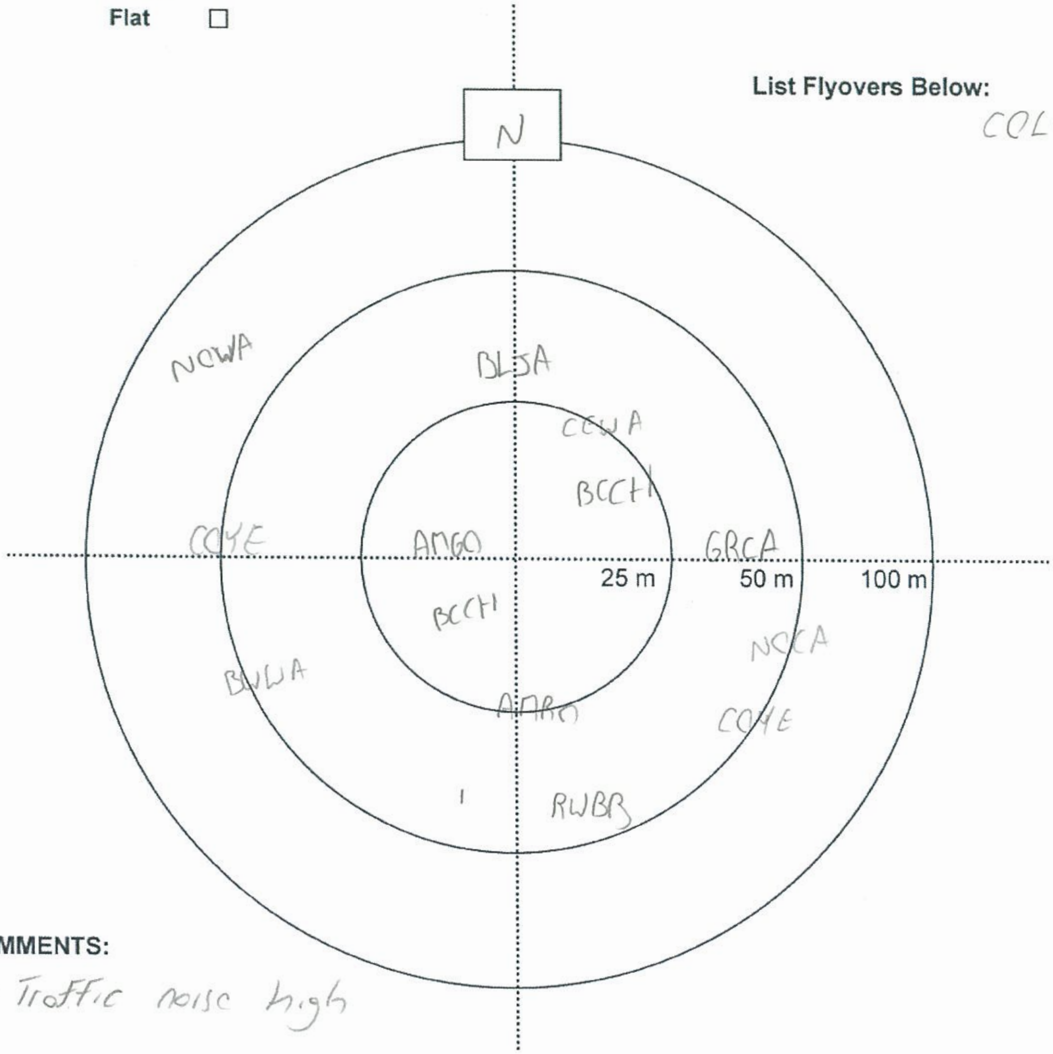
Project #: 216114 **Project Name:** Aberfoyle **GPS Co-ord.:** See Map

Date: June 21, 2018 **Surveyor:** RA AC

Time Started: 6:38 **Time Ended:** 6:48 **Point Number:** 3

Slope:
Vertical ☐
Steep ☐ **Direction slope faces (Aspect)** (ex. NE): ____________
Gentle ☐
Flat ☐

List Flyovers Below:
COLO



COMMENTS:
- Traffic noise high

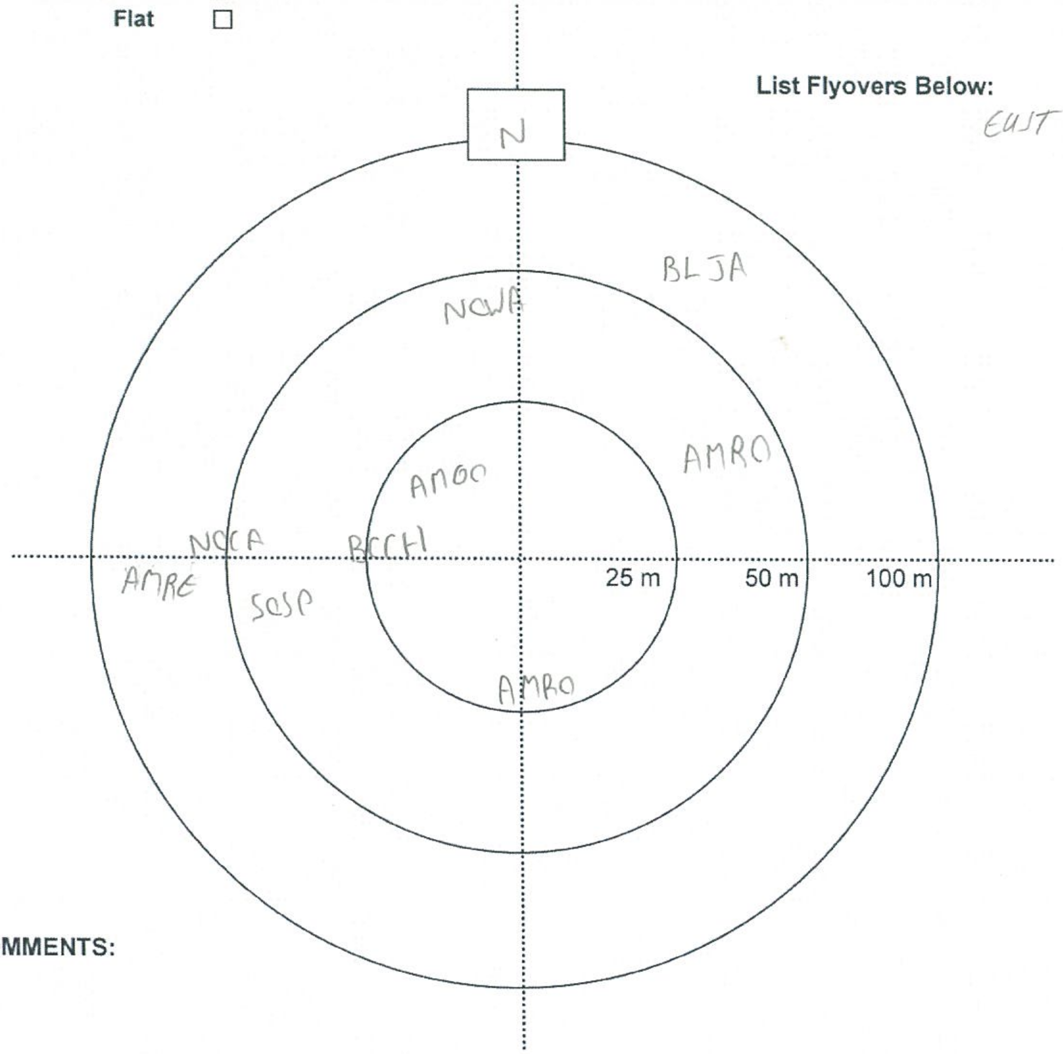
CLASSIFY HABITAT (within 100 m):

Breeding Bird Station Mapping Card

Project #: 216114
Project Name: AberFoyle
GPS Co-ord.: See Map
Date: June 21, 2018
Surveyor: RA, BC
Time Started: 6:54
Time Ended: 7:04
Point Number: 4

Slope:
- Vertical ☐
- Steep ☐
- Gentle ☐
- Flat ☐

Direction slope faces (Aspect) (ex. NE): ____________



List Flyovers Below:
EUST

COMMENTS:

CLASSIFY HABITAT (within 100 m):

Breeding Bird Station Mapping Card

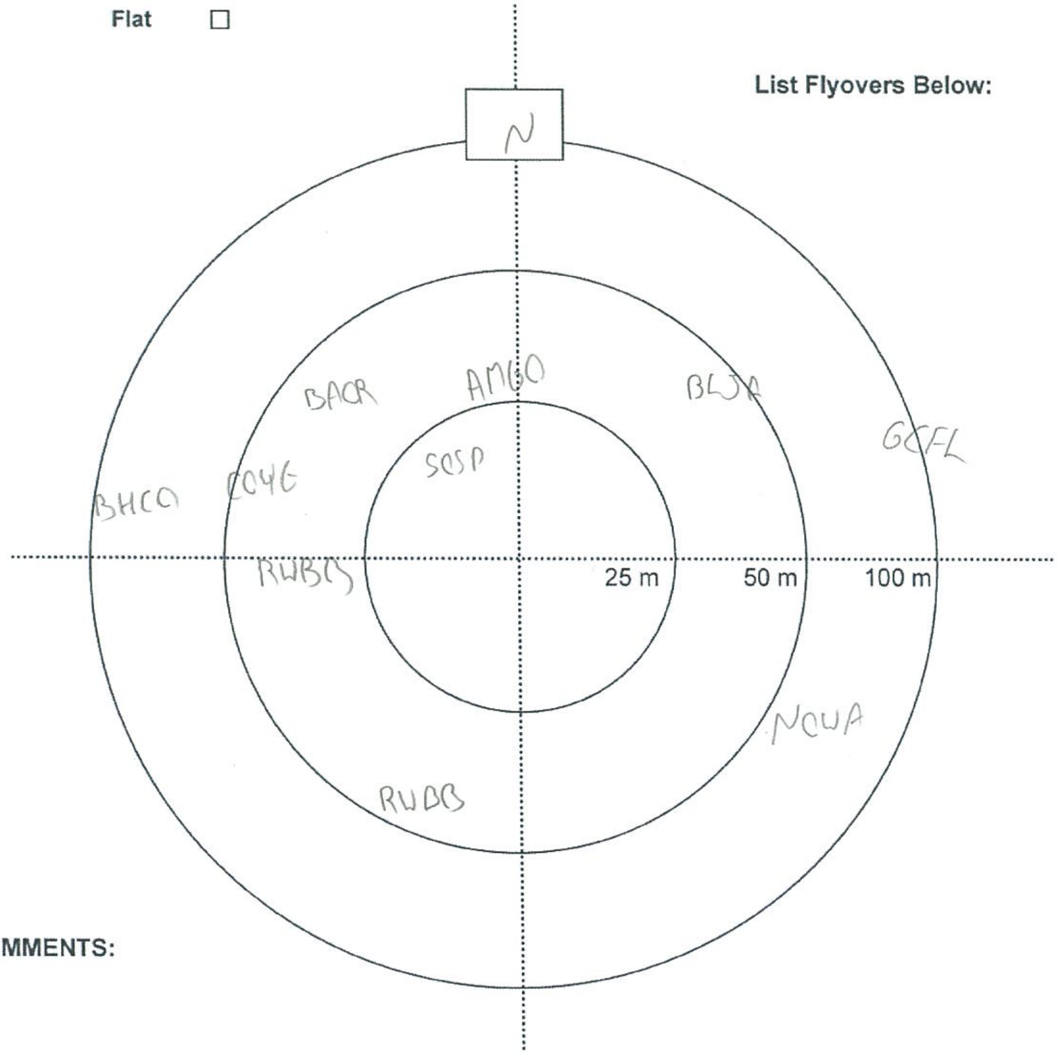
Project #: 216114 **Project Name:** Aberfoyle **GPS Co-ord.:** See Map

Date: June 21, 2018 **Surveyor:** BA, GC

Time Started: 7:10 **Time Ended:** 7:20 **Point Number:** 5

Slope:
Vertical ☐
Steep ☐ Direction slope faces (Aspect) (ex. NE): ____________
Gentle ☐
Flat ☐

List Flyovers Below:



COMMENTS:

CLASSIFY HABITAT (within 100 m):

APPENDIX I

Technical Memorandum: Estimation of Infiltration and TW3-80 Drawdown Analysis

S.S. PAPADOPULOS & ASSOCIATES, INC.
Environmental & Water-Resource Consultants

Memorandum

Date: March 7, 2019

From: Christopher Neville and Xiaomin Wang

To: File

Project: SSP-994-33: Nestle Ontario - Aberfoyle

Subject: **Estimation of infiltration at Aberfoyle with the SWB model**

Overview

The SWB model of the United States Geological Survey has been applied to estimate infiltration in the area that surrounds the Nestlé Waters Canada (NWC) Aberfoyle facility. The SWB model has been applied to assess the likely variability in annual infiltration and how the infiltration is distributed across the area around the NWC production well TW3-80.

The SWB model refers consistently to “recharge”. In fact, the quantity that is reported as “recharge” should be interpreted as “infiltration”. The SWB model does not account for the flow mechanism in the vadose zone. The interval between the bottom of the root zone and the top of the water table is not considered in the SWB analysis. For cases in which the water table is right beneath the bottom of the root zone, the SWB model would perform well and infiltration and recharge would be expected to coincide. For cases in which there is a significant travel time between the bottom of the root zone to the top of water table, the SWB result may not match actual groundwater recharge in time or in space.

Using the same precipitation data as reported in the NWC Aberfoyle 2018 Annual Monitoring Report, it is estimated that over the past 11 years the annual infiltration has ranged from about 100 mm to 240 mm and is approximated relatively closely as about 20% of the total annual precipitation.

This memorandum documents the application of the SWB model and consists of five main sections:

- Introduction;
- Model input;
- Sources of input data;
- Results for the Aberfoyle area; and
- Checks on the results.

1. Introduction

The SWB model implements a modified Thornthwaite-Mather soil-water balance analysis (Westenbroek et al., 2010). The SWB model estimates each component of the soil-water balance for daily timesteps. Model outputs may be daily, monthly, or annual values of infiltration, along with estimates of interception, snow cover, runoff, potential and actual evapotranspiration. The spatial distributions of these quantities are calculated over time using a gridded data structure.

The SWB model calculates infiltration with a modified Thornthwaite-Mather soil-water accounting method (Thornthwaite and Mather, 1957). Infiltration is calculated as the difference between the change in soil moisture and sources and sinks:

$$infiltration = (precip + snowmelt + inflow) - (interception + outflow + ET) \\ - \Delta\, soil\ moisture$$

The descriptions of the terms in the water balance are presented below, following the terminology of the documentation of the SWB model:

Precip – daily values of precipitation using ASCII or Surfer grid formats;

Snowmelt – daily values of snowmelt calculated based on air temperature of daily mean, maximum and minimum;

Inflow – daily values of water inflow into a cell calculated over a flow-direction grid derived from a digital elevation model;

Interception – daily values of rainfall trapped and used by vegetation, calculated by use of a “bucket” approach assuming a user-specified amount which varies from different land-use types and seasons;

Outflow – daily values of water outflow from a cell calculated based on curve number rainfall-runoff relation (Cronshey and others, 1986), soil type and runoff conditions;

ET – daily values of evapotranspiration. There are five methods included in the SWB code. The simplest method is Thornthwaite-Mather (1957) requiring only daily maximum and minimum air temperature. The Thornthwaite-Mather method contains functions considering daylight length, radiation, sunset angle for the estimation of potential evapotranspiration; and

Δ soil moisture – daily values of the amount of water held in soil storage for a given cell calculated based on the Thornthwaite-Mather (1957) procedure.

2. Model Input

The datasets required for the application of the SWB model are listed below.

Gridded (ESRI ASCII or Surfer)
Land-use classification
Hydrologic soil group
Flow direction
Available soil-water capacity
Tabular
Climate data (e.g. precipitation and temperature)
Soil and land use property lookup table
Soil-water retention table (Thornthwaite-Mather, 1957)

A text model control file must be prepared for running the SWB code and the following additional information is required:

- Model domain, grid size;
- Growing season start and end;
- Initial soil moisture;
- Initial snow cover;
- Runoff calculation and routing method;
- Evapotranspiration method; and
- Output options.

Optional inputs for *ET* methods other than Thornthwaite-Mather (1957) and Hargreaves and Samani (1985) include daily average wind speed in m/s, average relative humidity in percent, maximum relative humidity in percent and percentage of possible sunshine.

3. Sources of Input Data for the Aberfoyle area

The limits of the area considered in the analysis are shown in Figure 1. The area has been selected to extend northeast beyond the expected limits of the capture zone of the NWC TW3-80 production well, and southwest to the Sideroad 10 stream gauge on Mill Creek.

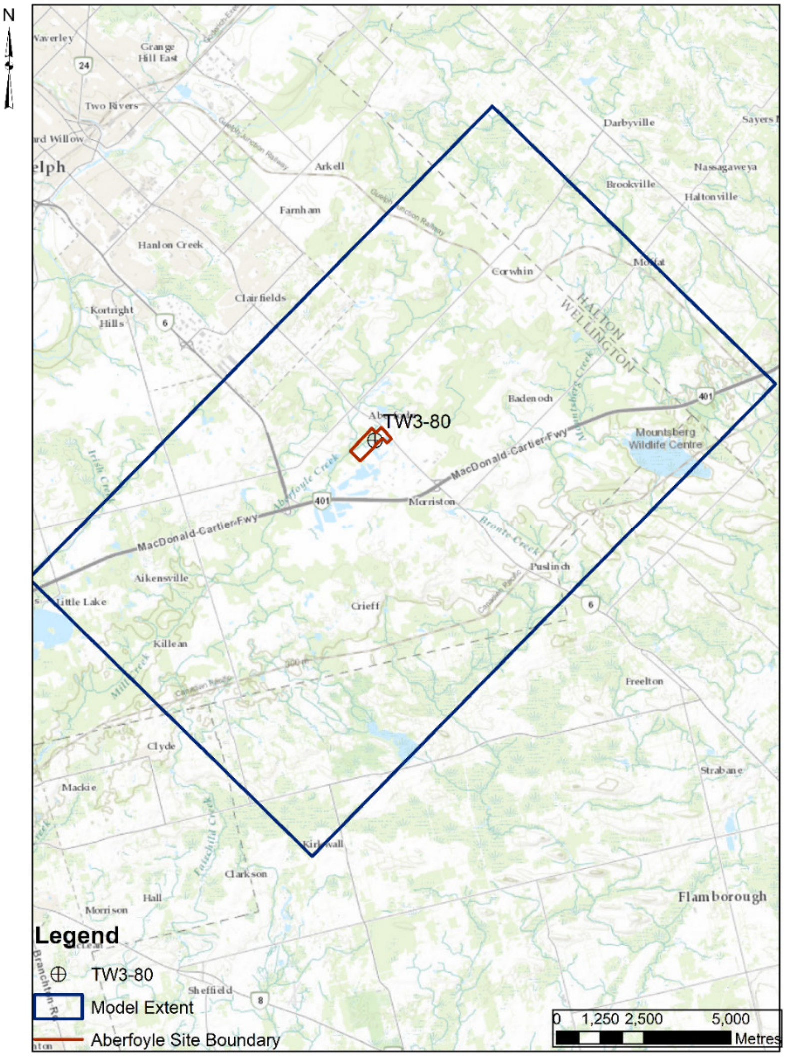


Figure 1. Model limits

Climate data

Two types of climate data are required: precipitation and temperature. Both sets of data are obtained from Environment Canada. For this analysis, 11 years of climate data between 2008 and 2018 are considered.

Where available, the daily precipitation data from the Kitchener/Waterloo (KW) Station are specified as input. When data are missing from the station during 2010 and 2018, the gap is filled in using data from Roseville or Elora RCS meteorological stations. Prior to 2010, the precipitation data are primarily obtained from the Waterloo Wellington 2 Station.

Daily minimum and maximum temperature data are obtained from the from Guelph Turfgrass (GT) Station. When data are missing from the record for the GT station, gaps are filled using data from Waterloo Airport, Elora RCS, Roseville and KW meteorological stations.

Land cover data

Land cover data are obtained from the Southern Ontario Land Resource Information System (SOLRIS v2) mapping compiled by OMNRF (2015).
https://www.javacoeapp.lrc.gov.on.ca/geonetwork/srv/en/main.home

Flow direction data

Flow direction data are obtained from the Ontario Integrated Hydrology Data (OMNRF, 2012).
https://www.javacoeapp.lrc.gov.on.ca/geonetwork/srv/en/main.home

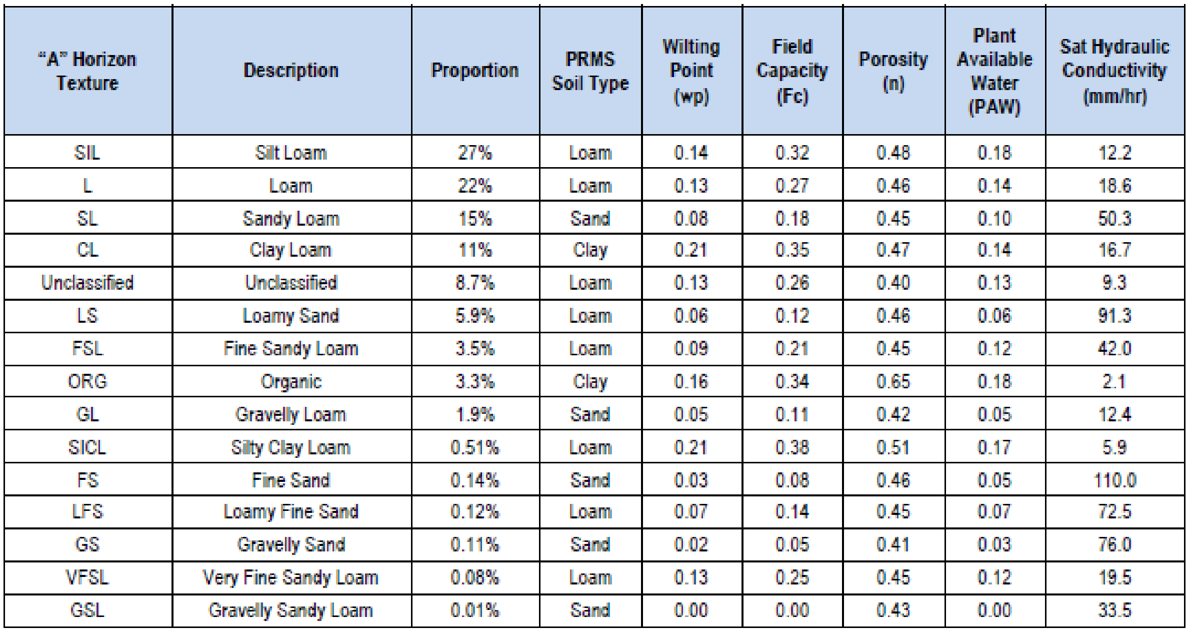
Hydrologic soil type data

Hydrologic soil groups are used to estimate runoff from precipitation. The classification of soils within the study area has been obtained using the Ontario Data - Soil Survey Complex created by Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA, 2012).
https://www.javacoeapp.lrc.gov.on.ca/geonetwork/srv/en/main.home

Soil-water capacity data

The soil-water capacity data are specified based on the textures of the surficial soils. The description of the soil textures, 'A' horizon, are provided in the field named "ATEXTURE1" of the Soil Survey Complex Data obtained from the OMAFRA website. A lookup table relating soil-water capacity and soil texture is reproduced below (Earthfx, 2016; Table 8.11).

Table 8.11: Soils mapping based parameters lookup table.



"A" Horizon Texture	Description	Proportion	PRMS Soil Type	Wilting Point (wp)	Field Capacity (Fc)	Porosity (n)	Plant Available Water (PAW)	Sat Hydraulic Conductivity (mm/hr)
SIL	Silt Loam	27%	Loam	0.14	0.32	0.48	0.18	12.2
L	Loam	22%	Loam	0.13	0.27	0.46	0.14	18.6
SL	Sandy Loam	15%	Sand	0.08	0.18	0.45	0.10	50.3
CL	Clay Loam	11%	Clay	0.21	0.35	0.47	0.14	16.7
Unclassified	Unclassified	8.7%	Loam	0.13	0.26	0.40	0.13	9.3
LS	Loamy Sand	5.9%	Loam	0.06	0.12	0.46	0.06	91.3
FSL	Fine Sandy Loam	3.5%	Loam	0.09	0.21	0.45	0.12	42.0
ORG	Organic	3.3%	Clay	0.16	0.34	0.65	0.18	2.1
GL	Gravelly Loam	1.9%	Sand	0.05	0.11	0.42	0.05	12.4
SICL	Silty Clay Loam	0.51%	Loam	0.21	0.38	0.51	0.17	5.9
FS	Fine Sand	0.14%	Sand	0.03	0.08	0.46	0.05	110.0
LFS	Loamy Fine Sand	0.12%	Loam	0.07	0.14	0.45	0.07	72.5
GS	Gravelly Sand	0.11%	Sand	0.02	0.05	0.41	0.03	76.0
VFSL	Very Fine Sandy Loam	0.08%	Loam	0.13	0.25	0.45	0.12	19.5
GSL	Gravelly Sandy Loam	0.01%	Sand	0.00	0.00	0.43	0.00	33.5

Soil and land use property lookup table

The soil and land use property lookup table is developed with the following procedure:

- Obtain the land use description provided by SOLRIS v2, e.g., Forest – tree cover > 60%;
- Download the Land Use Code (LU) "LU_lookup_WISCLAND_w_forested_hillslope.txt" from the USGS website;
- Based on the land description, obtain the SCS number, maximum infiltration rates, interception storage values and depth of root zone from the USGS table; and
- Integrate all the information into a new lookup table for the Aberfoyle analysis.

4. Results (1): Calculated distributions of annual infiltration for the Aberfoyle area

The calculated distributions of annual infiltration from 2008 to 2018 are shown in Figures 2 to 12. To simplify comparison of the distributions of estimated infiltration, the map of the results for each year are plotted at the same scale and with the same ranges of infiltration.

- Figure 2: 2008
- Figure 3: 2009
- Figure 4: 2010
- Figure 5: 2011
- Figure 6: 2012
- Figure 7: 2013
- Figure 8: 2014
- Figure 9: 2015
- Figure 10: 2016
- Figure 11: 2017
- Figure 12: 2018

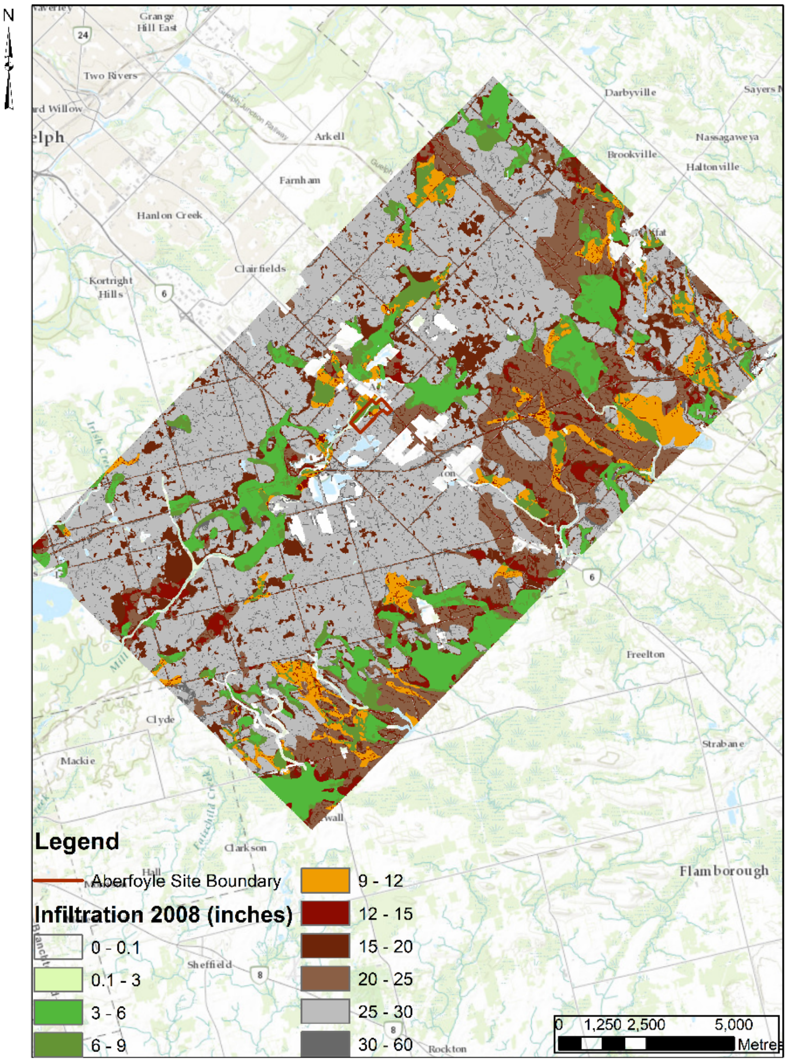


Figure 2. Calculated distribution of annual infiltration for 2008

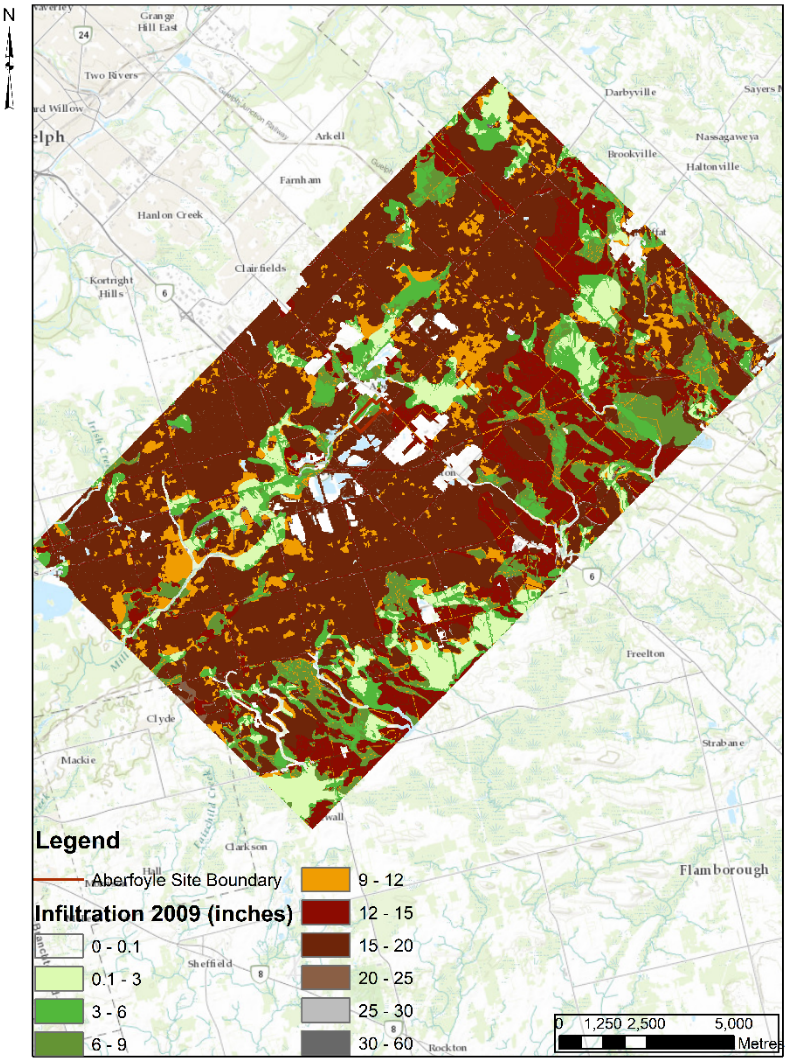


Figure 3. Calculated distribution of annual infiltration for 2009

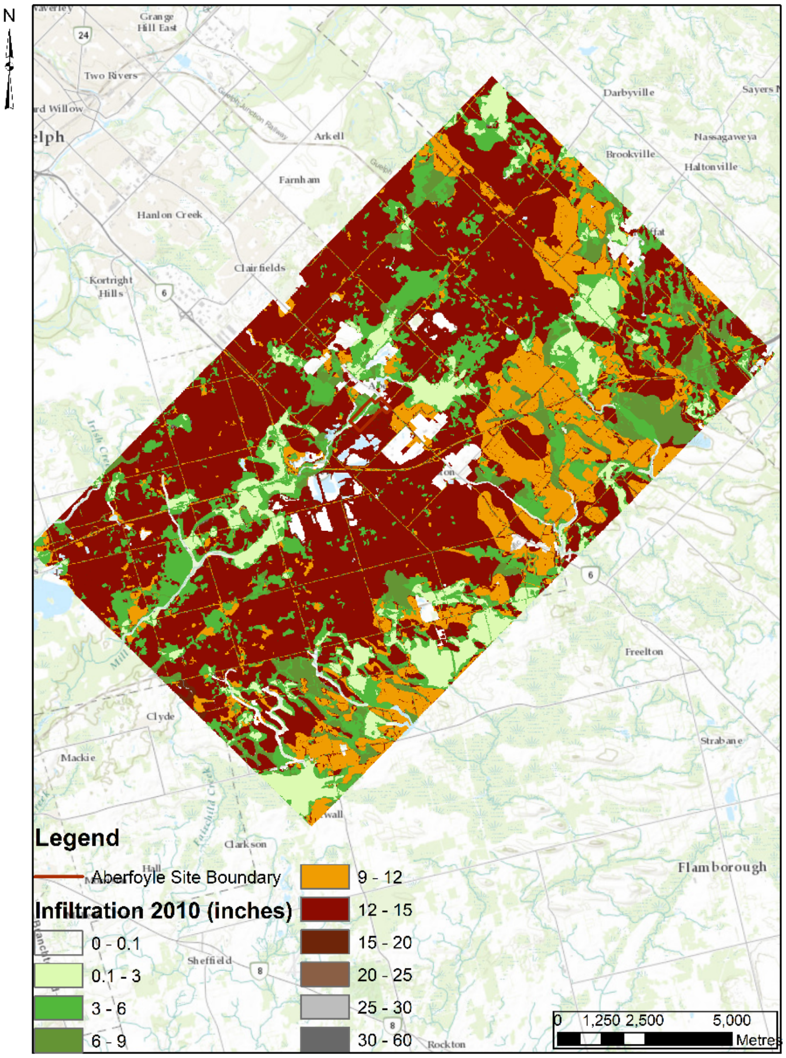


Figure 4. Calculated distribution of annual infiltration for 2010

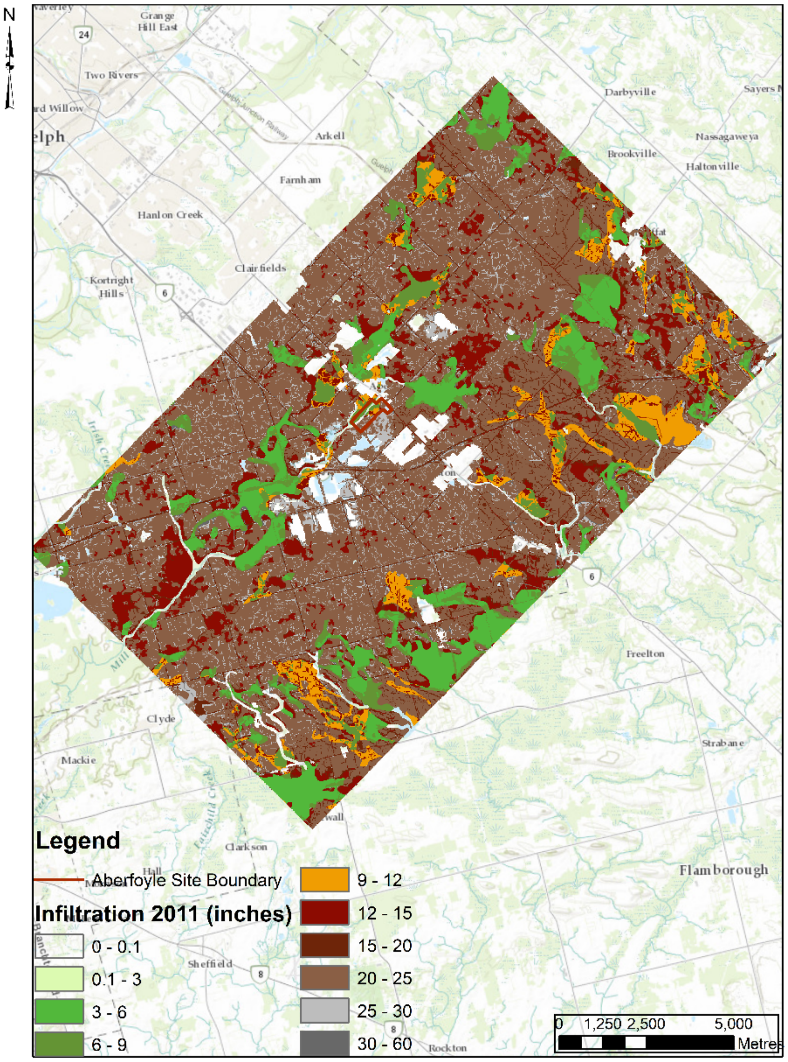


Figure 5. Calculated distribution of annual infiltration for 2011

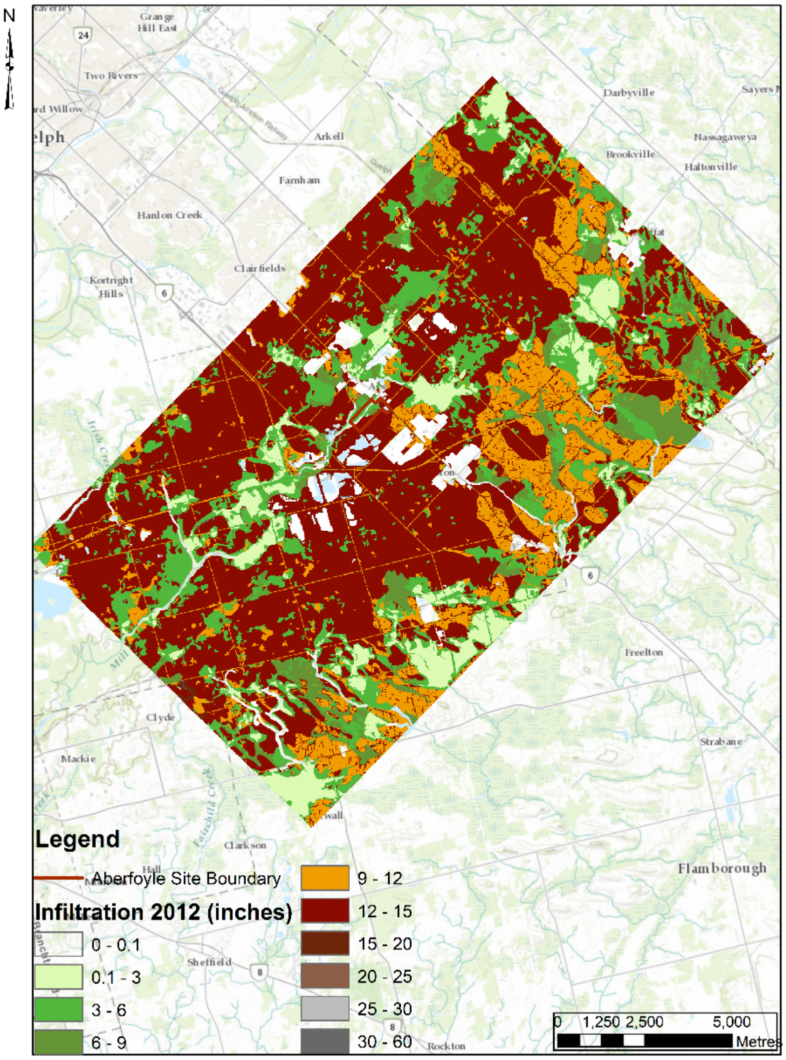


Figure 6. Calculated distribution of annual infiltration for 2012

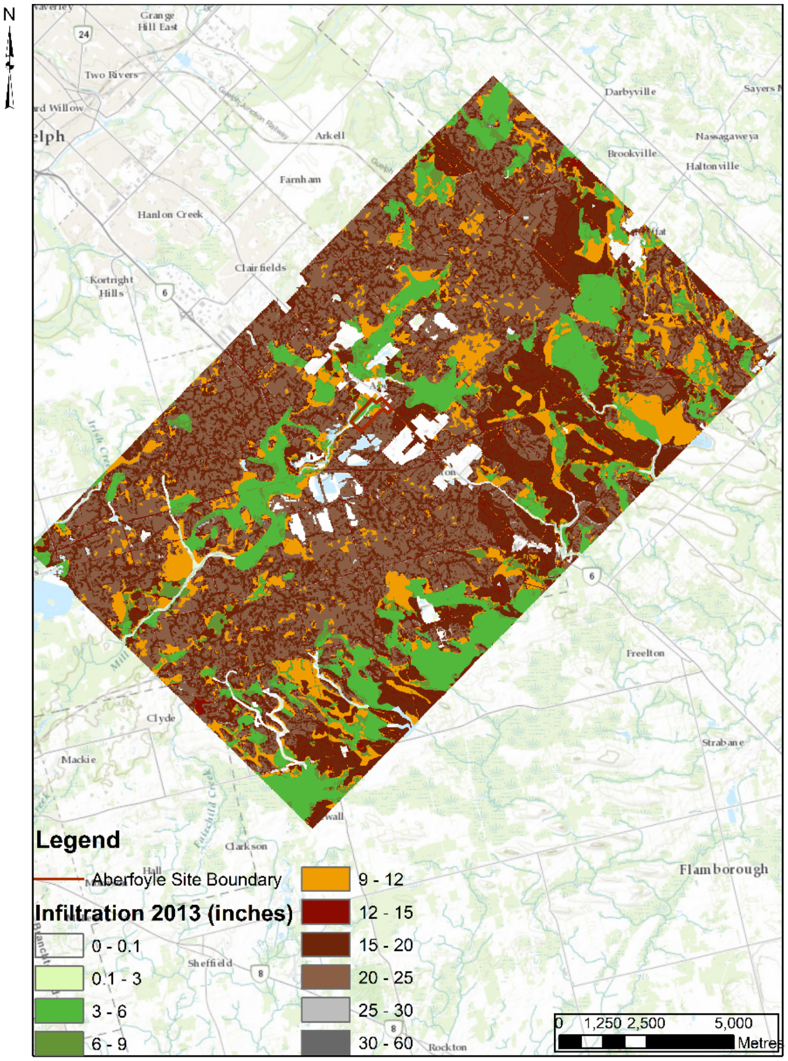


Figure 7. Calculated distribution of annual infiltration for 2013

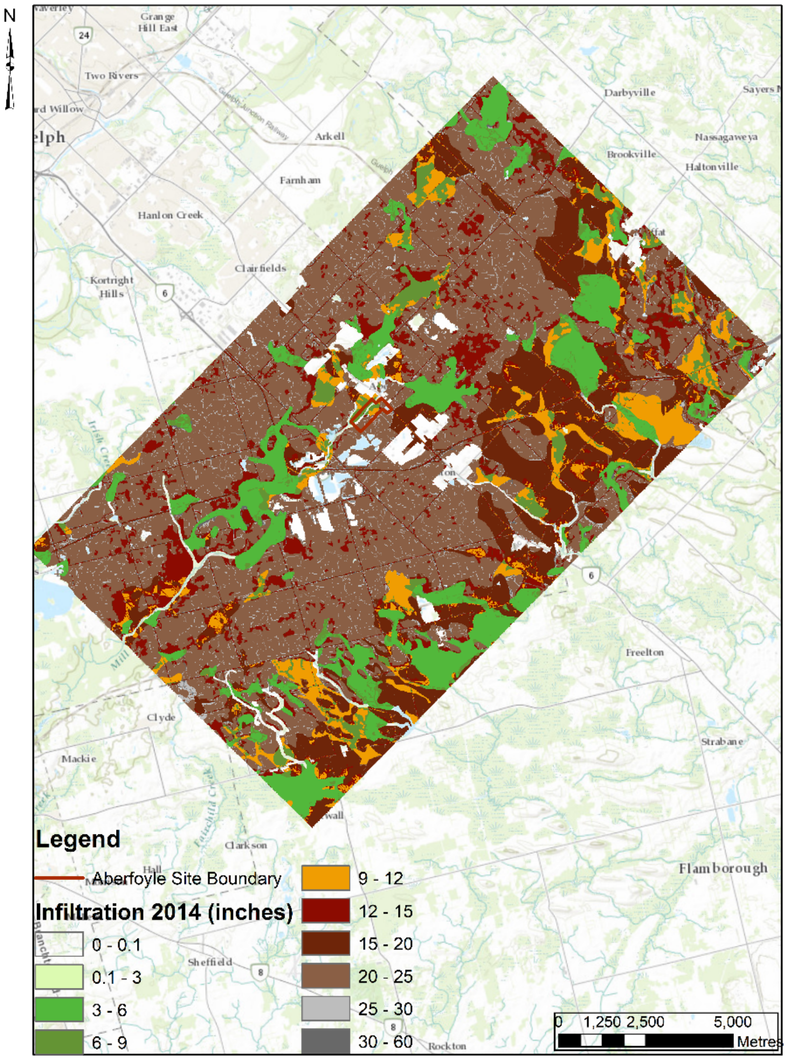


Figure 8. Calculated distribution of annual infiltration for 2014

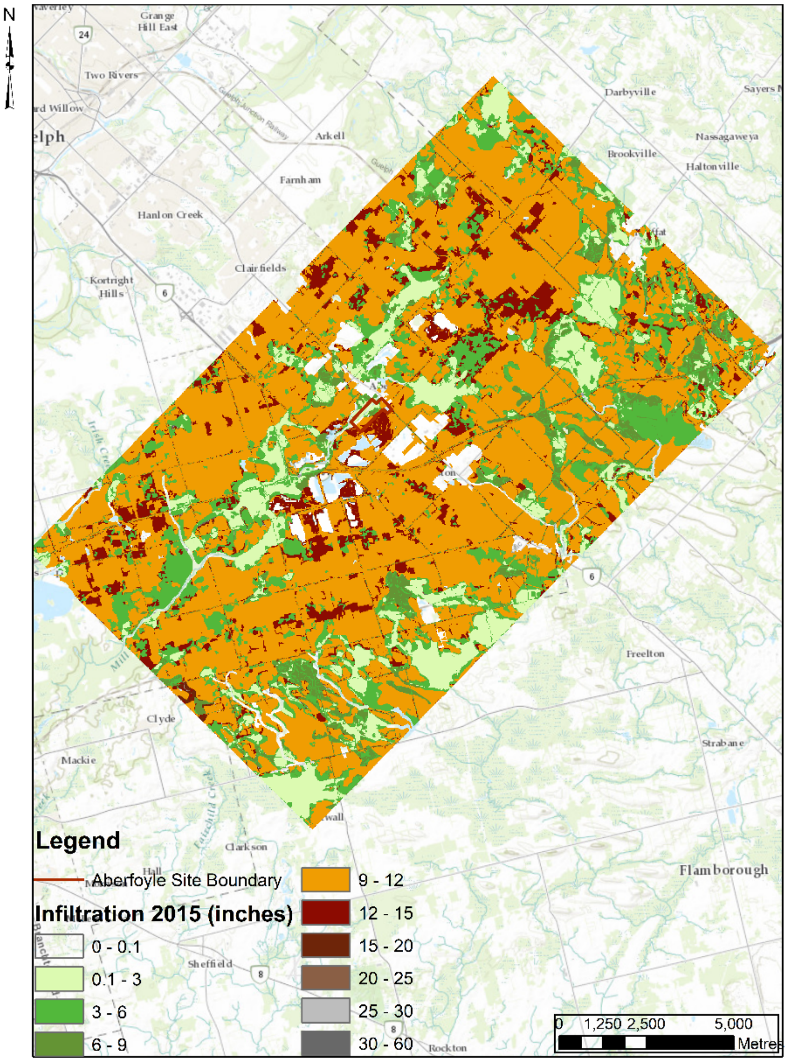


Figure 9. Calculated distribution of annual infiltration for 2015

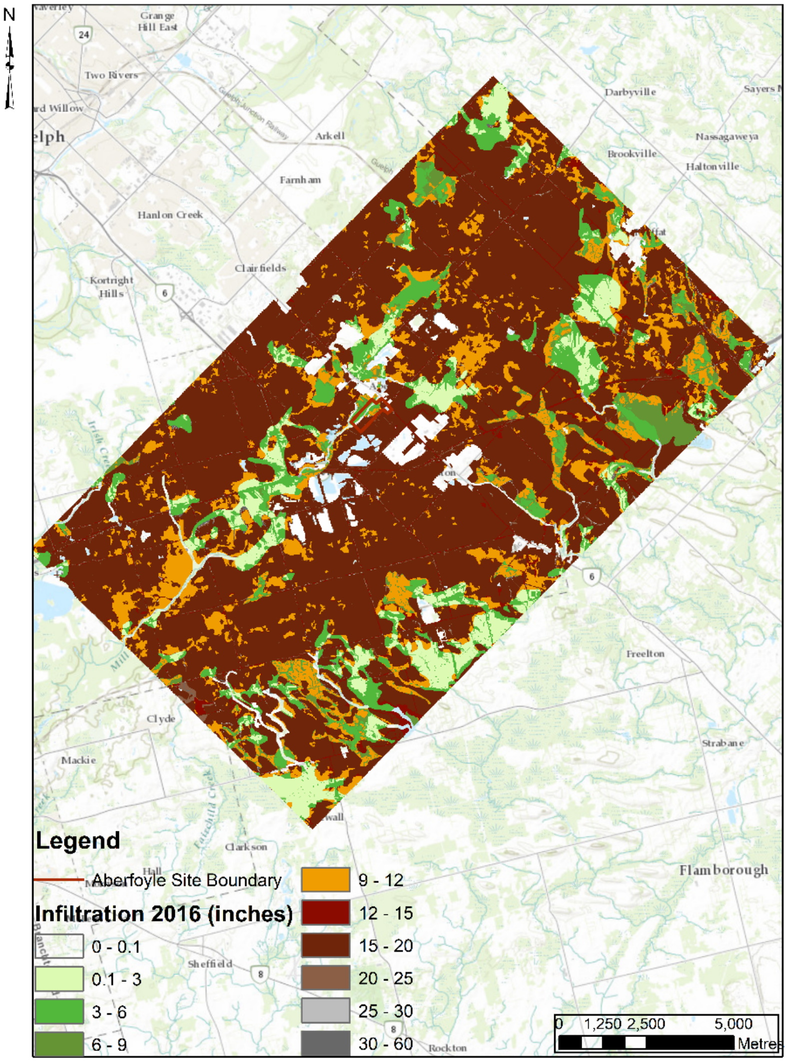


Figure 10. Calculated distribution of annual infiltration for 2016

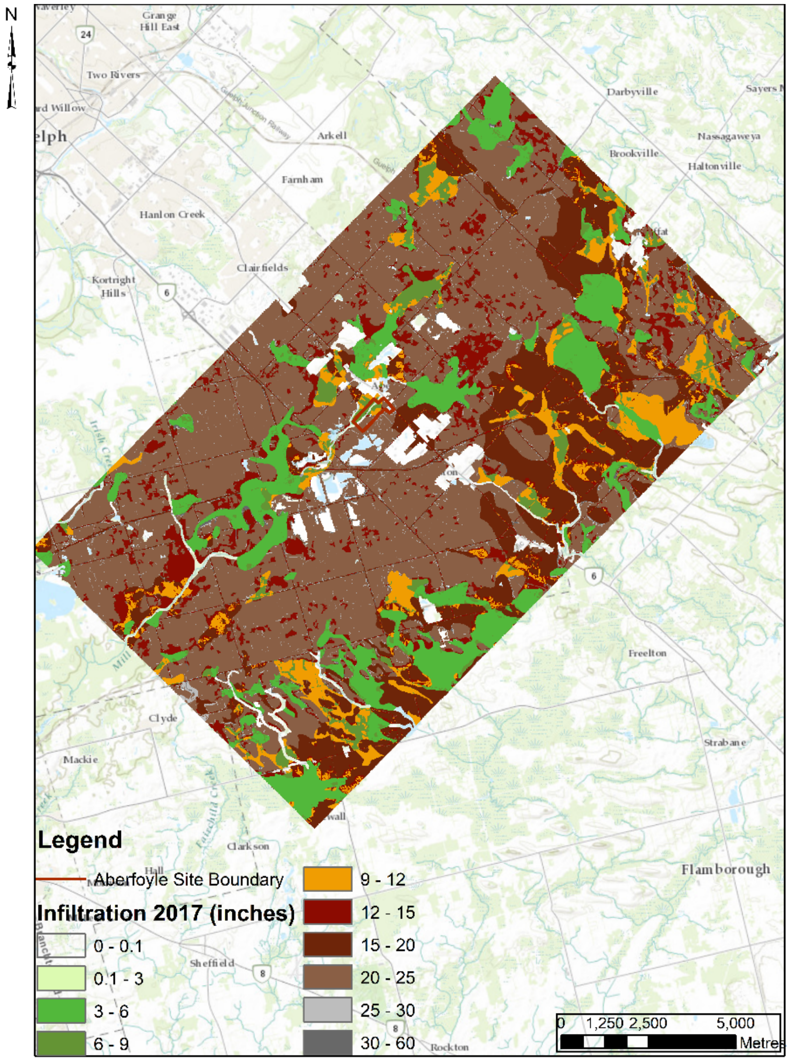


Figure 11. Calculated distribution of annual infiltration for 2017

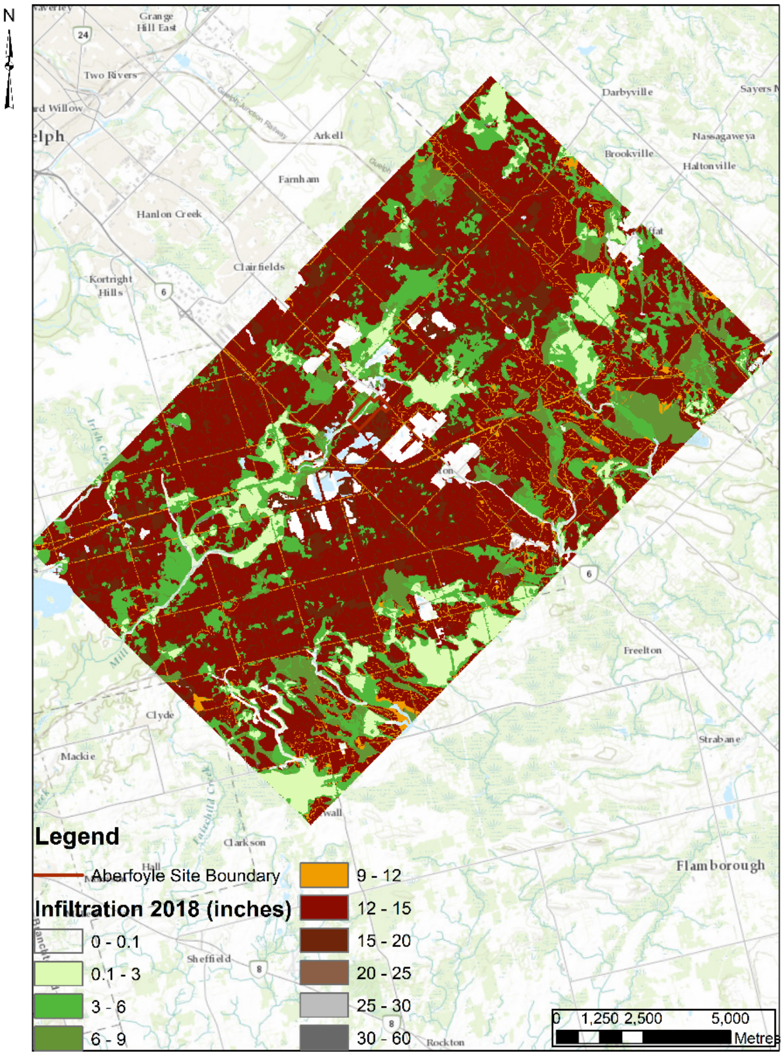


Figure 12. Calculated distribution of annual infiltration for 2018

5. Results (2): Calculated average annual infiltration for the Aberfoyle area, 2008-2018

The annual average infiltration distribution is shown in Figure 13.

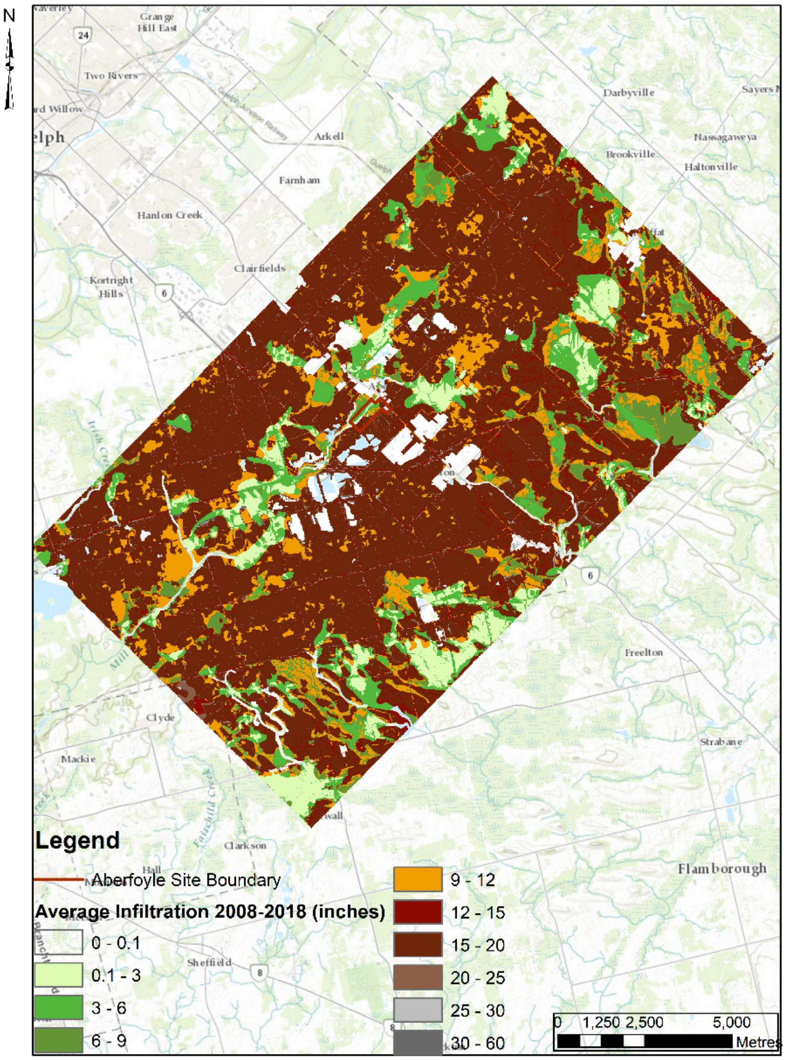


Figure 13. Calculated distribution of annual average infiltration from 2008 to 2018

6. Inferred relation between annual infiltration and total annual precipitation

The annual total precipitation and the estimated annual total infiltration using the SWB model are assembled on the following table. The mean and median vales of the annual precipitation and annual infiltration are also presented on the table. Over the 11-year period of the analysis, annual precipitation has varied over a relatively wide range, from about 770 mm to 1300 mm. Over this period the estimates of the annual infiltration range from about 100 mm (97.2 mm) to 240 mm (242.6 mm), a range of about ±70 mm from the median value.

Year	Annual total precipitation (mm)	Annual total infiltration (mm)
2008	1304.7	242.6
2009	964.9	160.0
2010	833.1	113.7
2011	1081	217.9
2012	770.6	113.7
2013	1088.6	175.5
2014	973.8	201.1
2015	795.8	97.2
2016	931.9	161.9
2017	949.4	195.6
2018	807.1	126.9
Mean	954.6	164.2
Median	949.4	161.9

The values of annual infiltration estimated with the SWB are plotted against the total annual precipitation in Figure 14. The following simple regression equation approximates the relation between estimated annual infiltration (*INF*) and between the annual precipitation (*P*) relatively well:

$$INF = 0.17\,P; \quad R^2 = 0.98$$

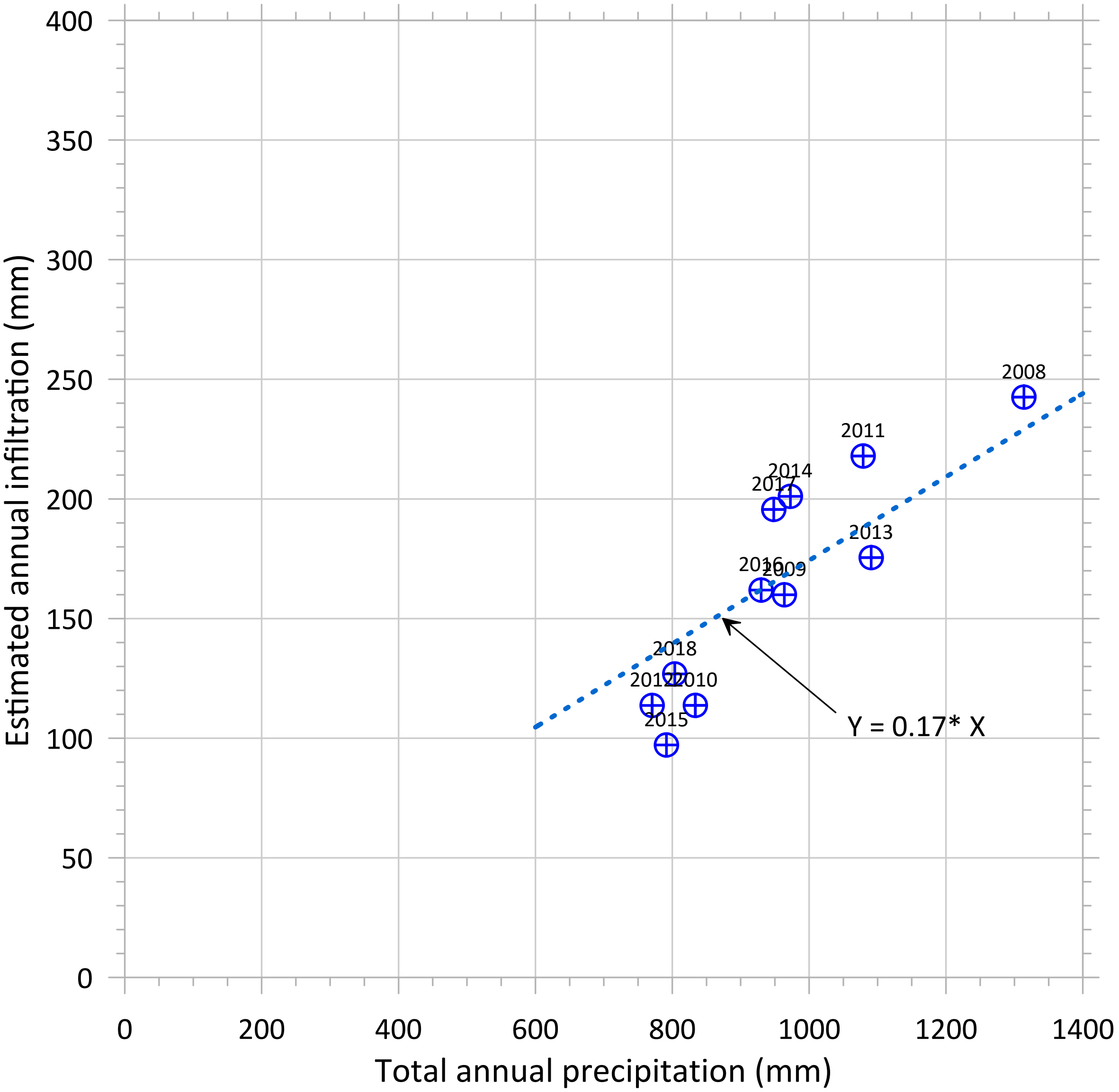


Figure 14. Relationship between infiltration and precipitation

7. Checks on the results of the demonstration application for Aberfoyle

Three checks on the results have been made. These checks are not intended to be definitive. Rather, they have been developed to assess in a general sense whether the results of the infiltration calculations are reasonable.

Check #1: Consistency of calculated infiltration rates with reported values for the University of Guelph's Elora Research Station

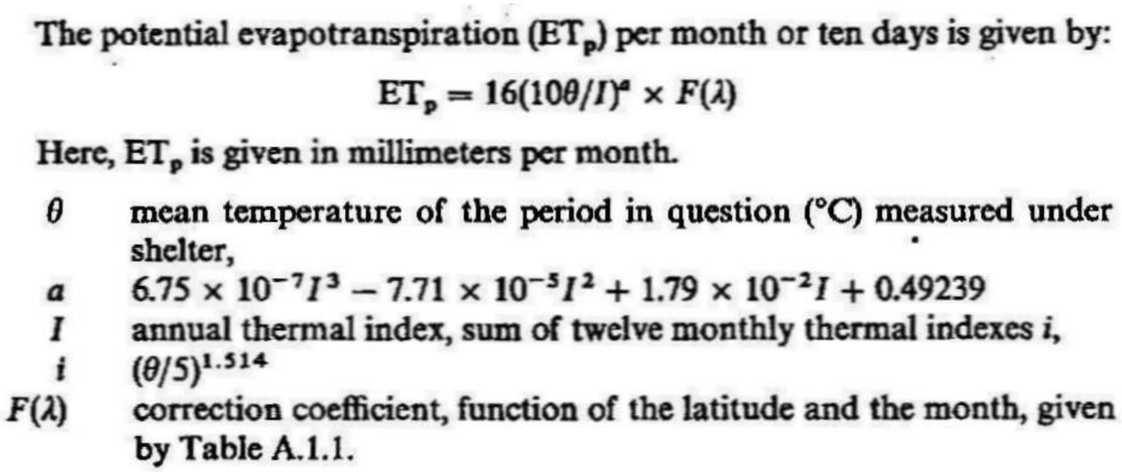
Values of annual recharge estimated McCoy et al. (2006) for the University of Guelph's Elora Research Station are reproduced below.

Year	Conventional Tillage (inches)	Non-conventional Tillage (inches)
2001	8.74	8.27
2002	8.03	6.16
2003	8.11	8.19

The reported annual recharge estimates vary over a relatively narrow range, from about 6 inches (150 mm) to 9 inches (230 mm). The reported estimates are consistent with the bulk of the values of annual infiltration over the 11 years of analyses calculated by the SWB model.

Check #2: Consistency of the calculated evapotranspiration with the potential evapotranspiration estimated with the de Marsily (1986) implementation of the Thornthwaite-Mather method

As a check on the evapotranspiration calculations, the de Marsily (1986) implementation of the Thornthwaite-Mather method has been applied to estimate potential evapotranspiration. The mathematical formulation is reproduced below.



The potential evapotranspiration (ET_p) per month or ten days is given by:

$$ET_p = 16(10\theta/I)^a \times F(\lambda)$$

Here, ET_p is given in millimeters per month.

θ	mean temperature of the period in question (°C) measured under shelter,
a	$6.75 \times 10^{-7}I^3 - 7.71 \times 10^{-5}I^2 + 1.79 \times 10^{-2}I + 0.49239$
I	annual thermal index, sum of twelve monthly thermal indexes i,
i	$(\theta/5)^{1.514}$
$F(\lambda)$	correction coefficient, function of the latitude and the month, given by Table A.1.1.

For completeness, de Marsily (1986) Table A.1.1 is reproduced below. The complete reference for the table provided in de Marsily (1986) is:

Brochet, P., and N. Gerbier, 1974: L'evapotranspiration. Aspect agrométérologique, évaluaton pratique de l'évapotranspiration potentielle. Monographe 65, Météroligie Nationale, Paris, France.

Kevin MacKenzie, Golder Associates, has indicated that the values on Table A.1.1 are day-length adjustment factors. Multiplication of the values by on Table A.1.1 by 12 hours yields the approximate daylight hours by latitude.

Potential evapotranspiration with the de Marsily implementation has been calculated with the monthly mean temperatures reported in 2016 at the Kitchener-Waterloo weather station. The calculated evapotranspiration obtained with the de Marsily implementation is about 620 mm. This value is within the range calculated with the SWB model, 533 mm to 632 mm.

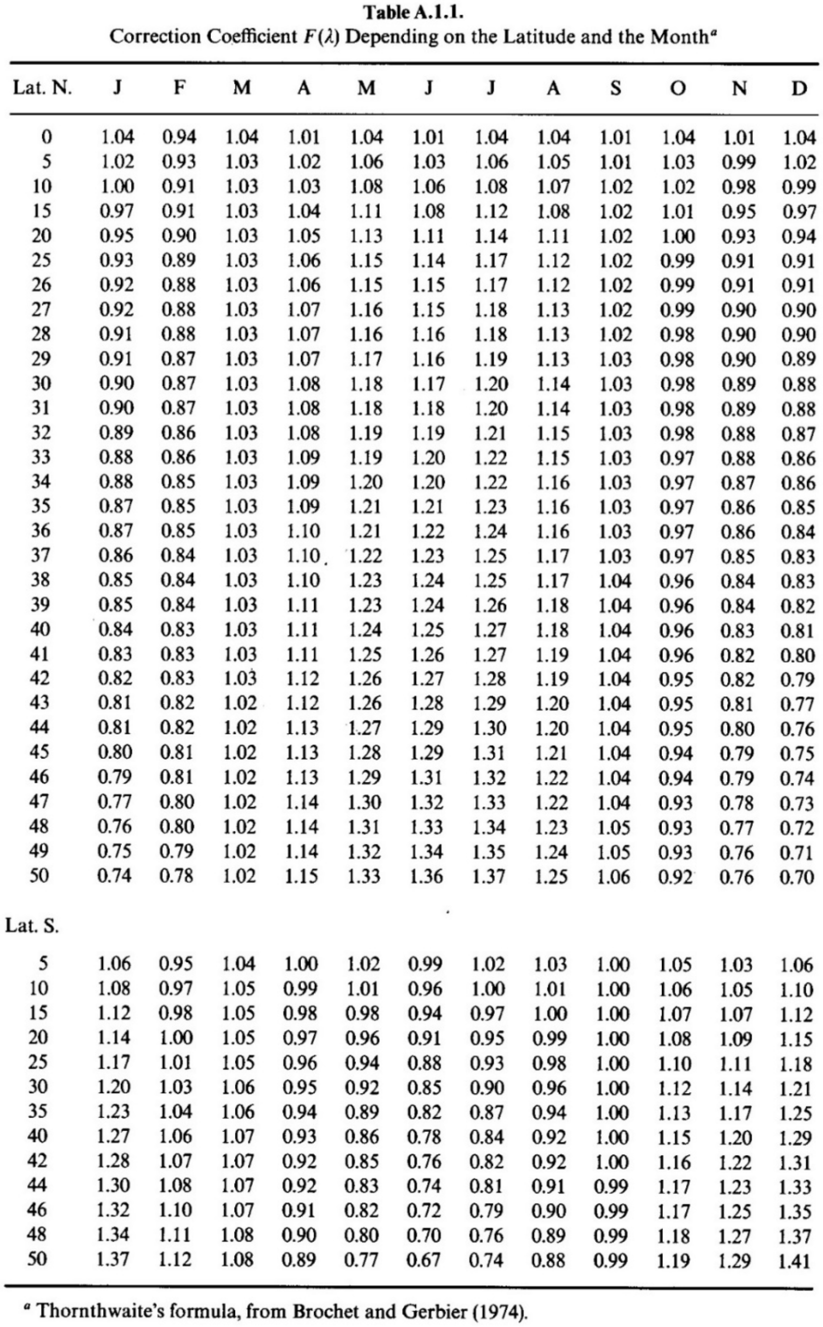


Table A.1.1.

Correction Coefficient $F(\lambda)$ Depending on the Latitude and the Month[a]

Lat. N.	J	F	M	A	M	J	J	A	S	O	N	D
0	1.04	0.94	1.04	1.01	1.04	1.01	1.04	1.04	1.01	1.04	1.01	1.04
5	1.02	0.93	1.03	1.02	1.06	1.03	1.06	1.05	1.01	1.03	0.99	1.02
10	1.00	0.91	1.03	1.03	1.08	1.06	1.08	1.07	1.02	1.02	0.98	0.99
15	0.97	0.91	1.03	1.04	1.11	1.08	1.12	1.08	1.02	1.01	0.95	0.97
20	0.95	0.90	1.03	1.05	1.13	1.11	1.14	1.11	1.02	1.00	0.93	0.94
25	0.93	0.89	1.03	1.06	1.15	1.14	1.17	1.12	1.02	0.99	0.91	0.91
26	0.92	0.88	1.03	1.06	1.15	1.15	1.17	1.12	1.02	0.99	0.91	0.91
27	0.92	0.88	1.03	1.07	1.16	1.15	1.18	1.13	1.02	0.99	0.90	0.90
28	0.91	0.88	1.03	1.07	1.16	1.16	1.18	1.13	1.02	0.98	0.90	0.90
29	0.91	0.87	1.03	1.07	1.17	1.16	1.19	1.13	1.03	0.98	0.90	0.89
30	0.90	0.87	1.03	1.08	1.18	1.17	1.20	1.14	1.03	0.98	0.89	0.88
31	0.90	0.87	1.03	1.08	1.18	1.18	1.20	1.14	1.03	0.98	0.89	0.88
32	0.89	0.86	1.03	1.08	1.19	1.19	1.21	1.15	1.03	0.98	0.88	0.87
33	0.88	0.86	1.03	1.09	1.19	1.20	1.22	1.15	1.03	0.97	0.88	0.86
34	0.88	0.85	1.03	1.09	1.20	1.20	1.22	1.16	1.03	0.97	0.87	0.86
35	0.87	0.85	1.03	1.09	1.21	1.21	1.23	1.16	1.03	0.97	0.86	0.85
36	0.87	0.85	1.03	1.10	1.21	1.22	1.24	1.16	1.03	0.97	0.86	0.84
37	0.86	0.84	1.03	1.10	1.22	1.23	1.25	1.17	1.03	0.97	0.85	0.83
38	0.85	0.84	1.03	1.10	1.23	1.24	1.25	1.17	1.04	0.96	0.84	0.83
39	0.85	0.84	1.03	1.11	1.23	1.24	1.26	1.18	1.04	0.96	0.84	0.82
40	0.84	0.83	1.03	1.11	1.24	1.25	1.27	1.18	1.04	0.96	0.83	0.81
41	0.83	0.83	1.03	1.11	1.25	1.26	1.27	1.19	1.04	0.96	0.82	0.80
42	0.82	0.83	1.03	1.12	1.26	1.27	1.28	1.19	1.04	0.95	0.82	0.79
43	0.81	0.82	1.02	1.12	1.26	1.28	1.29	1.20	1.04	0.95	0.81	0.77
44	0.81	0.82	1.02	1.13	1.27	1.29	1.30	1.20	1.04	0.95	0.80	0.76
45	0.80	0.81	1.02	1.13	1.28	1.29	1.31	1.21	1.04	0.94	0.79	0.75
46	0.79	0.81	1.02	1.13	1.29	1.31	1.32	1.22	1.04	0.94	0.79	0.74
47	0.77	0.80	1.02	1.14	1.30	1.32	1.33	1.22	1.04	0.93	0.78	0.73
48	0.76	0.80	1.02	1.14	1.31	1.33	1.34	1.23	1.05	0.93	0.77	0.72
49	0.75	0.79	1.02	1.14	1.32	1.34	1.35	1.24	1.05	0.93	0.76	0.71
50	0.74	0.78	1.02	1.15	1.33	1.36	1.37	1.25	1.06	0.92	0.76	0.70
Lat. S.												
5	1.06	0.95	1.04	1.00	1.02	0.99	1.02	1.03	1.00	1.05	1.03	1.06
10	1.08	0.97	1.05	0.99	1.01	0.96	1.00	1.01	1.00	1.06	1.05	1.10
15	1.12	0.98	1.05	0.98	0.98	0.94	0.97	1.00	1.00	1.07	1.07	1.12
20	1.14	1.00	1.05	0.97	0.96	0.91	0.95	0.99	1.00	1.08	1.09	1.15
25	1.17	1.01	1.05	0.96	0.94	0.88	0.93	0.98	1.00	1.10	1.11	1.18
30	1.20	1.03	1.06	0.95	0.92	0.85	0.90	0.96	1.00	1.12	1.14	1.21
35	1.23	1.04	1.06	0.94	0.89	0.82	0.87	0.94	1.00	1.13	1.17	1.25
40	1.27	1.06	1.07	0.93	0.86	0.78	0.84	0.92	1.00	1.15	1.20	1.29
42	1.28	1.07	1.07	0.92	0.85	0.76	0.82	0.92	1.00	1.16	1.22	1.31
44	1.30	1.08	1.07	0.92	0.83	0.74	0.81	0.91	0.99	1.17	1.23	1.33
46	1.32	1.10	1.07	0.91	0.82	0.72	0.79	0.90	0.99	1.17	1.25	1.35
48	1.34	1.11	1.08	0.90	0.80	0.70	0.76	0.89	0.99	1.18	1.27	1.37
50	1.37	1.12	1.08	0.89	0.77	0.67	0.74	0.88	0.99	1.19	1.29	1.41

[a] Thornthwaite's formula, from Brochet and Gerbier (1974).

Check #3: Consistency of the estimated infiltration with the Maxey-Eakin correlation between recharge and annual precipitation

Figure 15 was developed from correlations between recharge and annual precipitation presented in Maxey and Eakin (1949) and Farvolden (1967). The total precipitation between 2008 and 2018 ranged from 770.6 mm to 1304.7 mm. Referring to the plot, the fraction of precipitation that recharges the groundwater system is expected to be about 25%. This value is relatively close to the fraction of precipitation predicted to infiltrate that has been inferred from the simple regression shown in Figure 14 (17%).

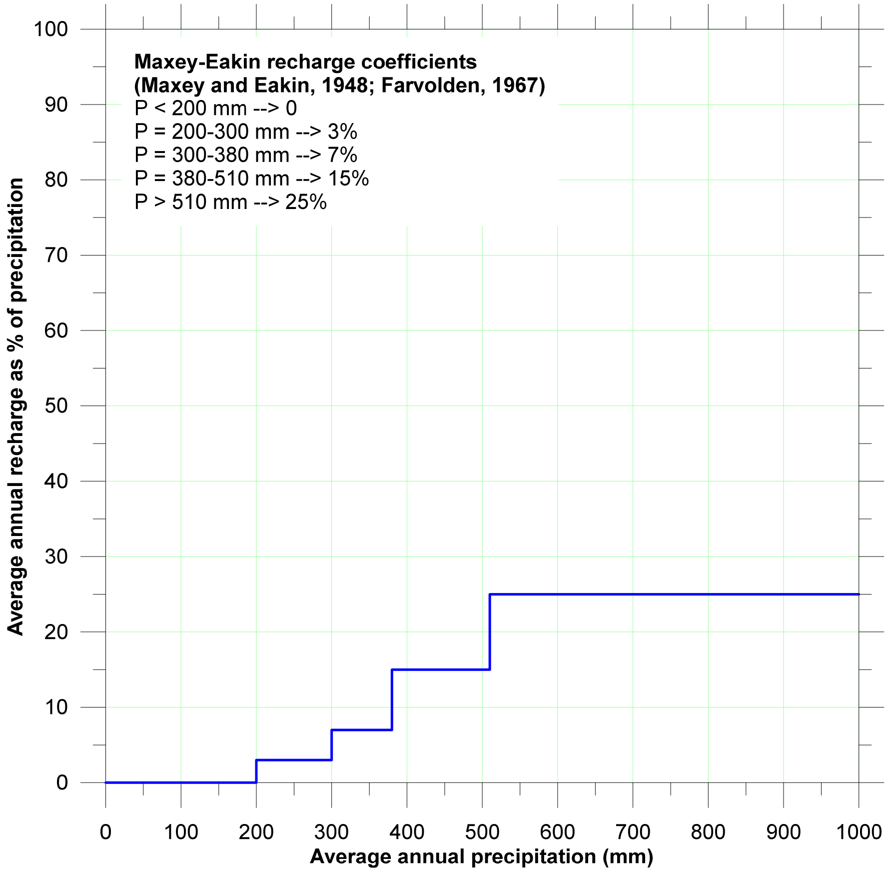


Figure 15. Correlations between recharge and annual precipitation presented in Maxey and Eakin (1949) and Farvolden (1967)

Check #4: Comparison with the basin yield

The 30-year average precipitation in the study area is 916.5 mm. The average evapotranspiration estimated from the 2008 - 2018 SWB model analysis is 587.2 mm. The basin yield is estimated by subtracting the evapotranspiration from the precipitation, 329.3 mm/yr.

The average observed basin yield from the Mill Creek at Sideroad Rd 10 02GAC19 between 1991 and 2005 according to Figure 3.12 of Appendix B1 of AquaResource (2011) ranges between 0.4 m^3/s to 1 m^3/s. The basin area is approximately 82.3 km^2. The rate of basin yield per unit area is therefore calculated as between 153 mm/yr and 383 mm/yr. The basin yield inferred from the SWB analysis falls within the range of the reported in AquaResource (2011).

8. References

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TECHNICAL MEMORANDUM

DATE February 25, 2019

Project No. 13-1152-0250 (1000)

TO Andreanne Simard, Ph.D., Natural Resource Manager
Nestle Waters North America

CC John Piersol, GAL Chris Neville, SSP&A

FROM Joel Henry, Greg Padusenko

EMAIL Gregory_Padusenko@golder.com

TW3-80 DRAWDOWN ANALYSIS

Withdrawals from well TW3-80 by Nestlé Waters Canada (NWC) are authorized by Permit to Take Water (PTTW) number 1381-95ATPY. Water levels have consistently been presented as hydrographs that simultaneously present up to five years of daily pumping data from TW3-80, daily precipitation, and daily water level data (Figure D1a in Annual Report). Because water levels at TW3-80 can vary up to 12 m each day, the TW3-80 hydrograph illustrates both the daily maximum and daily minimum levels rather than each hourly measurement. The hydrographs are effective for enabling a rapid, qualitative assessment of multiple years of data, graphically illustrating the degrees of daily, seasonal, and annual variability. Furthermore, long-term trends in aquifer capacity can be noted in the multi-year hydrographs, and the absence of marked declines is a significant line of evidence that the aquifer is being sustainably managed.

However, a qualitative review of the hydrographs is limited in its ability to support the interpretation of long-term trends, and to distinguish between potential causes of water level changes. The pumping rate of TW3-80 is the primary influence on the water level in TW3-80. Other factors such as aquifer recharge and nearby competing withdrawals also influence water levels, but the degrees to which they contribute to water level changes cannot be accurately accounted by visual inspection. The following analysis has been completed to quantitatively determine the degree to which TW3-80 pumping rates affect water levels at TW3-80.

TW3-80 Annual Withdrawal Volumes

Annual water withdrawals from well TW3-80 increased each year from 2011 through 2016, before decreasing in 2017 and 2018. Overall the water taking has been similar from 2015 to 2017. The water taking in 2018 was similar to that in 2014. The volume of groundwater withdrawn from TW3-80 in each of the last eight years are listed in Table 1.

Table 1: Annual TW3-80 Withdrawal Volumes

Year	Annual Volume (litres)
2011	568,025,080
2012	583,823,567
2013	600,537,587

2014	**678,452,126**
2015	**762,363,664**
2016	**783,540,441**
2017	**767,883,336**
2018	**676,946,402**

To quantitatively demonstrate the degree to which the water levels are directly related to pumping rates, the following analysis evaluates the relationship between monthly average pumping rates with monthly average water levels in TW3-80.

Analysis

The TW3-80 transducer dataset currently extends from September 2005 through December 2018. Hourly water level measurements for the entire dataset were averaged each day and then assembled in monthly averages. Months in which fewer than 20 days of water levels were recorded, due to periodic data gaps related to transducer failure, are excluded from the analysis. Daily groundwater withdrawal data from TW3-80 are aggregated as monthly totals. The monthly-averaged water levels are plotted against cumulative monthly pumping on Figure 1.

Figure 1 illustrates the inverse linear relationship between the monthly TW3-80 pumping rate, and the average monthly water levels in TW3-80. Based on a regression of 152 months of data, every 100 L/min increase in pumping results in a 0.64 m decline in water level. Most individual data points do not fall directly on the regressed line, meaning that variables other than the pumping rate influence the TW3-80 water level; however, 140 of the 152 data points (92%) are within 1 m of the expected water level, defined by the regression.

The goodness-of-fit of the regression (R^2 statistic) may be used to assess the ability of the regression relation to explain the relationship between the pumping level and the pumping rate. The R^2 value of 0.90 means that the monthly average pumping rate accounts for 90% of the variation in the monthly average TW3-80 water level. The 10% balance is understood to be caused by the other external variables, such as variations in aquifer recharge and other nearby groundwater withdrawals.

Effect of Precipitation

It is very challenging to quantitatively describe the relationship between precipitation and aquifer water levels, as precipitation is not the same as recharge. The relationship between precipitation and aquifer recharge is seasonally variable, with most recharge occurring in late winter and early spring, after the ground surface thaws and before plant transpiration becomes significant. The relationship between precipitation and aquifer recharge is not linear either, as unusually intense precipitation is likely to increase runoff, and not enhance recharge. Additionally, aquifer recharge (or the lack thereof during a drought) to the deep aquifer is not instantaneous, such that relating precipitation in a discrete month is unlikely to have a good correlation to the average water level in that same month.

However, the data illustrated on Figure 1 suggest that variations in aquifer recharge (and by extension, precipitation) have no greater than about +/-1 m effect on aquifer water levels. As stated, 140 of 152 data points in this regression are within +/-1 m of the regressed line. This means that even under drought conditions and significant precipitation deficits, the deep aquifer is affected by no greater than 1 m beyond what is predicted based only on the monthly pumping.

Conclusions

Groundwater withdrawals from TW3-80 account for 90% of the influence on water levels measured at TW3-80. For each 100 L/min change in the monthly-average pumping rate, water levels are predicted to change by 0.64 m. The effects of precipitation deficits that have been observed, affecting recharge volumes to the deep aquifer, have been inferred to have no greater impact than about 1 m of additional decline on TW3-80 water levels.

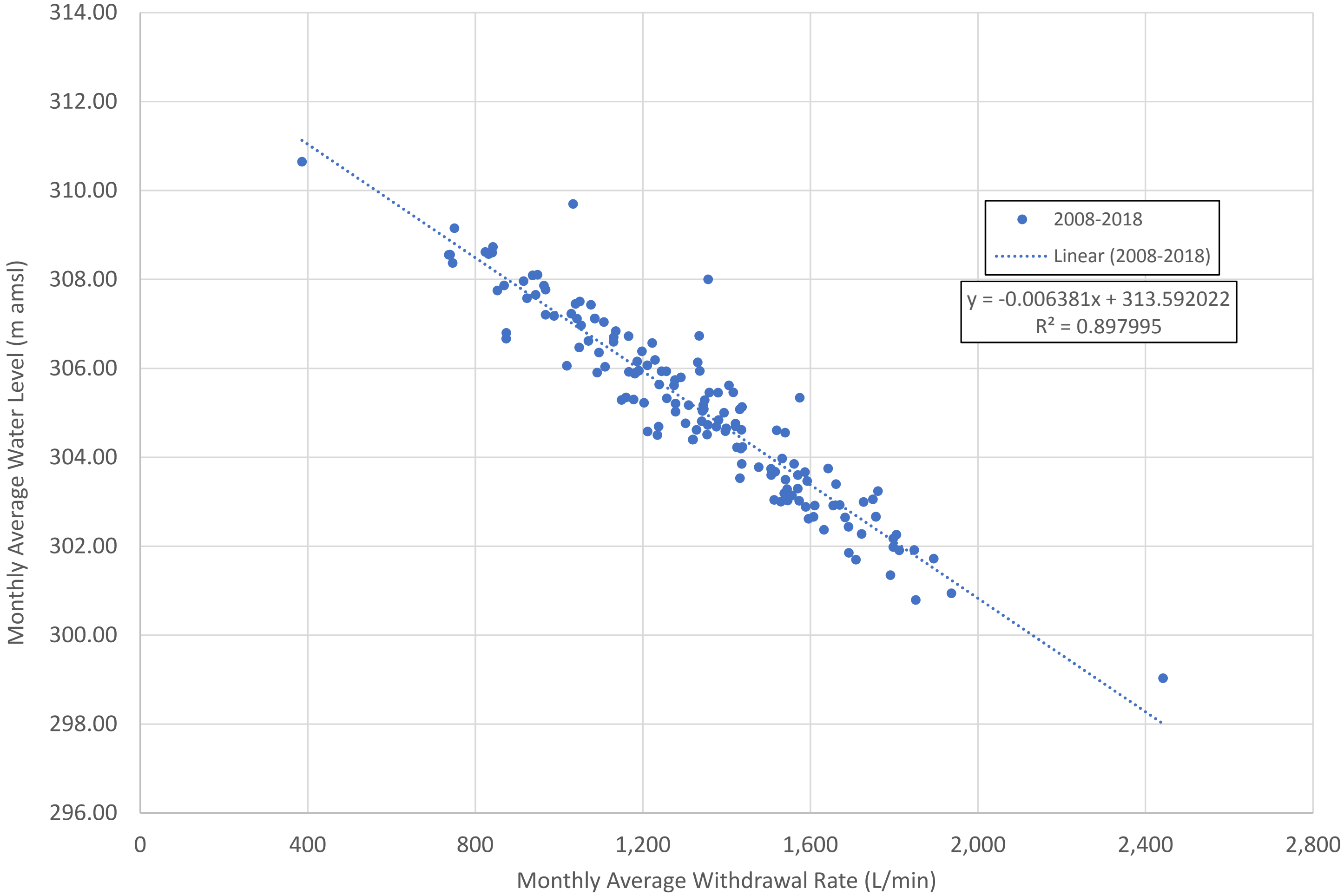
\\golder.gds\gal\mississauga\active\2013\1152\13-1152-0250 nestle waters ws s. ontario\aberfoyle\reports\2018 annual report\draft report\app i technical memo\13-1152-0250 (1000) tm 28jan2019 tw3-80 analysis.docx

ATTACHMENT

Figure 1

Figure 1

Relationship between TW3-80 Withdrawal Rate and Water Level



APPENDIX J

Letters to MECP

GOLDER

April 30, 2018 Project No. 13-1152-0250 (1000)

Director, Ministry of the Environment and Climate Change
West Central Region
119 King Street West, 12th Floor
Hamilton, Ontario
L8P 4Y7

INACCESSIBLE MONITORING LOCATIONS
CONDITION 4.7 OF PERMIT TO TAKE WATER NUMBER 1381-95ATPY
NESTLÉ CANADA INC. – ABERFOYLE SUPPLY WELL TW3-80

Dear Director:

On behalf of Nestlé Waters Canada (Nestlé), Golder has prepared this letter to provide information to the MOECC on monitoring locations that have become inaccessible along with a recommended replacement monitoring location to comply with Permit to Take Water 1381-95ATPY (PTTW).

Condition 4.7 states:

> *The Permit Holder shall identify to the Director in writing, within 15 days of any monthly monitoring event, any monitoring locations identified in Condition 4.2 and 4.3 which become inaccessible and/or abandoned along with a recommendation for replacement monitoring locations. Upon approval of the Director the monitoring program shall be appropriately modified.*

SW9 is a staff gauge where water levels are measured on a monthly basis as part of the PTTW requirements. SW9 is located in a wash pond on the Dufferin property south of the Nestlé property (Figure 1). Golder was unable to measure a water level at SW9 during the April monitoring event on April 18, 2018 due to the staff gauge being inaccessible. During the monitoring event, it was noted that the wash pond where SW9 is situated was partially filled in. The portion that was filled in covered staff gauge SW9, making the monitoring location permanently inaccessible/destroyed.

At this time, we would recommend that no additional monitoring locations be established for the following reasons:

- The station is situated in a wash pond where the water levels change due to the water taking from the wash pond;
- There does appear to be an influence on the water levels in the pond from pumping the Nestlé production well, TW3-80 (Figure 2); and
- Monitoring station, SW10, on the Dufferin property, provides surface water level information on the Dufferin property in close proximity to SW9 that can be used to track changes in surface water levels in the area.

As such, no replacement monitoring location is recommended at this time, and SW9 should be removed from the PTTW.

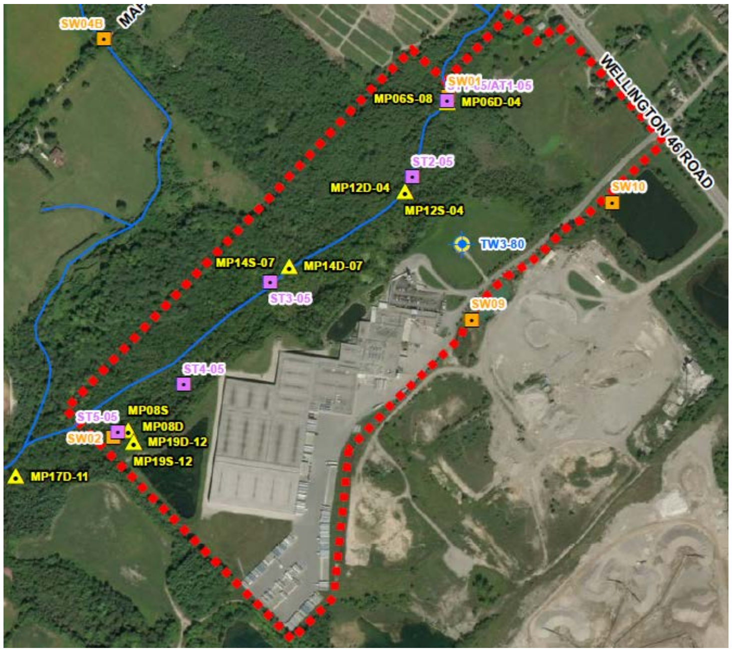


Figure 1. SW9 Location

In addition, Golder has prepared this letter to provide information to the MOECC on locations where monthly water levels were not obtained or a transducer had failed during this monitoring event. This information is typically provided in our Annual Reports but we will provide monthly updates until we receive clarification of Condition 4.7 of the PTTW as requested in our email dated February 27, 2017.

It is our understanding that missed measurements only need be reported in the Annual Report rather than under Condition 4.7 when the wells have not become inaccessible such that a replacement is needed, but rather temporarily frozen or blocked during a monitoring event or transducer failure. Golder has identified locations of any missing data in the Annual Reports since 2014. Golder sent an email to the MOECC on February 27, 2017 to request clarification as to what constitutes an inaccessible monitor under Condition 4.7. Until the intent of the Condition has been clarified in writing from the MOECC, Nestlé will notify the MOECC of any and all water levels not obtained on a monthly basis.

Golder has identified the following monitoring locations where a water level could not be measured during this monthly event, however it is anticipated that monitoring will continue at these locations and no replacement wells are needed:

- MP1D-16 – the water was frozen and a water level was measured to the top of the ice. The transducer could not be removed from the well to download. We note that this station is not part of the Conditions of the PTTW.

If you should have any questions on the above, please do not hesitate to contact us. Please confirm that SW9 can be removed from the PTTW monitoring and not be replaced with an additional staff gauge.

Yours truly,

Golder Associates Ltd.

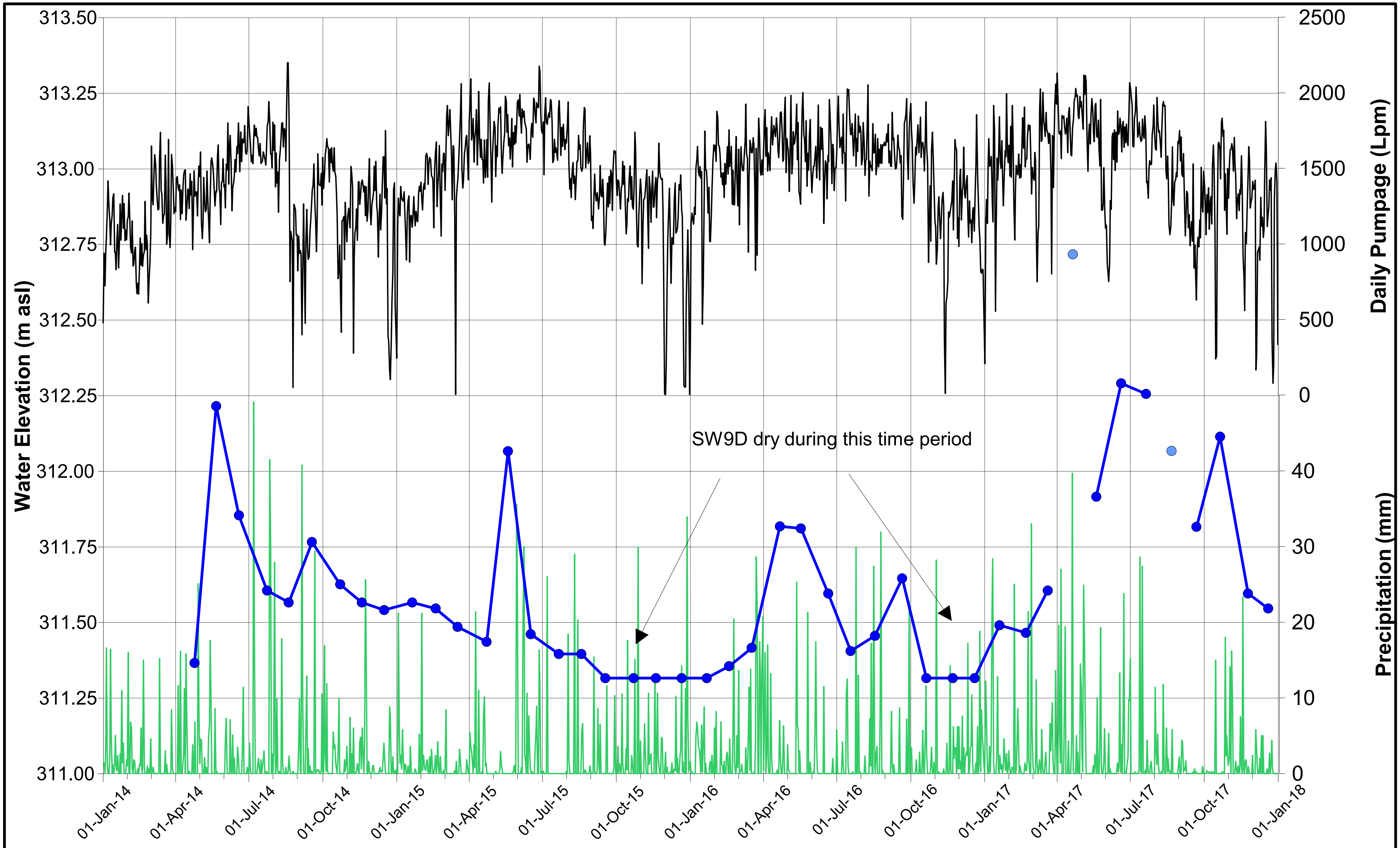
Greg Padusenko, M.Sc., P.Eng., P.Geo.
Hydrogeologist

John Piersol, M.Sc., P.Geo.
Senior Hydrogeologist, Associate

GRP/JAP/ll

CC: Andreanne Simard, Nestlé Waters Canada
Abdul Quyum, Ministry of the Environment and Climate Change
Lynnette Armour, Ministry of the Environment and Climate Change

\\golder.gds\gal\mississauga\active\2013\1152\13-1152-0250 nestle waters ws s. ontario\aberfoyle\letters to moe\2018\monitoring issues apr 2018\13-1152-0250 ltr 2018apr30 april monitoring update aberfoyle.docx



PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

SW9 HYDROGRAPH
2017 ANNUAL MONITORING REPORT

DATE	DECEMBER 2017
DESIGN	JH
REVIEW	GP
APPROVED	GP

Golder Associates

PROJECT NO.	**REV**	**FIGURE**
13-1152-0250 (1000)	A	2

August 9, 2018 Project No. 13-1152-0250 (1000)

Director, Ministry of the Environment, Conservation and Parks
West Central Region
119 King Street West, 12th Floor
Hamilton, Ontario
L8P 4Y7

INACCESSIBLE MONITORING LOCATIONS
CONDITION 4.7 OF PERMIT TO TAKE WATER NUMBER 1381-95ATPY
NESTLÉ CANADA INC. – ABERFOYLE SUPPLY WELL TW3-80

Dear Director:

On behalf of Nestlé Waters Canada (Nestlé), Golder has prepared this letter to provide information to the MECP on monitoring locations that have become inaccessible along with a recommended replacement monitoring location to comply with Permit to Take Water 1381-95ATPY (PTTW).

Condition 4.7 states:

> *The Permit Holder shall identify to the Director in writing, within 15 days of any monthly monitoring event, any monitoring locations identified in Condition 4.2 and 4.3 which become inaccessible and/or abandoned along with a recommendation for replacement monitoring locations. Upon approval of the Director the monitoring program shall be appropriately modified.*

W2 is the supply well for the Aberfoyle Mill Restaurant located approximately 500 m northeast of the Nestlé production well (TW3-80) as shown on Figure 1. The well is completed in the lower bedrock aquifer to a depth of approximately 55.5 m below ground surface. Water levels are measured in the well on a monthly basis as part of the PTTW requirements. Nestlé was contacted by the property owner of the Aberfoyle Mill on August 8, 2018 requesting that Nestlé no longer monitor their well (W2). Nestlé had previously reached out the property owner to request installing a monitoring well on the property to replace private well W2, however, the property owner did not want a monitoring well on their property. As such, Nestlé is looking for a new location to replace W2, which includes the property across the road from the Aberfoyle Mill Restaurant.

Due to the difficulty in getting access to private land in the area, Nestlé will continue to make their best effort to obtain a suitable location to install a replacement monitoring well at a location close to W2. This may include drilling on the northeast boundary of the Nestlé property. Nestlé will provide the proposed location to the MECP.

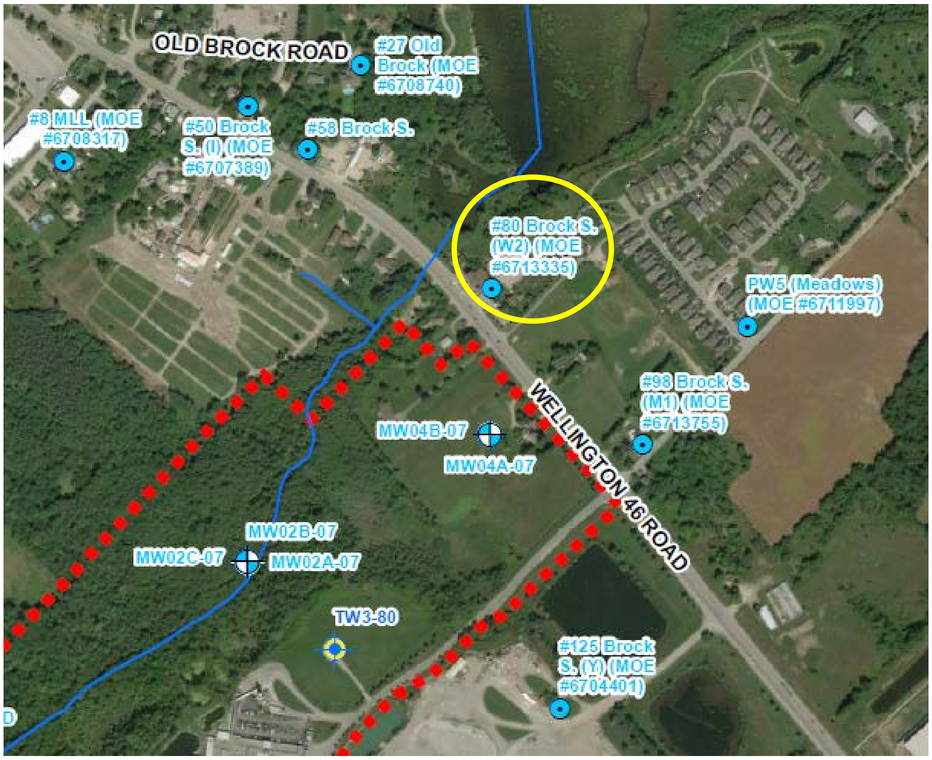


Figure 1. W2 Location

If you should have any questions on the above, please do not hesitate to contact us.

Yours truly,

Golder Associates Ltd.

Greg Padusenko, M.Sc., P.Eng., P.Geo.
Hydrogeologist

John Piersol, M.Sc., P.Geo.
Senior Hydrogeologist, Associate

GRP/JAP/ll

CC: Andreanne Simard, Nestlé Waters Canada
Abdul Quyum, Ministry of the Environment, Conservation and Parks
Lynnette Armour, Ministry of the Environment, Conservation and Parks

\\golder.gds\gal\mississauga\active\2013\1152\13-1152-0250 nestle waters ws s. ontario\aberfoyle\letters to moe\2018\monitoring issues aug 2018 w2\13-1152-0250 ltr 2018aug9 aberfoyle well w2.docx

golder.com

HARDEN

Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline
Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies

Geochemistry

Phase I / II

Regional Flow Studies

Contaminant Investigations

OMB Hearings

Water Quality Sampling

Monitoring

Groundwater Protection Studies

Groundwater Modeling

Groundwater Mapping

Permits to Take Water

Environmental Compliance Approvals

Our File: 0215

April 8, 2019

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

Attention: Ms. Karen Landry
CAO

Dear Ms. Landry;

Re: Nestlé Waters Canada – 2018 Monitoring Report Review

We are pleased to submit our comments on the 2018 Monitoring Report. As part of our review we reference the following documents;

Golder Associates Ltd, 2019, 2018 Annual Monitoring Report, Aberfoyle Site, Nestlé Waters Canada

Porrt and Associates, 2019, Examination of the Temperature Suitability of Aberfoyle Creek for Resident Fishes: 2006 -2018

We also attended the technical review meeting hosted by Nestle Waters Canada on March 7, 2019.

1.0 General Comments on Regional Influence of Water Taking by Nestlé Waters Canada

The annual water taking by Nestlé Waters Canada is summarized in the following table obtained from the Golder report.

Year	Total Volume Pumped (Millions of Liters)
2011	568
2012	583
2013	600
2014	678
2015	762
2016	783
2017	767
2018	676

Between 2011 and 2015 there was a 34% increase in water taking with 2015, 2016 and 2017 having similar volumes of taking. There was a 12% decrease in 2018 compared to the average taking between 2016 and 2018.

Groundwater potentials declined 2011 through to 2015 and with the stable pumping rates 2015 through to 2017, groundwater potentials have also stabilized. This makes it more apparent that declining groundwater potentials are the result of increased taking by Nestlé Waters Canada rather than due to an external change such as decreased precipitation. This is manifest in 2018 by the water level increase in the aquifer to an unusual decrease in pumping between September and December 2018.

2.0 Comment on Aquifer Response to Change in Pumping Rates

An unusual decrease in pumping rate between September and October 2018 results in a noticeably different seasonal response in groundwater levels. We have attached the hydrograph for Fireflow Well as an example of the observed response. The rising water levels between September and December 2018 are in response to the rate change and represent the highest water levels in that well since 2014 when the pumping rate was similar. This exemplifies the ability of the aquifer to recover when pumping rates are decreased. The rapid recovery is mainly due to the fact that the aquifer is depressurized, but not dewatered.

3.0 Comment on Apparent Decline in Groundwater Levels at OW10C-09 and others.

The water levels in monitor OW10C-09 located on the Gilmour Property at a distance of approximately 1200 metres from the pumping well are shown on the attached figure. The water level has an apparent decline from an elevation of 318 metres above mean sea level (m AMSL) in 2014 to 317 m AMSL in 2018. This cannot be explained by the historical pumping. A similar decline is noted in OW10D-09 and there may be other, more subtle, examples. Our comment is that, visually, it is difficult to determine if long-term water level changes at specific locations in the aquifer are due to pumping at TW3-80 or from an external influence. We recommend that more analysis be conducted that separates pumping influence on water levels to determine if this apparent decline can be related to pumping from TW3-80.

4.0 Comment on Apparent Decline in Surface Water Levels at SW2

Similar to some groundwater levels, the water level at Station SW2 in Aberfoyle Creek appears to be declining between 2014 and 2018. The reason for this apparent decline should be investigated. The hydrograph for SW-2 is attached.

There are also periods of time when Aberfoyle Creek is losing water, specifically February, June, July and September of 2018 and in the summer months of 2015. The measured losses are within the expected error of the measurement method; however, Aberfoyle Creek should be a gaining stream given the interpretation of overburden water levels on Figure 2.6 of the Golder Report. The fisheries work done by Portt and Associates determines that the temperature conditions in this reach of Aberfoyle Creek are not suitable for Brook or Brown trout, mainly as a result of warm water discharged from the Mill Pond. Harden Environmental is not qualified to comment on the fisheries aspect and we recommend that a fisheries expert comment on this matter on behalf of the Township of Puslinch.

5.0 Comment on Ambient Groundwater Levels in Paris Moraine and Aberfoyle Outwash from Puslinch Groundwater Monitoring Network

The state of water levels in the headwater areas of this area was an area of concern at the March 7, 2019 meeting. As part of the Township of Puslinch Groundwater Monitoring Network we have attached hydrographs for MW6, MW4 and MW5. These monitors are representative of ambient groundwater levels either on the Paris Moraine (MW5), Galt Moraine (MW4) or the outwash deposits (MW6) found between the moraines. The hydrographs show that water levels in the area upgradient of water taking by Nestlé Waters Canada are stable, showing no overall decline. The hydrograph for MW6 also shows that there is no long-term change in the upward hydraulic gradient between the shallow and deep intervals at MW6.

Sincerely,
Harden Environmental Services Ltd.

Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
WATERCOURSES PRODUCED USING INFORMATION UNDER LICENSE WITH THE GRAND RIVER CONSERVATION AUTHORITY © GRAND RIVER CONSERVATION AUTHORITY, 2014
PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

PROJECT
2018 ANNUAL REPORT

TITLE
2018 SURFACE WATER MONITORING LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-16
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO.	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	3.3

REFERENCE(S)
BASE DATA - MNR LIO, OBTAINED 2013
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM
ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2013
PROJECTION: UTM NAD83 ZONE 17
WATERCOURSES PRODUCED USING INFORMATION UNDER LICENSE WITH THE GRAND RIVER CONSERVATION AUTHORITY © GRAND RIVER CONSERVATION AUTHORITY, 2014
PROPERTY BOUNDARY OBTAINED FROM CRA, NOVEMBER 2014.

CLIENT
NESTLE WATERS CANADA

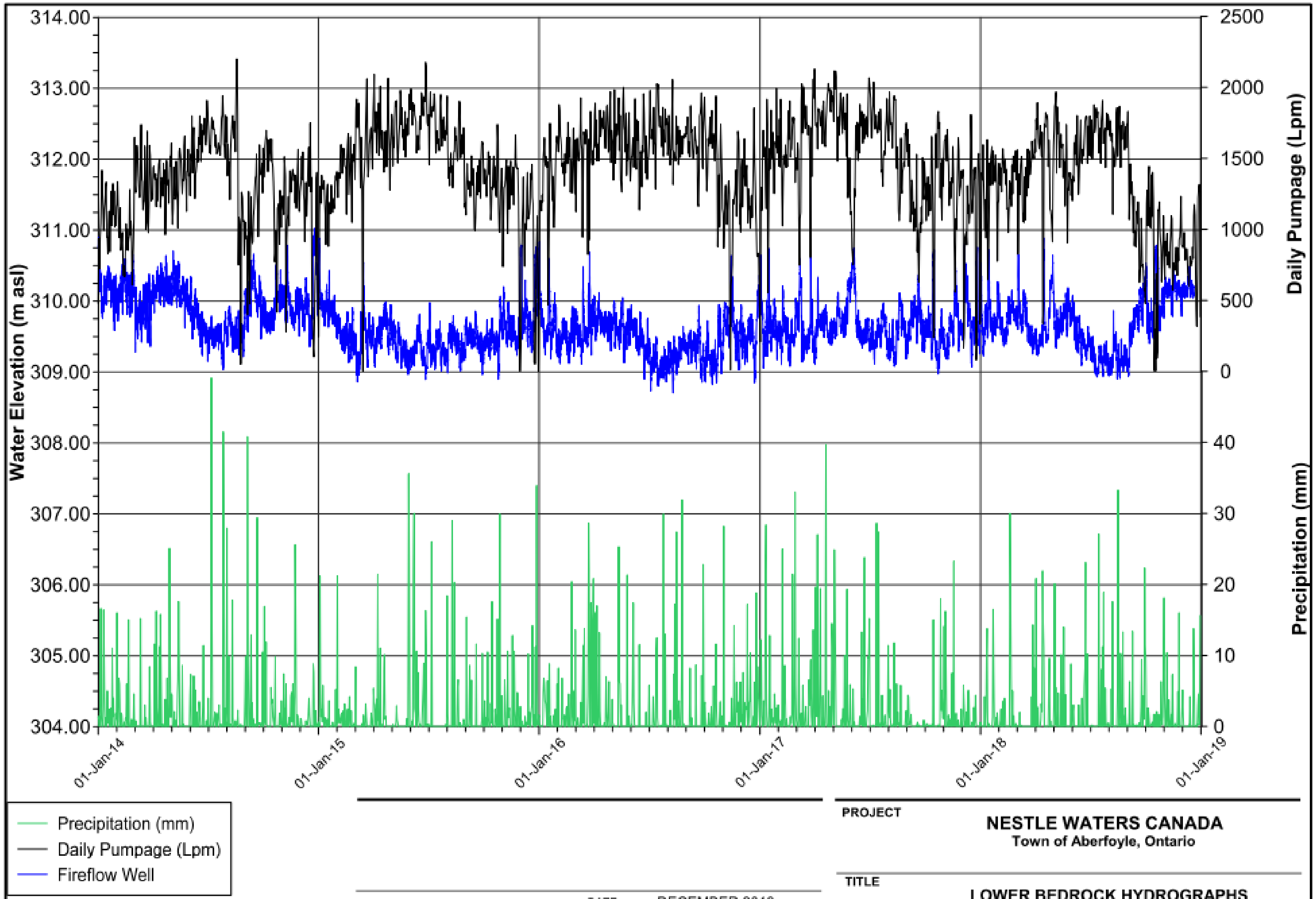
PROJECT
2018 ANNUAL REPORT

TITLE
2018 BEDROCK MONITORING LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-18
DESIGNED	JMC
PREPARED	JMC/PR
REVIEWED	GP
APPROVED	JP

PROJECT NO	CONTROL	REV.	FIGURE
13-1152-0250	0019	1.0	3.1



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

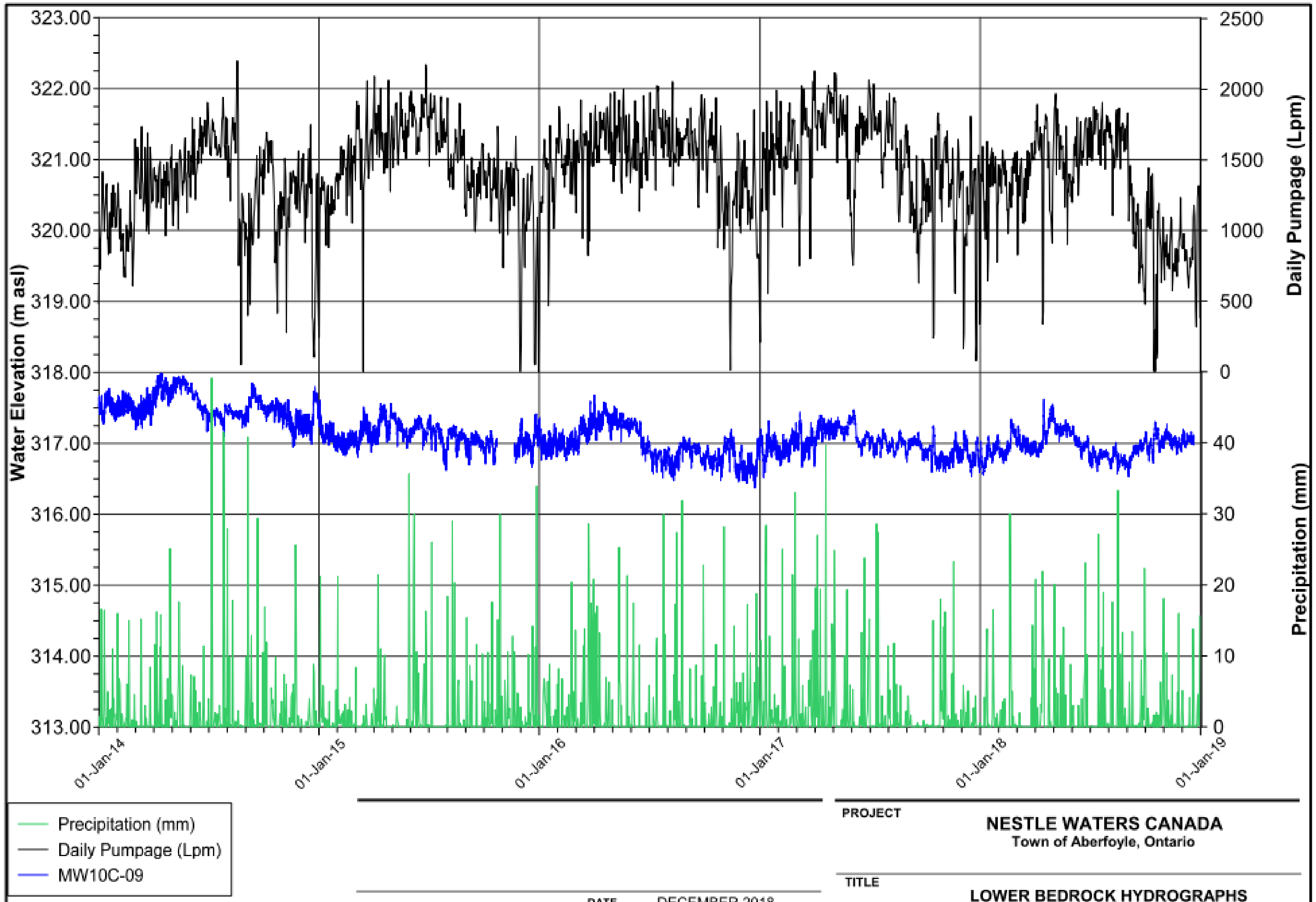
PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	D15



GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

TITLE

LOWER BEDROCK HYDROGRAPHS
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
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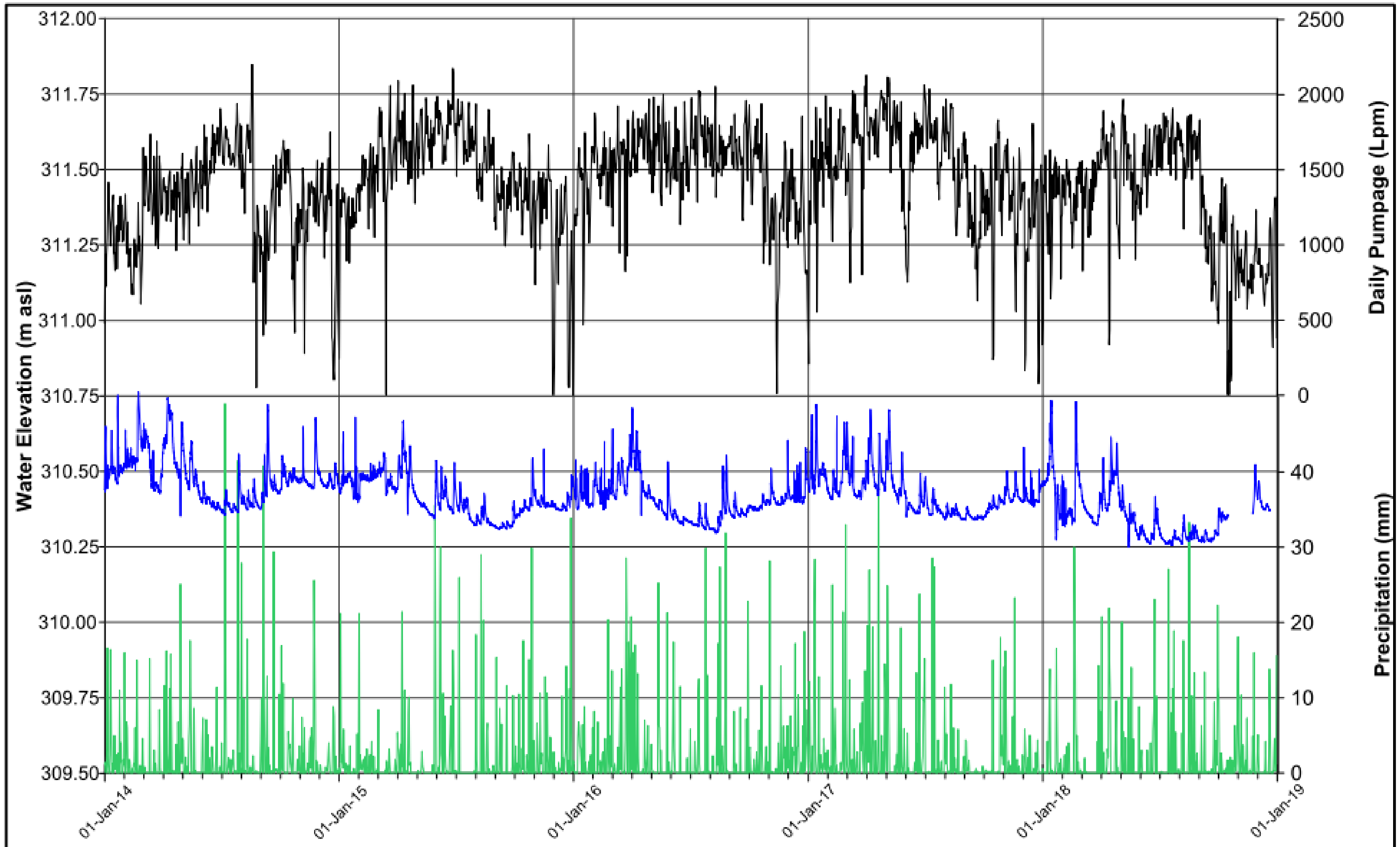


🟩	Precipitation (mm)
▬	Daily Pumpage (Lpm)
🟦	SW2

GOLDER

DATE	DECEMBER 2018
DESIGN	JH
REVIEW	GP
APPROVED	GP

PROJECT

NESTLE WATERS CANADA
Town of Aberfoyle, Ontario

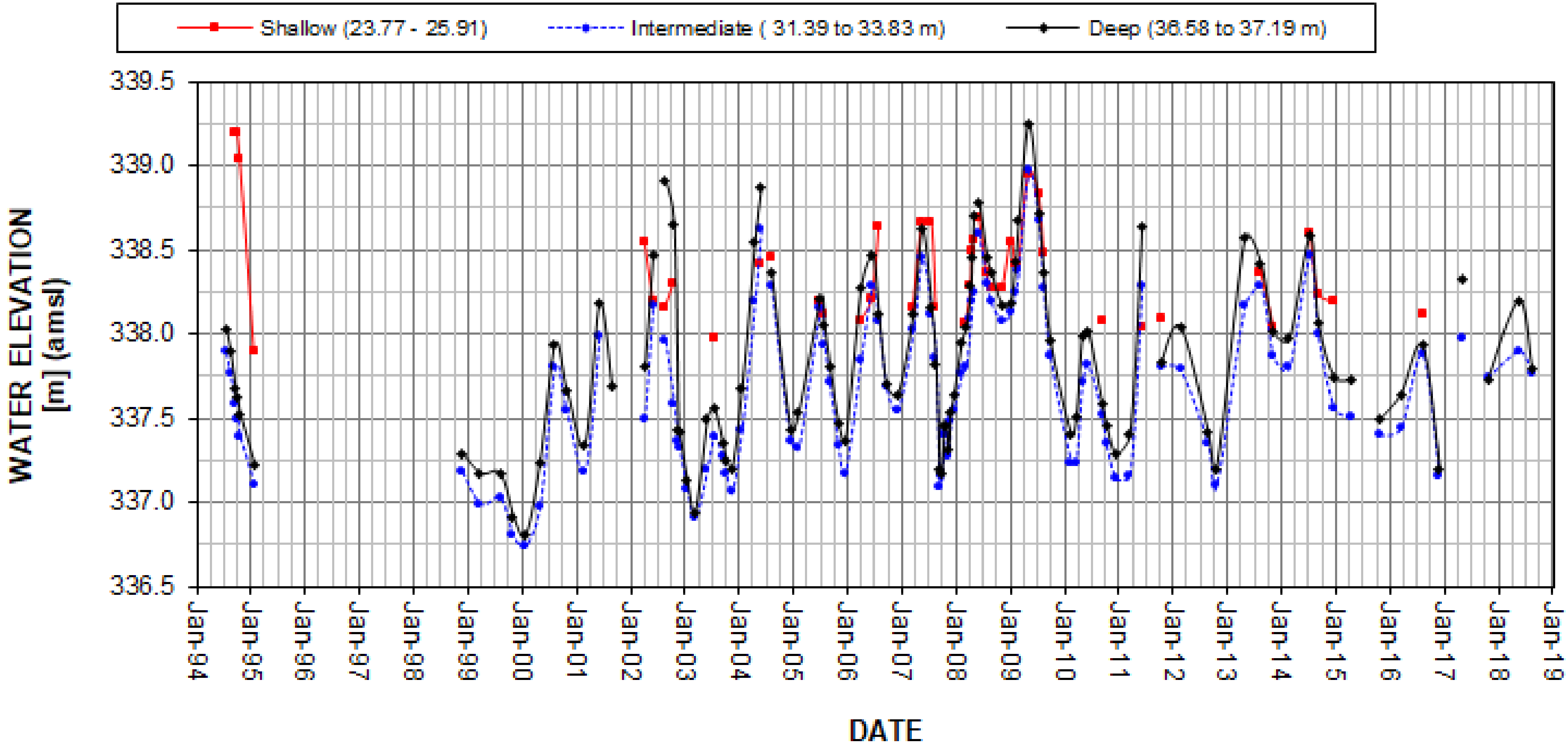
TITLE

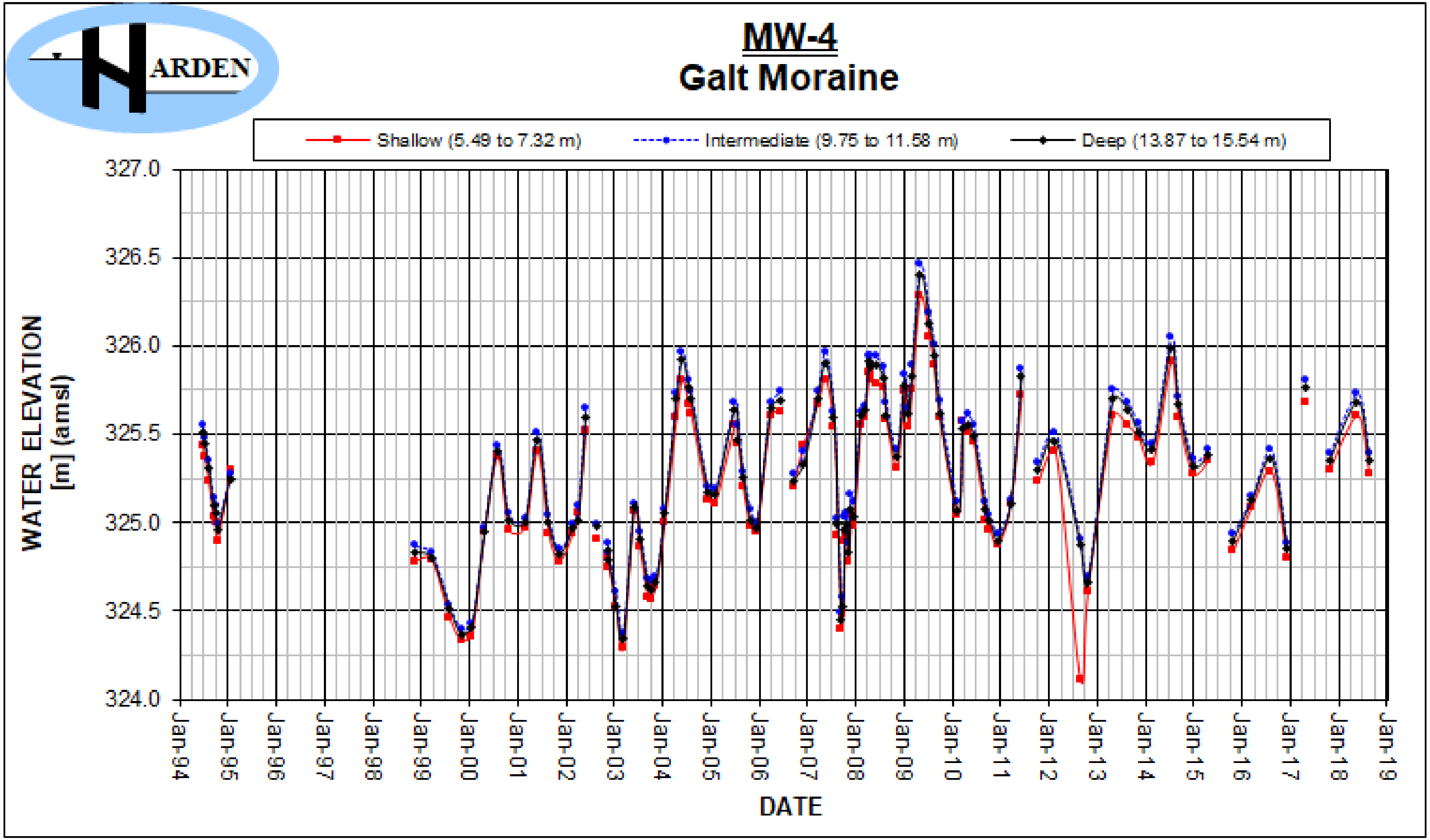
SW2 HYDROGRAPH
2018 ANNUAL MONITORING REPORT

PROJECT NO.	REV	FIGURE
13-1152-0250 (1000)	A	E15a

HARDEN

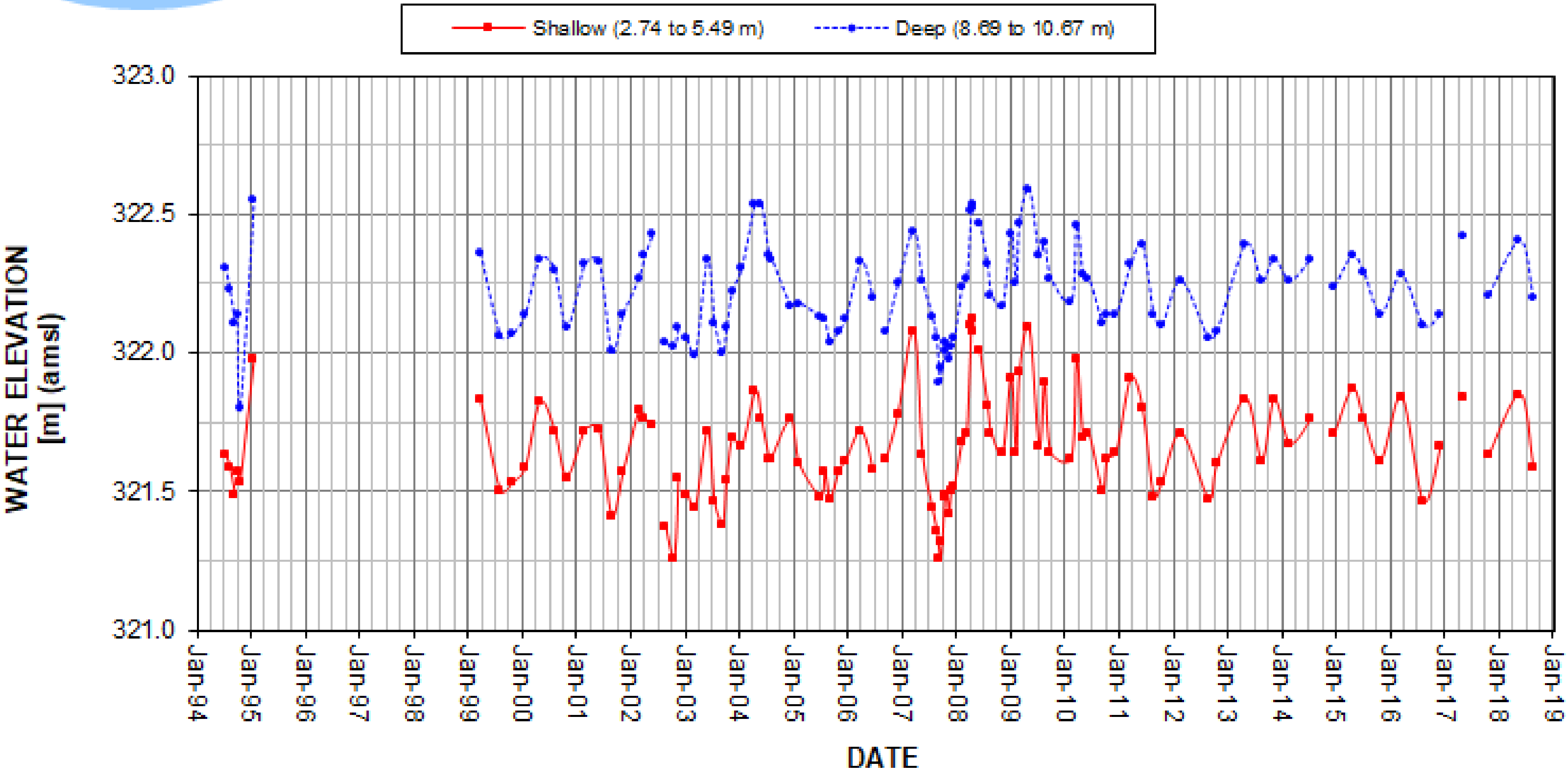
MW-5
Paris Moraine




HARDEN
MW-4
Galt Moraine
Shallow (5.49 to 7.32 m)
Intermediate (9.75 to 11.58 m)
Deep (13.87 to 15.54 m)
WATER ELEVATION
[m] (amsl)
327.0
326.5
326.0
325.5
325.0
324.5
324.0
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
DATE

ARDEN

MW-6
Aberfoyle Outwash



Groundwater
Science Corp.

Unit 2, 465 Kingscourt Drive,
Waterloo, ON N2K 3R5
Phone: (519) 746-6916
groundwaterscience.ca

2018 Groundwater Monitoring Report
CBM Puslinch Pit
Licence No. 17600
North Half Lot 26, Con. 1
Township of Puslinch

Prepared For:

St. Marys Cement Inc. (Canada)
CBM Aggregates - Aberfoyle
55 Industrial Street
Toronto, ON
M4G 3W9

Prepared By:

Andrew Pentney, P.Geo.
Groundwater Science Corp.

March 2019

TABLE OF CONTENTS

Figures

Tables

Appendices

1.0 BACKGROUND

CBM operates the Puslinch Pit, located on North Half of Lot 26, Concession 1, Township of Puslinch, County of Wellington, Ontario. The pit was previously known as the Mast Pit, ownership was transferred from Puslinch Quality Aggregates Ltd. to CBM in 2006. The property location is shown on **Figure 1**. The pit was issued a Class A License (No. 17600) by the Ministry of Natural Resources to include extraction below the water table.

The License (Site Plan) conditions specify a groundwater monitoring program as part of the on-going operations at the site. This report summarizes the results of the groundwater monitoring program that has been completed to date, and specifically the results of the monitoring completed in 2018.

The monitoring requirements, methodology, information sharing and monthly summaries associated with the program are outlined in Sections 1.1, 1.2, 1.3 and 1.4. The monitoring results are presented in Section 2 and discussed in Section 3. Recommendations regarding the program are made in Section 4 of this report.

1.1 MONITORING REQUIREMENTS

The Technical Recommendations for Hydrogeology listed on the Site Plan include a specific monitoring, mitigation and reporting plan, as well as Thresholds and an Action Response Plan. The monitoring program conditions associated with the site are summarized in the 2005 Annual Report (dated January 2006), please refer to that report or the Site Plan for specific details.

1.2 MONITORING METHODOLOGY

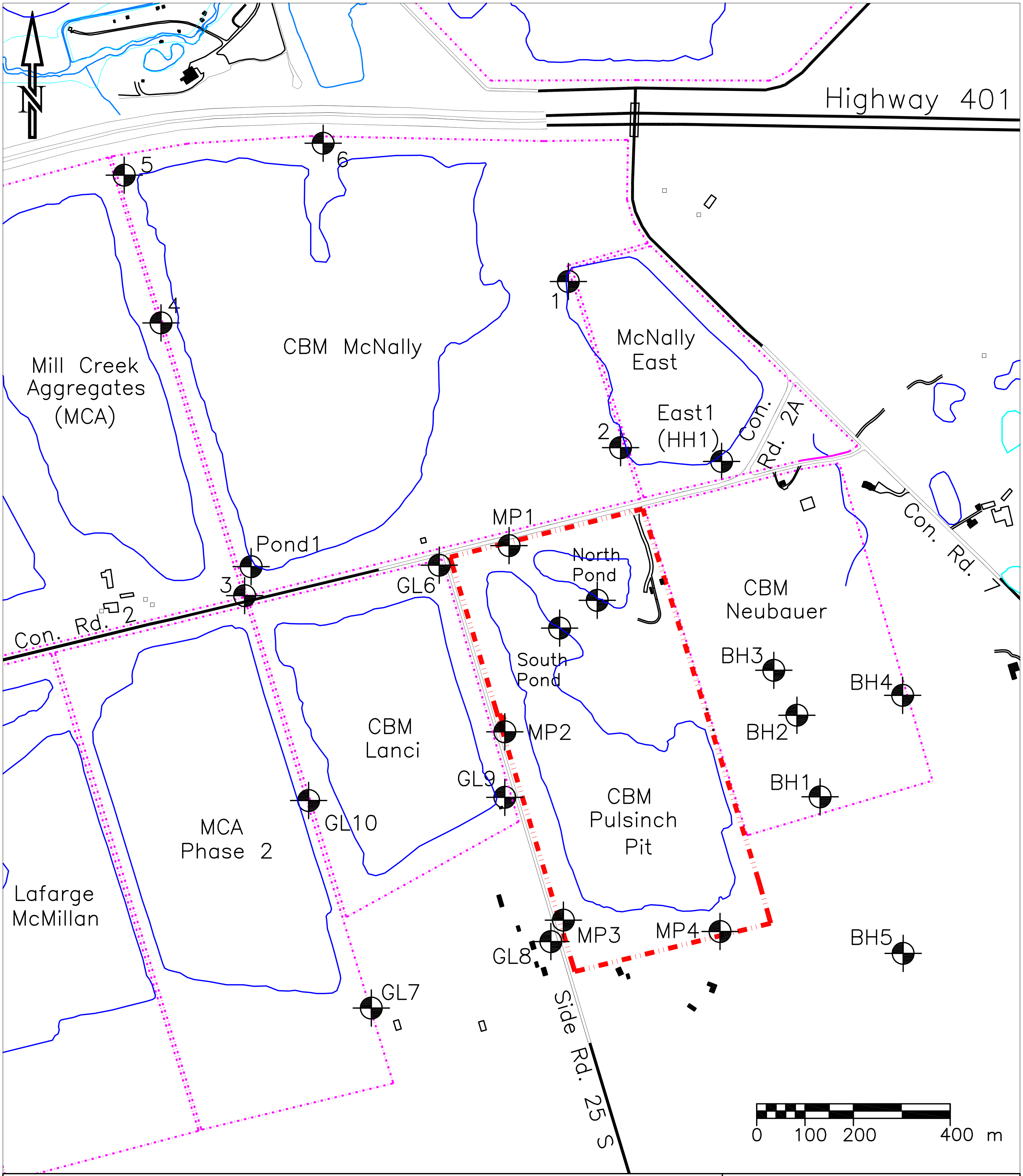
The field methodology used as part of this monitoring program are industry standard techniques for the establishment and monitoring of observation wells, staff gauges and stilling wells. The operator obtained manual water level measurements on an approximate weekly basis during below water table extraction (operational period) from August to December 2018. There were no below water operations from January to July 2018.

Pond level measurements were obtained at the stilling wells and groundwater level measurements were obtained at monitoring wells as depth below top of well in metres using an electronic water level meter. The measurements were recorded in the field and provided by the operator on a regular basis.

Precipitation data was reviewed, as described in **Section 2.2** of this report. In addition Mill Creek (at Side Road 10) hourly flow data, as reported on the GRCA website, was reviewed.

1.3 INFORMATION SHARING

At the request of the MNR all historical data for the Puslinch Pit is available to the Mill Creek Cumulative Impact Assessment study. The information is transferred upon request.



▭ CBM Puslinch Pit Licence Boundary (approximate)

▭ existing Licence boundaries (approximate)

○ ∼ surface water: pond (approximate), creek or swale

⬭ wetland (OBM mapping)

modified from :
1) OBM mapping UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO
2) Site Plans, Harrington McAvan Ltd.
3) 2018 Air Photo, Google Earth

Figure 1: Local Monitoring Locations

CBM Puslinch Pit
Groundwater Monitoring Program
Annual Report

Goundwater Science Corp.

Scale: as shown
Date: March 2019

1.4 MONTHLY SUMMARIES

Monthly summaries are not available for 2018 due to water level data collection issues (as described later in this report). Based on the CBM reported extraction summaries, below water extraction operations occurred from August to December 2018. As noted in **Section 2.4** no threshold exceedances occurred in 2018, and to date no significant impact on local water table elevations have been observed. A new water level data collection process was initiated in March 2019. Moving forward monthly summaries can be expected during periods of below water table operations at the site.

2.0 RESULTS

The monitoring program as implemented at the Puslinch Pit site satisfies the general information gathering conditions specified on the Site Plan. The data obtained is summarized in the following sections.

2.1 EXTRACTION SUMMARIES

The reported below water table monthly extraction rates are summarized in **Table 1**. In 2018 extraction was reported to be within the "south" pond area only. The approximate pond outline is shown on **Figure 1**. A reported total of 113,930 tonnes of material was excavated from below the water table in 2018.

Month	Tonnes Extracted Below Water Table	
	North Pond	South Pond
January	0	0
February	0	0
March	0	0
April	0	0
May	0	0
June	0	0
July	0	0
August	0	10,390
September	0	7,680
October	0	7,900
November	0	58,770
December	0	29,190
Total	0	113,930

Table 1: Below Water Table Excavation Summary

Aggregate washing operations are no longer conducted at the Puslinch Pit, and the former wash ponds are currently not in use.

2.2 CLIMATE DATA

For comparison to the hydrographs, a plot of the monthly precipitation and current 30-year monthly precipitation normal (1981-2010) reported by Environment Canada for the weather station location closest to the site (at the Region of Waterloo International Airport) for the years 2001 to 2018 is included in **Appendix B**.

The data is provided by Golder Associates as part of a coordinated approach to monthly and annual precipitation analysis for the Township of Puslinch, and to our knowledge as of the data of this report, is consistent with other annual monitoring assessments for the area (e.g. Nestlé Waters Canada).

The graph indicates seasonal and annual variation, and a comparison to "average" values as represented by the Environment Canada reported 30-year Climate Normal. As indicated, on an annual basis the reported total precipitation in 2018 of 807.1 mm was below "average" (916.5 mm). Relatively "dry" conditions occurred in "winter" 2017/2018, "normal" conditions occurred during "spring" and "summer", and relatively "dry" conditions occurred again later in "fall" 2018.

2.3 WATER LEVEL MONITORING

In 2018 water level measurements have been obtained by CBM at the stilling wells installed in the north and south ponds; and, at on-site water table monitoring wells MP1, MP2, MP3 and MP4. Due to operations and safety considerations locations are occasionally inaccessible. The former wash ponds are no longer in use and the south pond has extended to the former processing area. Measurements of the water table elevation in the area of the former wash ponds are provided by the south pond monitor. Monitoring locations are shown on **Figure 1**. Installation summaries for the monitors included in this program are provided in **Table 2**.

Monitor	Ground Surface Elevation (mAMSL)	Reference Point Elevation (mAMSL)	Top of Screen Elevation (mAMSL)	Screen Bottom Elevation (mAMSL)
MP1	314.02	314.77	302.94	301.42
MP2	315.77	316.56	303.20	301.68
MP3	316.74	317.50	304.57	303.05
MP4	314.68	315.35	302.36	300.84
North Pond	307.96	308.24	n/a	n/a
South Pond	307.09	307.79	n/a	n/a
Note: Elevations are geodetic, as reported by Van Harten Surveying Inc., July 2007				

Table 2: Installation Summaries

The most recent water level measurements as reported by CBM are summarized in table form in **Appendix A**. Hydrographs of the monitoring results to date are also included in **Appendix A**.

Occasional anomalous readings are noted in the 2017 and 2018 data set, inconsistent with both historical data and measurements obtained at adjacent sites (e.g. Neubauer Pit and Lanci Pit). This is particularly evident in the MP1 and MP3 data. To illustrate the anomalies a comparison plot is provided in **Appendix A** showing data obtained at Lanci GL6 (near MP1) and GL8 (near MP3) is provided. The reason for the anomalous reading is unknown, but could include malfunctioning water level tape, errors in reading the water level tape, condensation on the PVC pipe, etc. The primary anomalous readings (from August 17, 2017 to September 6, 2017, and, August 8, 2018 to September 4, 2018) were removed from the data set for the remaining hydrographs. The remaining data may also contain discrepancies, however can be used to assess general trends.

In March 2019 Groundwater Science Corp. assumed monitoring duties at the Puslinch Pit and Neubauer Pit in order to collect a more complete data set for the sites moving forward. As part of that work water level dataloggers were installed in all of the existing on-site monitors and programed to obtain measurements four times daily.

The water level monitoring results indicate that 2017 conditions were within the seasonal an annual ranges observed since 2004. The relatively "dry" conditions in 2018 are reflected in the water table elevations at the site. The magnitude of seasonal groundwater level variation observed in 2018 is within the historical range for the site.

The monitoring results indicate that the overall pattern of groundwater flow has not changed at the site. Flow directions at the site remain generally to the south to southwest and the groundwater level difference (slope) across the site was within typical ranges (in 2018 generally between 0.45 and 0.48 m from MP1 to MP3) experienced in the past.

2.4 THRESHOLD, LOW WATER AND RAINFALL RESPONSE

Working Thresholds for the Puslinch Pit, as part of the Groundwater Monitoring Program conditions, have been developed. The thresholds are included in **Table 3**.

There were no threshold exceedances in 2017 at the Puslinch Pit. As part of the Low Water Response status for Mill Creek, if flow volumes within the creek are lower than established "normal values" then water users (e.g. Permit To Take Water holders) may be asked or required to reduce water usage. However, since CBM has taken over operations, aggregate washing no longer occurs at the Puslinch Pit and water use at the site is minimal.

Location	Threshold (mAMSL)
North Pond	305.64
South Pond	305.34
MP3	305.27
MP4	305.27
Note: Elevations are geodetic, as per July 2007 survey	

Table 3: Working Thresholds

Overall on-site water levels remained within the historical observed range, therefore no mitigation measures were recommended as a result of the Low Water Response program, due either to precipitation conditions or in response to threshold levels. Moving forward more complete annual data sets should be available to assess threshold compliance.

3.0 DISCUSSION

The compiled monitoring data for the CBM Puslinch Pit indicates that the below water table extraction at the pit (including the "equivalent pumping" effect) has had an insignificant effect on the overall groundwater flow system, and, has not resulted in any measurable alteration to the division of water between the Mill Creek and Fletcher Creek subwatersheds. This could be due to a combination of factors, including the presence of the till "ridge"; the "capture" and increased "storage" of precipitation on-site; and/or, the limited potential for flow system impacts (due to below water table extraction) at this location within the regional groundwater setting.

4.0 RECOMMENDATIONS

Based on the results of this monitoring program and the requirements of the Site Plan, the following recommendation is made:

1. The groundwater monitoring program should continue in 2019 as per the Site Plan conditions.

Report Prepared By:

Andrew Pentney, B.Sc., P.Geo.
Hydrogeologist, Principal
Groundwater Science Corp.

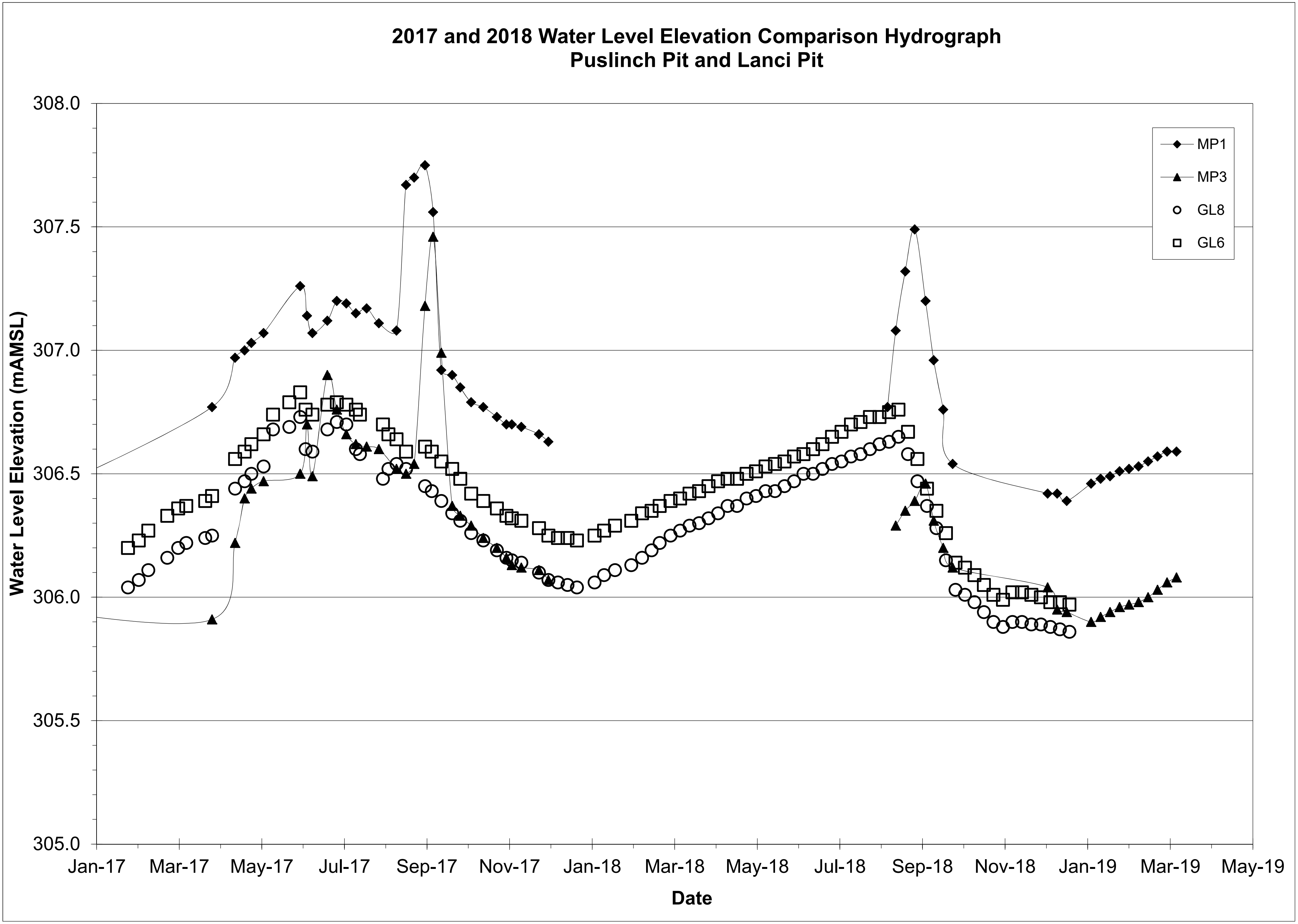
PROFESSIONAL GEOSCIENTIST
ANDREW H, PENTNEY
PRACTISING MEMBER
0652
ONTARIO

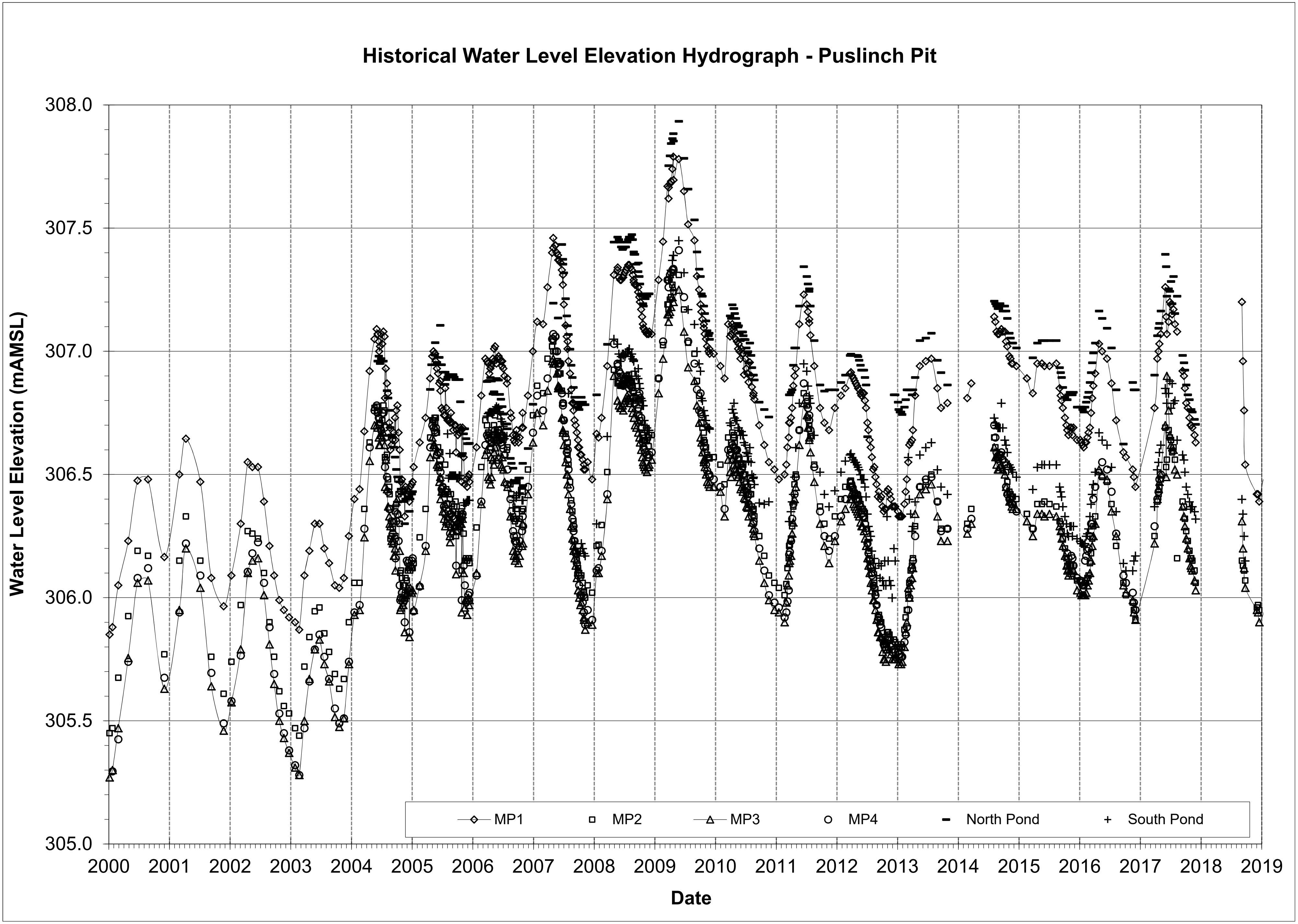
Appendix A

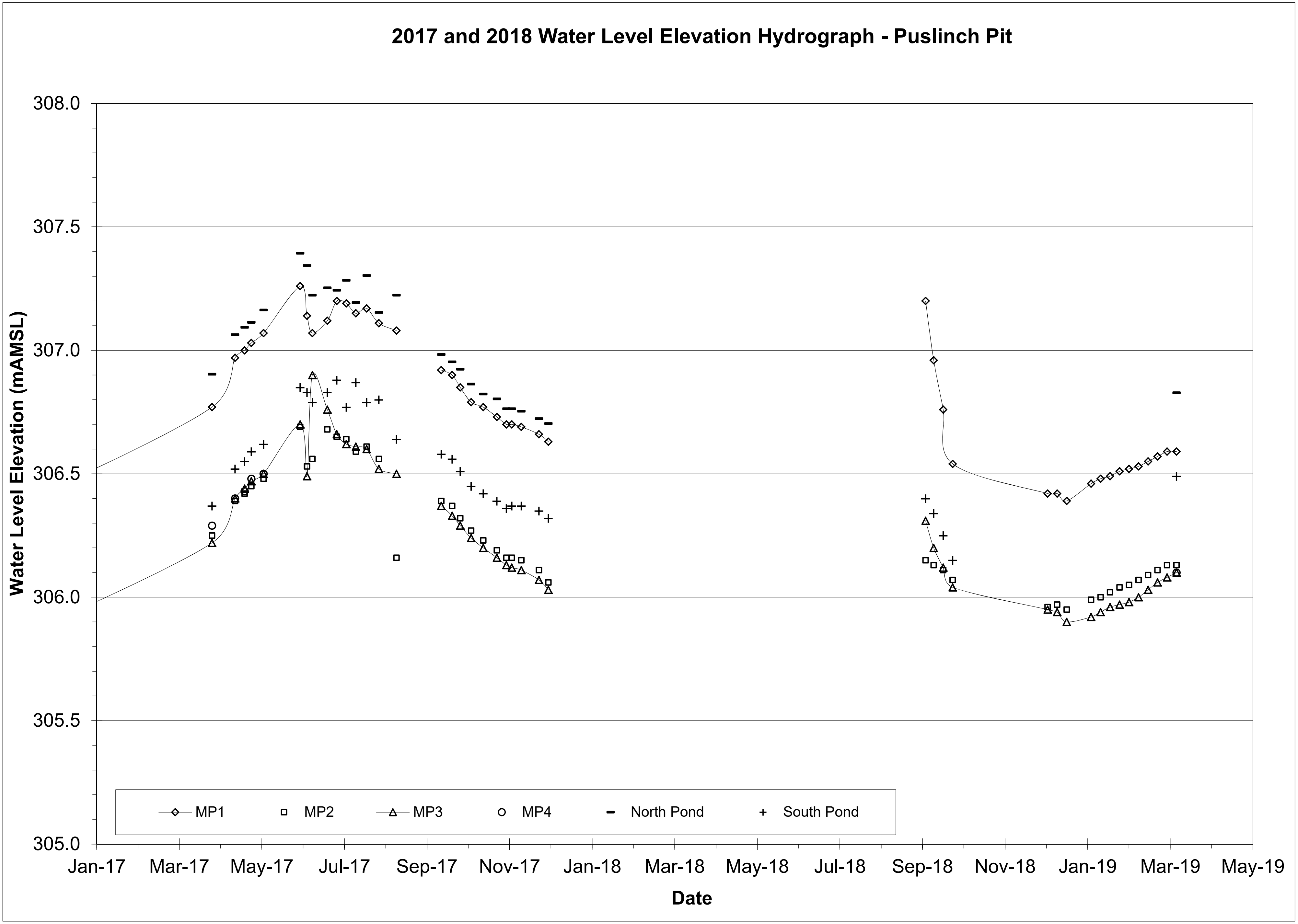
Water Level Data, Hydrographs and Climate Charts

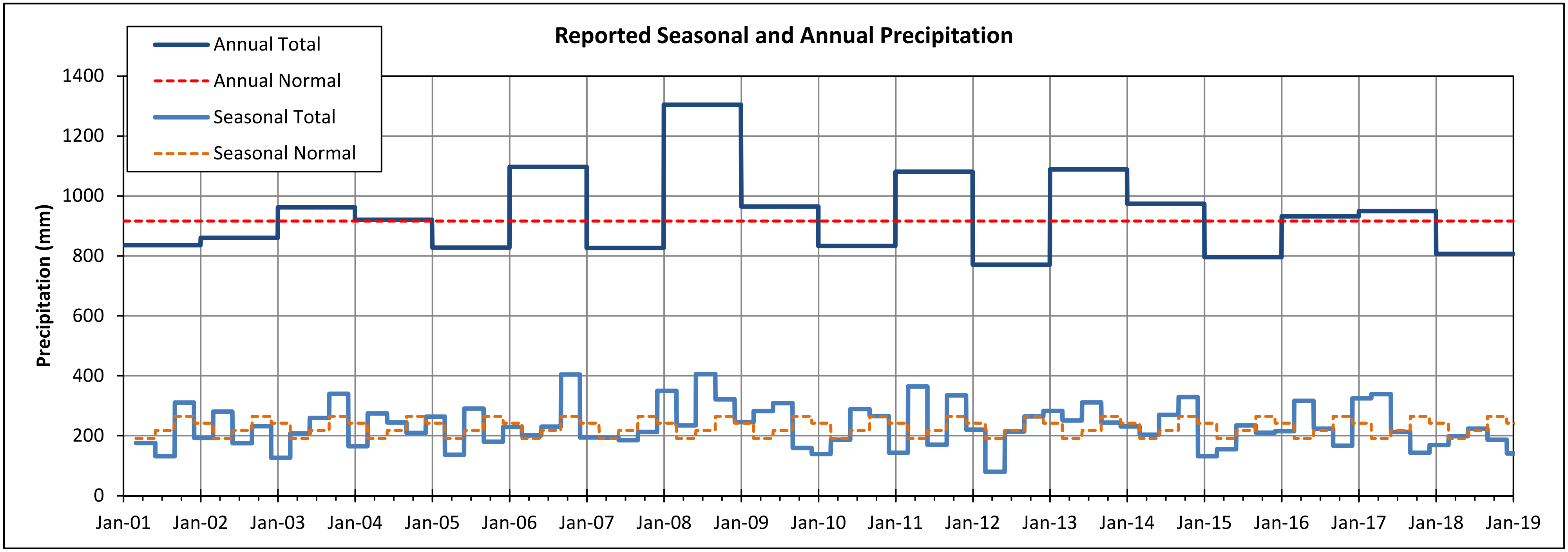
Date	Water Level Elevations (mAMSL*) CBM Puslinch Pit					
	MP1	MP2	MP3	MP4	North Pond	South Pond
Ref. Elevation:	314.77	316.56	317.50	315.35	307.38	306.80
Threshold:	-	-	305.27	305.27	305.64	305.34
27-Mar-17	306.77	306.25	306.22	306.29	306.90	306.37
13-Apr-17	306.97	306.39	306.40	306.40	307.06	306.52
20-Apr-17	307.00	306.42	306.44	306.43	307.09	306.55
25-Apr-17	307.03	306.45	306.47	306.48	307.11	306.59
04-May-17	307.07	306.48	306.50	306.50	307.16	306.62
31-May-17	307.26	306.69	306.70	#N/A	307.39	306.85
05-Jun-17	307.14	306.53	306.49	#N/A	307.34	306.83
09-Jun-17	307.07	306.56	306.90	#N/A	307.22	306.79
20-Jun-17	307.12	306.68	306.76	#N/A	307.25	306.83
27-Jun-17	307.20	306.65	306.66	#N/A	307.24	306.88
04-Jul-17	307.19	306.64	306.62	#N/A	307.28	306.77
11-Jul-17	307.15	306.59	306.61	#N/A	307.19	306.87
19-Jul-17	307.17	306.61	306.60	#N/A	307.30	306.79
28-Jul-17	307.11	306.56	306.52	#N/A	307.15	306.80
10-Aug-17	307.08	306.16	306.50	#N/A	307.22	306.64
12-Sep-17	306.92	306.39	306.37	#N/A	306.98	306.58
20-Sep-17	306.90	306.37	306.33	#N/A	306.95	306.56
26-Sep-17	306.85	306.32	306.29	#N/A	306.92	306.51
04-Oct-17	306.79	306.27	306.24	#N/A	306.86	306.45
13-Oct-17	306.77	306.23	306.20	#N/A	306.82	306.42
23-Oct-17	306.73	306.19	306.16	#N/A	306.80	306.39
30-Oct-17	306.70	306.16	306.13	#N/A	306.76	306.36
03-Nov-17	306.70	306.16	306.12	#N/A	306.76	306.37
10-Nov-17	306.69	306.15	306.11	#N/A	306.75	306.37
23-Nov-17	306.66	306.11	306.07	#N/A	306.72	306.35
30-Nov-17	306.63	306.06	306.03	#N/A	306.70	306.32
04-Sep-18	307.20	306.15	306.31	#N/A	#N/A	306.40
10-Sep-18	306.96	306.13	306.20	#N/A	#N/A	306.34
17-Sep-18	306.76	306.11	306.12	#N/A	#N/A	306.25
24-Sep-18	306.54	306.07	306.04	#N/A	#N/A	306.15
03-Dec-18	306.42	305.96	305.95	#N/A	#N/A	#N/A
10-Dec-18	306.42	305.97	305.94	#N/A	#N/A	#N/A
17-Dec-18	306.39	305.95	305.90	#N/A	#N/A	#N/A
04-Jan-19	306.46	305.99	305.92	#N/A	#N/A	#N/A
11-Jan-19	306.48	306.00	305.94	#N/A	#N/A	#N/A
18-Jan-19	306.49	306.02	305.96	#N/A	#N/A	#N/A
25-Jan-19	306.51	306.04	305.97	#N/A	#N/A	#N/A
01-Feb-19	306.52	306.05	305.98	#N/A	#N/A	#N/A
08-Feb-19	306.53	306.07	306.00	#N/A	#N/A	#N/A
15-Feb-19	306.55	306.09	306.03	#N/A	#N/A	#N/A
22-Feb-19	306.57	306.11	306.06	#N/A	#N/A	#N/A
01-Mar-19	306.59	306.13	306.08	#N/A	#N/A	#N/A
08-Mar-19	306.59	306.13	306.10	306.10	306.83	306.49

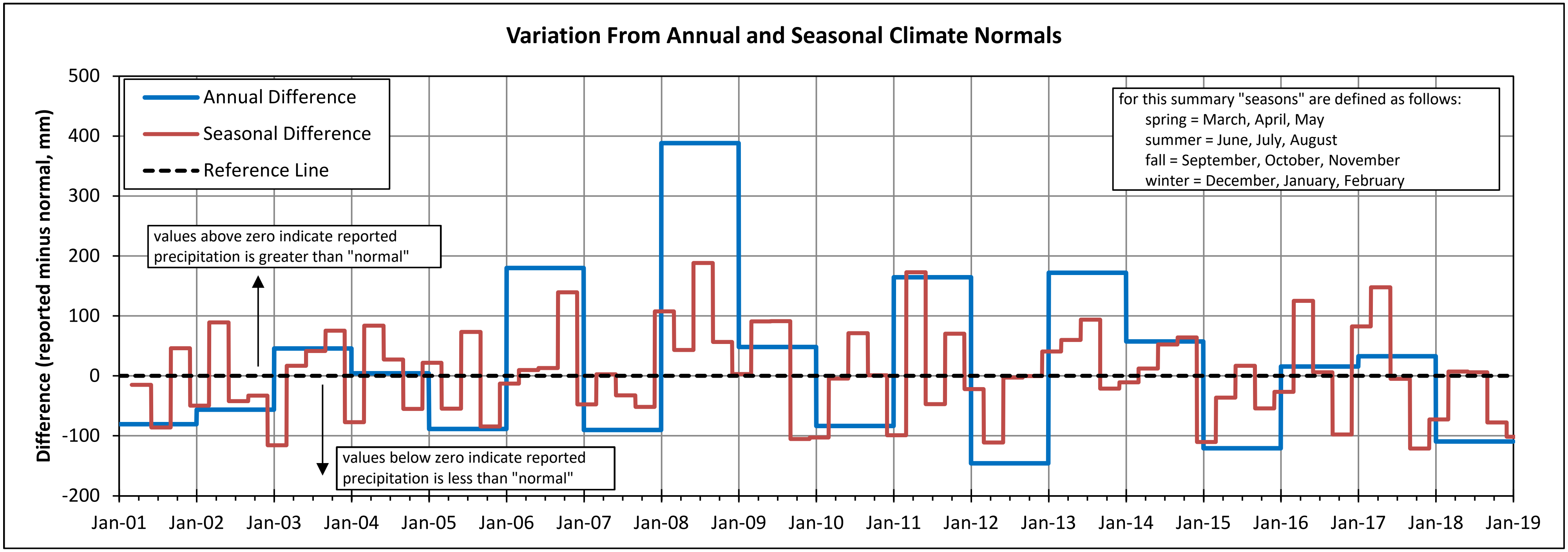
Notes:
* Elevations are geodetic, as per Van Harten Surveying Inc. July 2007
TOC = Top of Casing #N/A = not available
mAMSL = metres above mean sea level


2017 and 2018 Water Level Elevation Comparison Hydrograph
Puslinch Pit and Lanci Pit
Water Level Elevation (mAMSL)
308.0
307.5
307.0
306.5
306.0
305.5
305.0
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Jan-18
Mar-18
May-18
Jul-18
Sep-18
Nov-18
Jan-19
Mar-19
May-19
Date
MP1
MP3
GL8
GL6


Historical Water Level Elevation Hydrograph - Puslinch Pit
Water Level Elevation (mAMSL)
308.0
307.5
307.0
306.5
306.0
305.5
305.0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Date
MP1
MP2
MP3
MP4
North Pond
South Pond


2017 and 2018 Water Level Elevation Hydrograph - Puslinch Pit
Water Level Elevation (mAMSL)
308.0
307.5
307.0
306.5
306.0
305.5
305.0
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Jan-18
Mar-18
May-18
Jul-18
Sep-18
Nov-18
Jan-19
Mar-19
May-19
Date
MP1
MP2
MP3
MP4
North Pond
South Pond


Reported Seasonal and Annual Precipitation
Annual Total
Annual Normal
Seasonal Total
Seasonal Normal
Precipitation (mm)
1400
1200
1000
800
600
400
200
0
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19


Variation From Annual and Seasonal Climate Normals
Annual Difference
Seasonal Difference
Reference Line
for this summary "seasons" are defined as follows:
spring = March, April, May
summer = June, July, August
fall = September, October, November
winter = December, January, February
values above zero indicate reported precipitation is greater than "normal"
values below zero indicate reported precipitation is less than "normal"
Difference (reported minus normal, mm)
500
400
300
200
100
0
-100
-200
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19

HARDEN

Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline Road
R.R. 1, Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modeling
Groundwater Mapping
Permits to Take Water
Environmental Compliance Approvals

Our File: 0214 Puslinch File: E10 CBM

April 10, 2019

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

Attention: Ms. Karen Landry
CAO - Clerk

Dear Ms. Landry;

Re: CBM – Puslinch Pit – 2018 Monitoring Report Comments

We are pleased to present our review of the 2018 Groundwater Monitoring Report for the CBM-Puslinch Pit in Concession II. In 2018 a total of 113,930 tonnes of aggregate were removed from below the water table at the CBM-Puslinch Pit. This represents a significant decrease in production at this site. Aggregate washing operations have been moved off-site.

We have reviewed the water level data for the groundwater monitors and the ponds and find that there are no obvious changes to onsite water levels attributable to extractive activities. Water levels on-site fall within historical range.

We have no concerns with the monitoring data as presented.

Sincerely,

Stan Denhoed

Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist

2018 Annual Monitoring Report

Aberfoyle Pit No. 2
Township of Puslinch

Dufferin Aggregates,
a division of CRH Canada
Group Inc.

March 21, 2019

Reference No. 001644

Mr. Chris Fleming
Dufferin Aggregates
125 Brock Road South
Aberfoyle, Ontario
N1H 6H9

Dear Mr. Fleming:

Re: 2018 Annual Monitoring Report
Dufferin Aggregates Aberfoyle Pit No. 2
Township of Puslinch

Enclosed please find the 2018 Annual Monitoring Report for Dufferin Aggregates, Aberfoyle Pit No. 2, Township of Puslinch. This report was prepared in accordance with the monitoring program outlined in our August 1991 Final Monitoring Report, and subsequent follow-up correspondence/approvals from the Ministry of the Environment, Conservation and Parks, and the Ministry of Natural Resources and Forestry.

If you should have any questions, please do not hesitate to contact us.

Sincerely,

GHD

Greg M. Pucovsky

Greg M. Pucovsky, M.Sc., P. Geo.

GMP/we/3

Encl.

cc:
Seana Richardson, MNRF, Guelph (electronic copy)
Lynnette Armour, MECP, Guelph (electronic copy)
Karen Landry, Township of Puslinch (electronic copy)
Dufferin Aggregates (1 copy and electronic copy)
GHD (electronic copy)

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Figure Index

Table Index

Appendix Index

1. Introduction

GHD was retained by Dufferin Aggregates (a division of CRH Canada Group Inc.) to complete the 2018 groundwater sampling program and Annual Monitoring Report for Aberfoyle Pit No. 2. The Site is located on part of the west half of Lots 22 and 23, Concession 9, Township of Puslinch, in the County of Wellington (Figure 1.1).

The area licenced for extraction is 78.1 hectares (ha) (193 acres), of which an area of 68.0 ha (168 acres) will be extracted above the water table, and 53.4 ha (132 acres) below the water table. Prior to May 2000, Dufferin only extracted aggregate above the water table as per the phasing of operations on the Site plans approved by the Ministry of Natural Resources (MNR), now Ministry of Natural Resources and Forestry (MNRF). Removal of aggregate below the water table was initially conducted between May 1 and December 15, 2000, using a large backhoe, although the majority of mining in 2000 occurred above the water table.

Extraction of aggregate during the period of 2001 to 2003, inclusive, occurred from May to December, with mining occurring both above and below the water table. Mining operations only occurred above the water table during 2004. Extraction of aggregate occurred above and below the water table from May to December 2005, April to October 2006, April to November 2007, and May 1 to October 28, 2008. Extraction of aggregate did not occur between 2009 and 2015 inclusive. Aggregate extraction in 2016 only occurred below the water table from June 13 to July 7, 2016, but occurred below the water table in 2017 from May 22 to July 7, and November 9 to December 21, 2017. Extraction of aggregate occurred below the water table in 2018 from January 1 to March 21, July 23 to October 9, and December 18 to 20, 2018. A Permit to Take Water is not required for the aggregate operation since pumping of groundwater does not occur at the Site.

The initial monitoring program for the Site was originally developed by CRA (now GHD), and provided in our November 1988 report entitled "Assessment of Mining Impact, Aberfoyle Pit No. 2, Puslinch Township, Wellington County", and subsequent August 1991 report entitled "Final Monitoring Report, Dufferin Aggregates Aberfoyle Pit No. 2, Township of Puslinch, County of Wellington". This program was subsequently approved by the Ministry of the Environment (MOE), now Ministry of the Environment, Conservation and Parks (MECP), and was initiated during the summer of 1990. A final monitoring program, as outlined in Section 9.0 of our August 1991 report entitled "Final Monitoring Report, Dufferin Aggregates Aberfoyle Pit No. 2, Township of Puslinch, County of Wellington" was subsequently prepared and approved, and was to be implemented prior to and during mining below the water table. The monitoring program outlined in the August 1991 Final Monitoring Report and subsequent amendments to the program (based on comments by the MOE and MNR) have been implemented by GHD and Dufferin. Appendix A contains the proposed monitoring program from Section 9.0 of the August 1991 Final Monitoring Report, and follow-up correspondence/approvals from MOE and MNR.

The primary purpose of the monitoring program is as follows:

- Collect water level and water quality information during mining of aggregate, to evaluate the effects of extraction on local shallow groundwater levels.
- Provide recommendations regarding the monitoring program as necessary.

The monitoring program in 2018 consisted of the following:

- Monthly hydraulic (water level) monitoring (on-Site monitoring wells and on and off-Site surface water locations) by Dufferin.
- Groundwater quality monitoring at five on-Site monitoring wells by GHD.

The following provides the results of historical and 2018 hydraulic monitoring, water quality, and an interpretation of the results.

2. Geologic/Hydrogeologic Setting

The Site occurs within the Horseshoe Moraines physiographic region as defined by Chapman and Putnam, 1984. The Paris and Galt moraines are the two major features which constitute this region. The Site occurs between these two moraines within a spillway channel, which consists of sand, or sand and gravel deposits. These deposits comprise the surficial unconfined (water table) aquifer beneath the Site, which attains a thickness of about 12 metres (m) in the central portion of the Site. The aquifer decreases in thickness towards the southwest. Available information indicates that groundwater flow within the water table aquifer occurs in a general southwesterly direction. The surficial water table aquifer is underlain by fine-grained material consisting of clayey silt to silty clay.

Overburden at the Site is underlain by dolostone bedrock of the Middle Silurian Guelph Formation. The Site occurs near the contact with dolostone of the underlying Amabel Formation. Bedrock occurs at a depth of about 15 to 30 m (50 to 100 feet) below the original ground surface in the vicinity of the Site, and decreases in elevation in a general southwesterly direction. The bedrock aquifer is primarily utilized as a source of domestic water supply in the area.

3. Hydraulic Monitoring Program

3.1 General

The current hydraulic monitoring program consists of water level measurements in on-Site monitoring wells, and on- and off-Site surface water locations, as presented on Figure 3.1. Well construction details for the monitoring wells are provided in Table 3.1, and stratigraphic and instrumentation logs are presented in Appendix B. Water level data collected since aggregate extraction below the water table began in May 2000 is compared with historical water level trends and precipitation data in order to assess potential impacts. Precipitation data is provided in Section 3.2. The hydraulic monitoring activities and a description of trends are discussed in Section 3.3.

3.2 Precipitation Data

Annual precipitation data was originally obtained from the Ontario Climate Centre, Toronto, Ontario, but more recently from the Environment Canada National Climate Archive website. Precipitation data for the period of 1970 to 1989 was obtained from the Guelph OAC and Arboretum stations. Precipitation data from the Waterloo-Wellington Airport station was used for the period of 1990 to 2009, supplemented by Waterloo-Wellington 2, since the Guelph station was no longer classified as an official station after 1989. Precipitation data from the Kitchener-Waterloo station was used for the period of 2010 to 2018 inclusive. Historical total annual precipitation data for the period of 1970 to 2018 inclusive is presented in Table 3.2 and illustrated on Figure 3.2. This figure and subsequent figures also show historical periods of start and end of extraction of aggregate below the water table.

Available precipitation results indicate that the 30-year average annual precipitation for the period of 1981 to 2010 is 902.8 millimetres (mm). During the period of background water level monitoring between 1990 and 1999, the average annual precipitation was 888.1 mm, which is only slightly lower (1.7 percent) than the 30-year mean. Therefore, the 10-year period of background water level monitoring is representative of long-term average precipitation levels. As illustrated on Figure 3.2, the maximum annual precipitation during the 1990 to 1999 period occurred in 1992 (1,056.9 mm) and the minimum in 1998 (656.5 mm).

Since 2000, when aggregate extraction below the water table was initiated, total annual precipitation has ranged from 632.0 in 2007 to 1,209.3 mm in 2008. The average precipitation over this period (2000 to 2018) was 897.7 mm and thus still slightly above the 10-year average of 888.1 mm, and only slightly below the 30-year average of 902.8 mm. There was a general increasing trend in precipitation between 2002 and 2006, followed by the lowest annual precipitation recorded in the past 40 years in 2007 (632.0 mm). The highest annual precipitation during the past 40 years was subsequently recorded in 2008 (1,209.3 mm). Precipitation subsequently declined in 2009 (944.2 mm) and 2010 (826.7 mm), increased in 2011 (1,043.7 mm), declined significantly in 2012 (753.8 mm), and then increased significantly in 2013 (1,075.4 mm). Total annual precipitation in 2014 and 2015 declined from 928.7 mm to 769.8 mm, but subsequently exhibited an increasing trend to 908.9 mm in 2016 and 923.7 mm during 2017. The total annual precipitation of 762.7 mm in 2018 occurred well below the 10- and 30-year averages of 888.1 and 902.8 mm, respectively.

3.3 Hydraulic Monitoring

3.3.1 Groundwater Monitoring

Historical groundwater elevations for the monitoring wells and private wells are provided in Table 3.3. Water levels have been monitored since May 1990, with monthly levels generally taken since May 1999. The program currently consists of water level measurements at the following locations:

- Monitoring wells OW1A/B-90, OW2-90, OW3R-05, OW4R-05, OW5-90, OW6-90, OW7-05, and PW1-90.
- As per our recommendation in previous annual reports, the Ministry of the Environment and Climate Change (MOECC) agreed as per an October 27, 2014 memorandum, that water levels in private wells Van Horsigh, Behmann, Hohenadel, and Cox (formerly Gauthier) are no longer required to be monitored. As such, these four private wells are no longer monitored as of December 2014.

All monitoring locations are installed in the sand and gravel (water table) aquifer with the exception of the Behmann, Hohenadel, and Cox (formerly Gauthier) private wells. The Hohenadel well is installed in a confined sand and gravel unit. The Behmann well is also believed to be installed in a confined unit based on the measured depth (a well record is not available). The Cox (former

Gauthier) well is installed in the Guelph Formation bedrock aquifer. The Gauthier well was reported as "sealed" during the period of August to November 2002.

Wells OW3R-05 and OW4R-05 were completed in September 2005 as replacement wells for OW3-90 and OW4-90. OW3-90 and OW4-90 were installed in the buffer zone so that they would not have to be removed during aggregate operations. However, with the exception of four monitoring events, well OW3-90 had been dry since installation and monitoring well OW4-90 had been continuously dry. The surficial sands and gravels at these two locations were only about 2 m thick, and underlain by fine-grained material. The new wells were installed further east of the dry wells where the sands and gravels are thicker, thus allowing monitoring of water levels in this material. OW3-90 and OW4-90 were subsequently sealed and abandoned during 2007. In addition, new monitoring well OW7-05 was also installed in September 2005 to allow monitoring of groundwater levels within the eastern part of the Site.

Representative hydrographs for wells located in the upper sand and gravel are plotted against annual precipitation on Figure 3.3. The locations include OW1B-90 and OW7-05 located along the northeastern (upgradient) property boundary of the Site, OW2-90 and OW4R-05 located near the southwestern (downgradient) property boundary, and the Van Horsigh well to December 2014 located further cross-gradient of the Site. Water levels in the remaining private wells are plotted as of the last monitoring event in December 2014 on Figure 3.4.

Review of Figure 3.3 indicates that water levels in the upper sand and gravel wells typically exhibit a similar trend each year. In general, groundwater levels increase each year during the spring, with surplus precipitation relative to potential evaporation. Levels typically decrease toward the latter part of the year which is attributed to a water deficit, and often increase near the end of the year in response to increased precipitation during the fall. However, water levels in the above-noted wells did not exhibit an increasing trend during fall 2015 to 2018 inclusive, due to reduced precipitation during the latter half of the year, in contrast to the trend during the previous several years.

Prior to extraction of aggregate below the water table, water levels generally increased during the period of early 1995 to early 1997, with a subsequent overall decline in levels until about October 1999. The overall trend in water levels generally follows the trend in total annual precipitation with some degree of lag time. For example, the decline in water levels between 1997 and 1999 can be attributed to the decline in precipitation from well above average in 1996 (1,043.0 mm) to more average in 1997 (861.8 mm), and then to well below average in 1998 (656.5 mm).

During the 2000 to 2008 period (i.e., during extraction of aggregate below the water table), water level elevations upgradient of the extraction area (i.e., OW1B-90 and OW7-05) appear to have remained relatively stable, possibly moderated by the water levels in the adjacent active pond area. Water levels between 2009 and 2012 inclusive (no extraction period) generally exhibit an overall declining trend in response to declining annual precipitation between 2008 (1,209.3 mm) and 2010 (826.7 mm), and during 2012 (753.8 mm). Levels subsequently increased to mid-2014 in response to significantly higher precipitation in 2013 (1,075.4 mm). Water levels exhibited an overall decreasing trend from mid-2014 to 2016 in response to lower precipitation in 2014 (928.7 mm), significantly less in 2015 (769.8 mm). A slight increasing trend occurred from mid-2016 until the end of 2017 due to increased precipitation in 2016 (908.9 mm) and 2017 (923.7 mm). Significantly lower precipitation in 2018 (762.7 mm) resulted in lower minimum and maximum water levels in comparison to the two previous years.

Water level elevations at locations downgradient of the extraction area (i.e., OW2-90, OW3R-05 and OW4R-05) generally reflect trends in total annual precipitation. During the 2000 to 2008 period (i.e., during extraction of aggregate below the water table), water level elevations were relatively stable during the earlier part of this period, with fluctuations being similar to those in the upgradient wells. There was an overall increasing trend between 2004 and early 2007 due to increased precipitation. A somewhat greater degree of fluctuation in water levels at these locations is also observed during 2007, likely in response to the significant difference in annual precipitation between 2006 and 2007, and to a much lesser extent since water levels at these locations are not moderated by water levels in the active pond area.

Water levels between 2009 and 2012 inclusive (no extraction period) at the three downgradient locations OW2-90, OW3R-05 and to a lesser extent OW4R-05, generally exhibit an overall declining trend in response to declining annual precipitation between 2008 (1,209.3 mm) and 2010 (826.7 mm), and during 2012 (753.8 mm). The water levels in OW3R-05 and OW4R-05 during late summer 2011 were the lowest historically, and for OW2-90 the lowest since fall 2007, and thus approached historical lows. Water levels at these locations subsequently increased in response to significantly higher precipitation in 2013 (1,075.4 mm). Water levels subsequently exhibit an overall decreasing trend in 2014 and 2015 in response to lower precipitation in 2014 (928.7 mm) and 2015 (769.8 mm), and appear to have stabilized due to more stable levels of precipitation in 2016 (908.9 mm) and 2017 (923.7 mm). Extraction of aggregate had not occurred at the Site between October 2008 and early June 2016, therefore any changes in water levels can be attributed to climate or other influences. Following initiation of extraction in 2016, water levels at these locations during 2017 and 2018 do not exhibit a decreasing trend but rather a relatively stable trend. No significant deviations in seasonal or overall long-term water level trends are evident since aggregate extraction below the water table was initiated in May 2000. This is corroborated by an overall increasing trend in water levels at OW2-90, OW3R-05 and OW4R-05 during the initial extraction period.

Water levels in the Van Horsigh private well are less variable than those in the monitoring wells, however, they show the same seasonal trends and generally the same longer term trends during the extraction period as the downgradient monitoring wells. An overall trend of increasing water levels is apparent in the Van Horsigh well from 1999 to 2014.

Figure 3.4 indicates that historical water levels in the lower (confined) sand and gravel wells (Behmann and Hohenadel) and the bedrock well Cox (formerly Gauthier) typically exhibit trends similar to those in the on-Site monitoring wells. Some of the apparent differences, particularly in the Behmann and Hohenadel wells are due to the wells being in use and the absence of data during certain time periods. Water levels between 2009 and 2012 inclusive (no extraction period) generally exhibit an overall declining trend in response to declining annual precipitation between 2008 (1,209.3 mm) and 2010 (826.7 mm), and during 2012 (753.8 mm). However, water levels at these three locations generally increased in response to significantly higher precipitation in 2013 (1,075.4 mm) and 2014 (928.7 mm).

It should be noted that aggregate was also historically extracted above and below the water table at the Tikal pit owned by CBM, located immediately northwest and adjacent to the Dufferin Aggregates

Aberfoyle Pit No. 2 property. A pond is now located at the Tikal pit near the northwestern boundary of the Dufferin site. Review of available water level elevations for the closest Tikal monitoring well to OW1B-90, indicated a similar water level trend. In addition, for the most recent available Tikal data for the period from 2009 to 2011 inclusive (no extraction at Aberfoyle Pit No. 2), maximum and minimum water level elevations for these two locations are similar. It is our understanding that aggregate has not been extracted from the closed Tikal pit since 2014.

Based on the similarity of water level trends at the off-Site private domestic wells and the closest Tikal monitoring wells, trends in on-Site monitoring wells located near the Behmann and Hohenadel private wells, and since CBM was historically extracting aggregate closer to the Van Horsigh and Cox (formerly Gauthier) properties, it was recommended that monitoring of private domestic wells Van Horsigh, Behmann, Hohenadel, and Cox be discontinued. As previously noted for these wells, only the Van Horsigh well is believed to be completed in the water table aquifer. The MOECC subsequently agreed that monitoring of these four locations was no longer required as per the October 27, 2014 memorandum (Appendix A) which provided comments regarding the groundwater monitoring program. The private well owners were subsequently notified on December 18, 2014 that monitoring would no longer be conducted following the December 2014 monitoring event. Contact information was also provided to the private well owners in the event there were any further questions. It is our understanding that there was no follow-up by the private well owners related to cessation of monitoring of their wells.

3.3.2 Surface Water Monitoring

Historical surface water elevation data are provided in Table 3.4. Water levels have been monitored since June 1990, with monthly levels generally taken since May 1999. The 2018 surface water monitoring program and historical locations no longer monitored are outlined below:

- The surface water monitoring program in 2018 consisted of monthly water level measurements at Pond 1, Pond 2, SW2-91, WP1-93, and SW6-03. Pond 1 receives water from an adjacent well. SW6-03 was installed in 2003 to allow measurement of water levels within the on-Site Dufferin pond excavation.
- Historical surface water monitoring locations have included SW1-90, SW2-91, SW3-91, SW4-91, and WP1-93. These locations are utilized for monitoring of water levels within an area of non-permanent standing water, are not located within a defined water course, and were required to be monitored. However, the property owner denied access for monitoring beginning in June 2008, but subsequently provided access and monitoring was resumed in February 2012.
- It was previously requested in the 2016 Annual Monitoring Report and covering letter to the MOECC and MNRF, that surface water locations SW1-90, SW3-91, and SW4-91 be deleted from the monitoring program, since these locations are typically either dry or frozen, and thus do not provide useful information. Locations WP1-93, Pond 2, and less frequently SW2-91 are located in the area and are monitored to provide representative surface water levels. The MNRF agreed with this modification to the program as per an April 12, 2017 e-mail (copied to Lynnette Armour, MOECC).
- WP1-93 was determined to be blocked, but the blockage was subsequently able to be removed and water level monitoring was resumed at this location in September 2015.

- Historical location SW5-01, located at the headwaters of Aberfoyle Creek, was an additional location recommended by the MOE in January 1992. Permission to monitor was obtained in 2001 and monitoring was conducted between November 2001 and February 2006, after which the property owner denied access for monitoring. CRA (now GHD) recommended in the 2013 Annual Monitoring Report that SW5-01 be formally deleted from the monitoring program, and the MOE agreed as per the December 30, 2013 memorandum (Appendix A) which provided comments regarding the surface water monitoring program.

Hydrographs for the surface water locations are provided on Figures 3.5, 3.6, and 3.7. Three separate hydrographs are provided for clarity which either group off-site locations in similar proximity, or on and off-site surface water locations that typically are not dry for a significant portion of each year.

Hydrographs for the surface water monitoring locations which are cross-gradient of the Site are presented on Figures 3.5 and 3.6. Review of these figures to May 2008 for all locations except Pond 2 (Figure 3.6), indicates that the locations generally exhibit similar water level trends. It should be noted that the initial period of extraction below the water table occurred between 2000 and 2008. Monitoring could not be conducted between June 2008 and January 2012 at these locations as previously noted, but lower trending levels would be expected as lower total annual precipitation was recorded during 2 of the 3 years up to and including 2012. Surface water levels during the latter part of 2012 occurred within the lower end of the historical range of levels. Limited data is available for SW2-91 from 2012 to 2016, and for SW3-91, and SW4-91 during the period of 2012 to 2018 inclusive, often due to either frozen or dry conditions. A higher maximum level was measured in 2013 and 2014 in response to significantly more precipitation in 2013 (1,075.4 mm) and 2014 (928.7 mm) in comparison to 2012 (753.8 mm). Maximum water levels at SW2-91 and WP1-93 were lower from 2016 to 2018 inclusive, in response to lower, well below average precipitation in 2015 and 2018, and near average precipitation during 2016 and 2017. On an annual basis, maximum water elevations typically occur in the spring and minimum elevations in the fall or winter. The longer term water level trends correspond well with trends in annual precipitation.

Water levels in Pond 2 (Figure 3.6) also typically decline between spring and fall each year and subsequently recover. The range of water levels in Pond 2 is generally similar to those measured prior to below water table extraction with the exception of a large range in 2005 (extraction below the water table), and 2014 (no extraction below the water table). Surface water levels between 2009 and 2012 inclusive (no extraction period) generally exhibit an overall declining trend in response to declining annual precipitation between 2008 (1,209.3 mm) and 2010 (826.7 mm), and during 2012 (753.8 mm). However, surface water levels at Pond 2 increased in 2013 in response to increased precipitation during 2013 (1,075.4 mm), and minimum and maximum levels at this location during 2013 were higher in comparison to the period of 2010 to 2012. The range of water levels was greater in 2014 in comparison to the period between 2009 and 2013 inclusive, most likely in part to the high amount of precipitation in 2013 (1,075.4 mm) which resulted in the highest maximum surface water level at the end of 2013 since 2005. Water levels in Pond 2 subsequently declined in 2014 and 2015 with the lowest maximum and minimum levels measured in 2015 in comparison to the past several years. Pond 2 levels increased in 2016 and earlier 2017 in response to more average amounts of precipitation, and declined in 2018 in response to lower and well below average precipitation (762.7 mm). The 2018 average precipitation was the lowest recorded in the past 6 years.

As noted, access to WP1-93, SW2-91, SW3-91, and SW4-91 was not permitted by the property owner between June 2008 and January 2012. This is not considered to be limiting, as Pond 2 water levels are representative of water levels in this area. As previously indicated, access for monitoring was subsequently provided and monitoring was resumed. Water levels at SW3-91 and SW4-91 typically could not be measured due to either dry or frozen conditions. The inability to monitor surface water levels at these locations has historically occurred.

The water levels at off-Site location SW5-01, at the headwaters of Aberfoyle Creek, are presented on Figure 3.7. Water levels measured between November 2001 and February 2006 generally increased over time. No evidence of deviation from seasonal or overall long-term surface water level trends has been observed since extraction below the water table began in May 2000**.** As previously noted, access to SW5-01 was no longer permitted by the property owner after February 2006, and this location was subsequently removed from the monitoring program.

4. Water Quality Monitoring Results

4.1 Background

The potential water quality influence of aggregate extraction below the water table is evaluated by comparing background water quality in the on-Site monitoring wells and historically prior to 2015 in the off-Site private domestic wells, with water quality in these wells during aggregate operations. The groundwater quality is also compared to available MOE Ontario Drinking Water Standards, Objectives and Guidelines, revised June 2006. Section 4.2 presents the sampling program, and a summary of the results is provided in Section 4.3. Copies of all laboratory analyses for 2018 are provided in Appendix C.

4.2 Sampling Program

Prior to initial extraction of aggregate below the water table in May 2000, groundwater sampling was conducted to determine background water quality. In general, three sampling events were conducted for the monitoring wells (OW1A/B-90, OW2-90) and two or three events were conducted for the private domestic wells (Behmann, Hohenadel, Van Horsigh) between 1990 and 1999. Samples were subsequently collected twice per year during 2000 and 2001, and on an annual basis during the fall commencing in 2002.

Sampling during 2018 was conducted on September 21, 2018. Groundwater samples were collected from on-Site monitoring wells OW1A-90, OW1B-90, OW2-90, OW3R-05, and OW4R-05. All water samples were analyzed for general chemistry and metal parameters. A duplicate general chemistry/metals sample was collected from OW4R-05 for Quality Assurance/Quality Control. Total petroleum hydrocarbon (TPH) analysis was also performed on samples from OW1B-90, OW2-90, and OW3R-05.

It was previously recommended that the Behmann, Hohenadel, and Van Horsigh private domestic wells be deleted from the monitoring program. The MOECC subsequently agreed as per an October 27, 2014 memorandum, and thus the private domestic wells were no longer monitored following the 2014 monitoring event. The historical and 2018 water quality results for the monitoring wells, and historical to 2014 water quality results for the private domestic wells are presented in Tables 3.5 and 3.6, respectively.

Samples collected from the monitoring wells for analysis of metals parameters were filtered and preserved by the laboratory. Samples collected for general chemistry and TPH analysis were not filtered. All samples were stored in containers issued by the receiving laboratory, and placed in an ice-filled cooler for sample preservation. The samples were analyzed by ALS Laboratory Group, Waterloo, Ontario.

4.3 Water Quality Assessment

The following provides a summary of the water quality results for the on-Site monitoring wells. Historical and 2018 water quality data for the monitoring wells is provided in Table 3.5, and historical results to 2014 for the private domestic wells are outlined in Table 3.6.

Upgradient Groundwater Quality

Monitoring Wells OW1A/B-90 (Historical and 2018)

Nested monitoring wells OW1A-90 (deeper water table) and OW1B-90 (shallower water table) are located in the northern part of the Site, and adjacent to the initial area of extraction below the water table. The water quality for these wells is considered to represent background conditions, based on groundwater flow in a general southwesterly direction beneath the Site.

Concentrations of conductivity, chloride, sodium, iron and calcium are typically higher at OW1B-90 than at OW1A-90 both historically and during 2018. In September 2018, parameter concentrations for well OW1B-90 met ODWSs with the exception of iron (0.841 milligrams per litre [mg/L]) which is considered to be naturally occurring. Iron concentrations prior to extraction below the water table ranged from 0.24 to 2.51 mg/L. As such, the iron level in 2018 occurred within the range of background levels. With the exception of chloride and sodium, all other parameter concentrations are also within the range of background concentrations.

Levels of chloride and sodium at OW1B-90 exhibited a general increasing trend until about 2008 (51 mg/L). The chloride level subsequently declined and stabilized between 36.4 and 41.1 mg/L from 2010 to 2014 inclusive, and increased in 2014. Chloride levels from 2015 to 2018 inclusive increased from 43.7 to 60.9 mg/L, with the latter occurring during 2018. The chloride concentration between 1990 and 1999 (prior to extraction below the water table) ranged from 14 to 19 mg/L. Levels of sodium increased until about 2008 (20.0 mg/L) and subsequently declined and stabilized between 17.8 and 21.0 mg/L from 2010 to 2013 inclusive. The sodium level increased to 27.0 mg/L in 2014, but exhibited a decreasing trend to a level of 21.9 mg/L in 2016. Sodium was higher at 30.1 mg/L in 2017 and 25.7 mg/L in 2018. The sodium concentration between 1990 and 1999 (prior to extraction below the water table) ranged from 3.4 to 8.4 mg/L. It should be noted that use of calcium chloride for dust control was discontinued at the Site as of spring 2008, and thus prior to the period of no extraction below the water table between 2009 and 2015 inclusive.

The phosphorus levels at OW1B-90 between 2016 and 2018 inclusive were the lowest measured levels since 2002, with the exception of only a slightly lower level in January 2010. The phosphorus level at OW1B-90 exhibited a decreasing trend from 0.068 mg/L in 2012 to a stabilized range of levels of 0.0312 to 0.039 for the period of 2015 to 2018 inclusive.

All historical levels of TPH (gas/diesel) at OW1B-90 were non-detect with the exception of a detection in 2012. Historical levels of TPH (heavy oils) were non-detect with the exception of trace levels in 2006, 2011, and 2015. However, levels of TPH (gas/diesel) and TPH (heavy oils) at OW1B-90 were non-detect in September 2018, and thus non-detect for the past 3 years.

The background chloride concentration at OW1A-90 ranged from 2.7 to 9 mg/L between 1990 and 1999. Between 2002 and 2008, chloride levels increased from 2.2 to 20 mg/L and were a maximum in 2008. The chloride level subsequently declined to 9.7 mg/L in early 2010, and subsequently exhibited an increasing trend with a level of 21.2 mg/L in 2018. With the exception of iron (1.00 mg/L) which is considered to be naturally occurring, concentrations of all other parameters at deeper well OW1A-90 met their respective ODWSs. In addition, with the exception of chloride, sodium and iron, concentrations of all other parameters at OW1A-90, occurred within the historical range of concentrations.

Elevated total phosphorus concentrations have been measured in OW1A-90 since December 2003, which are significantly higher than the concentrations measured in shallower well OW1B-90. However, in September 2018, the total phosphorus concentration in OW1A-90 was 0.0397 mg/L, the lowest measured level since 2002. The phosphorus level exhibited a significant declining trend between 2016 and 2018 inclusive.

Phosphorus concentrations during 2018 at OW1A-90 and OW1B-90 occurred within both the background and historical range of levels. As such, there is not an overall increasing trend in concentrations at these two locations. It should be noted that there is no ODWS for phosphorus in groundwater.

TPH (gas/diesel) and TPH (heavy oils) are not analyzed at OW1A-90.

Downgradient Groundwater Quality

Monitoring Wells OW2-90, OW3R-05 and OW4R-05 (Historical and 2018)

Monitoring wells OW2-90, OW3R-05 and OW4R-05 are located in the water table aquifer and close to the southwestern (downgradient) property boundary.

Concentrations of all parameters at OW2-90 met their respective ODWSs during the September 2018 monitoring event. Parameter concentrations were also usually less than or within the range of background concentrations. There are no overall historical increasing trends in concentrations of parameters with the exception of chloride and sodium. Chloride levels have steadily declined since 2007, and were less than 5 mg/L between 2010 and 2013. The chloride level has exhibited an increasing trend from less than 2.0 mg/L in 2011 to a level of 16.4 mg/L in 2018. However, the 2018 chloride level at OW2-90 occurred within the background and historical range of concentrations. The increasing trend of chloride corresponded with an increase in sodium from 1.78 mg/L in 2011 to 5.61 mg/L in 2018. An increasing trend in chloride and sodium is in contrast to a general decreasing trend in conductivity between 2012 and 2015 inclusive, but a somewhat apparent increasing trend thereafter. Concentrations of TPH (gas/diesel) and TPH (heavy oils) were non-detect historically and also non-detect in 2018.

OW3R-05 and OW4R-05 were initially sampled in 2005 (i.e. no data is available prior to extraction below the water table).The concentrations of all parameters at these two locations met their respective ODWSs during the September 2018 monitoring event. All parameter concentrations with only two exceptions were also within or below the range of historical (2005 to 2017) concentrations. In general, an overall trend of increasing levels is not apparent at OW3R-05 and OW4R-05. The maximum chloride levels at both locations occurred in 2008, and subsequently decreased and stabilized between January 2010 and September 2016. The chloride level at OW3R-05 stabilized between 13.7 and 15.2 mg/L, and at OW4R-05 between 12.1 and 14.7 mg/L between January 2010 and September 2016. A slight increase in chloride and also conductivity occurred at OW3R-05 and OW4R-05 between 2016 and 2018 inclusive. Chloride levels were only slightly higher at both locations during 2018 in comparison to 2017. The concentrations of TPH (gas/diesel) and TPH (heavy oils) were non-detect at OW3R-05 in September 2018, and thus non-detect for the past 2 years. TPH (gas/diesel) and TPH (heavy oils) are not analyzed at OW4R-05.

Private Domestic Wells (Final 2014)

The Behmann and Hohenadel wells are deep overburden wells located downgradient of the Site. The Hohenadel well is installed in a confined sand and gravel unit underlying the till. The Behmann well is also believed to be installed in a confined unit based on the measured depth (a water well record is not available).

With the exception of iron (0.478 mg/L), parameter concentrations in the Behmann well met their respective ODWSs during the September 2014 monitoring event. However, the measured level of iron in 2014 occurs within the range of background concentrations (0.53 to 0.87 mg/L), and was lower in comparison to 2013. All other parameter concentrations were also within or lower than the range of background concentrations, with the exception of sulphate (45.8 to 51 mg/L background; 57.5 mg/L in 2014), and magnesium (31.6 to 32.1 mg/L background; 38.3 mg/L in 2014). Levels of the above two parameters were only slightly above the background range. The sulphate level has been stable between 50 and 58 mg/L since 2001. The chloride level in the Behmann well has only varied from 11.2 to 15.4 mg/L between 2000 and 2014, and thus has been stable. All measured chloride levels occurred within or below the background range of 12.2 to 16 mg/L. There is no overall increasing trend in parameter concentrations.

Parameter concentrations in the Hohenadel well met their respective ODWSs during the September 2014 monitoring event. Parameter concentrations were also less than or within the range of background concentrations, with the exception of chloride (1.54 to 5 mg/L background; 14.2 mg/L in 2014). The chloride level has stabilized between about 12 and 16 mg/L since 2005, including during the period of no extraction between 2009 and 2014. There appears to be a gradual increase in the concentrations until 2008, but a decrease and general stabilization thereafter. There is no overall increasing trend in parameter concentrations.

The Van Horsigh well is a shallow overburden well, likely installed in the surficial sand and gravel, and is located about 0.6 kilometre west and cross-gradient of Aberfoyle Pit No. 2. Concentrations of all measured parameters at this location met their respective ODWSs during the September 2014 monitoring event, however, chloride, sodium, and nitrate concentrations are notably elevated relative to other monitoring locations. Chloride, nitrate, and sodium levels occurred within or below background and historical ranges during September 2014. Based on the flow direction and location of the well near County Road 34, it is most likely that groundwater quality in this area has been and continues to be impacted by road salting activities. As such, mining of aggregate at the Site has not impacted groundwater quality in the shallow Van Horsigh overburden well.

Of the three private wells monitored for water quality, only the Van Horsigh well is a shallow overburden well, likely installed in the surficial sand and gravel. The water quality trends in the wells installed within deeper underlying units, and distant Van Horsigh well are not indicative of influences due to extraction of aggregate from the surficial unit.

Summary of Groundwater Quality

Water quality monitoring was conducted at monitoring wells OW1A/B-90, OW2-90, OW3R-05, and OW4R-05 during September 2018. Parameter concentrations generally met ODWSs, and occur within the background (pre-extraction below the water table) and historical range of concentrations. Exceptions include:

- Elevated chloride and sodium at shallow, upgradient well OW1B-90. The chloride and sodium concentrations are elevated relative to background concentrations, but occur well below respective ODWSs. These concentrations are believed to be related to the application of road salt upgradient of the Site. The iron concentration exceeds the ODWS, but occurs within the range of background and historical concentrations. Levels of iron have decreased since 2012, and have generally stabilized over the past three years during re-initiation of extraction below the water table in 2016. As such, the measured iron level is believed to be naturally occurring.
- Elevated iron concentration at deeper upgradient well OW1A-90. The iron level exceeds the ODWS but occurred within the historical range of levels.
- All measured levels of parameters at downgradient monitoring wells OW2-90, OW3R-05 and OW4R-05 occurred within respective ODWSs, and generally occurred within the historical range of levels.
- Levels of TPH (gas/diesel) and TPH (heavy oils) at OW1B-90, OW2-90, and OW3R-05 were all non-detect during the September 2018 sampling event.

Based on the available data, the water quality at the monitored locations does not appear to be impacted by aggregate extraction at the Site.

5. Conclusions

Based on the results of the 2018 annual monitoring program, the following conclusions are provided:

- The period of background water level measurements (1990 to 1999) reflects long-term average precipitation levels. The total annual precipitation in 2018 (762.7 mm) was well below the average of 888.1 mm for the 10-year background period from 1990 to 1999, the 30-year average of 902.8 mm (1981 to 2010), and also the average precipitation from 2000 to 2017 (905.2 mm).
- Water levels in the on-Site monitoring wells and surface water locations are influenced by seasonal fluctuations in precipitation. In general, water level trends correspond well with trends in total annual precipitation. Groundwater levels have not been adversely affected by extraction of aggregate below the water table from 2000 to 2008, and again commencing in June 2016.
- The groundwater quality results indicate that the measured parameter concentrations generally occur within the historical range of concentrations and met available ODWSs. Levels of TPH (gas/diesel) and TPH (heavy oils) were non-detect at the three monitored locations during the

September 2018 sampling event. Water quality in the area has not been impacted since initiation of aggregate extraction below the water table in 2000.

6. Recommendations

Based on the results of the 2018 annual monitoring program, the following recommendations are provided:

- Surface water locations SW1-90, SW3-91, and SW4-91 be deleted from the monitoring program since these locations are typically either dry or frozen, and thus do not provide useful information. Locations WP1-93, Pond 2, and less frequently SW2-91 are located in the area and are monitored to provide representative surface water levels. It should be noted that the MNRF agreed with this modification to the program, which was previously outlined in our 2016 and 2017 Annual Monitoring Reports, as per an April 12, 2017 e-mail (copied to Lynnette Armour, MOECC). Concurrence from the MECP for deletion of these surface water locations is also requested.
- Distant off-site Pond 1 be deleted from the monitoring program, since monitoring of this location is not representative of existing conditions due to periodic filling of the pond with groundwater from an adjacent well (i.e. no control by Dufferin), and the large Tikal Pond which occurs between Pond 1 and the Dufferin Site.
- Groundwater monitoring locations OW5-90, OW6-90, and PW1-90 be deleted from the monitoring program. These water table aquifer wells are centrally located in close proximity to the active area of mining, and thus will no longer be able to be monitored. Deletion of these locations would not compromise the monitoring program for the site, as there are perimeter monitoring locations which provide more useful information.
- With the exception of the above-noted surface water locations, the 2018 hydraulic and water quality monitoring program be continued during 2019.

All of Which is Respectfully Submitted,

GHD

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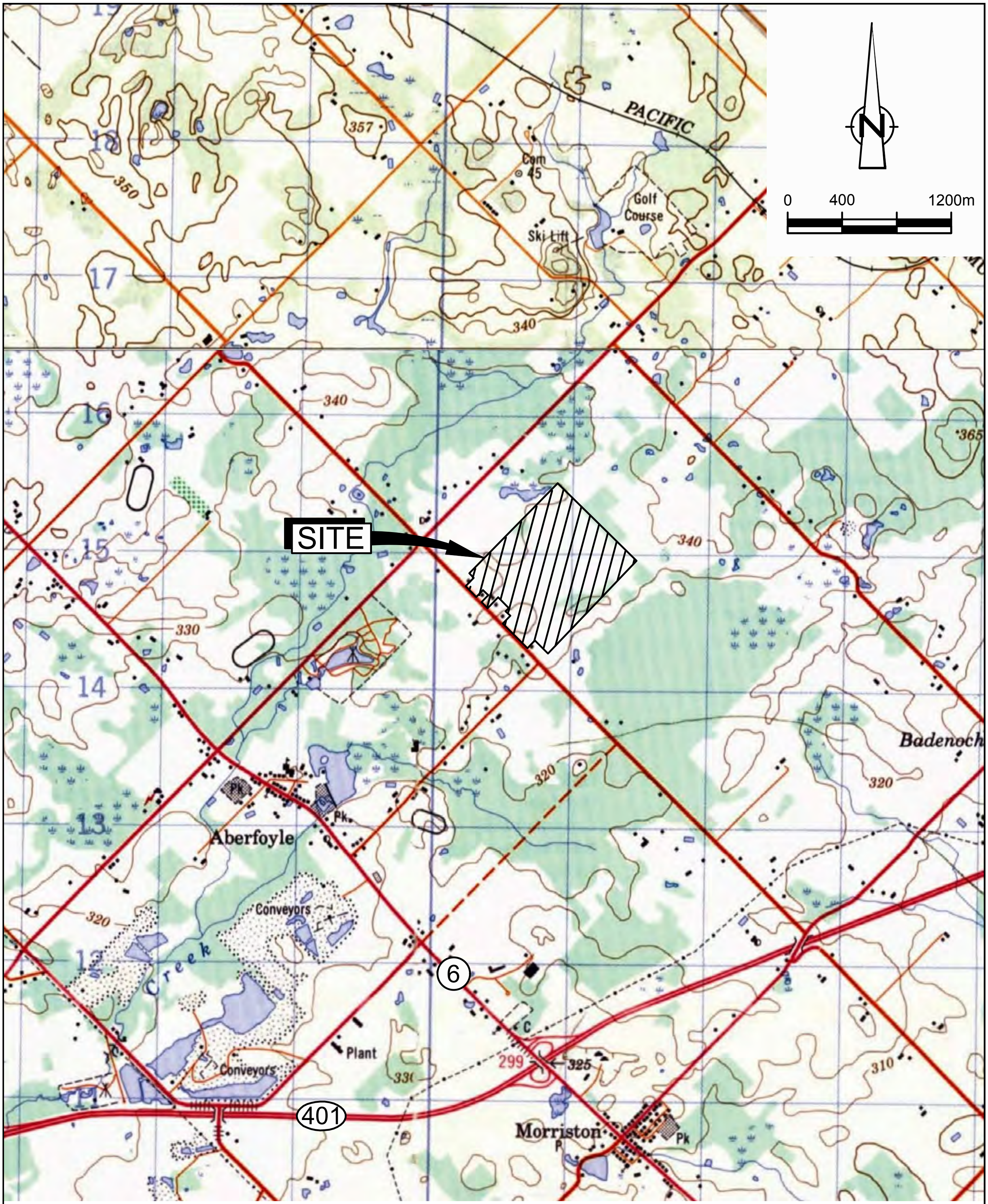


SOURCE: 40 P/8 CAMBRIDGE AND 40 P/8 GUELPH

figure 1.1

SITE LOCATION
ABERFOYLE PIT No. 2
Dufferin Aggregates

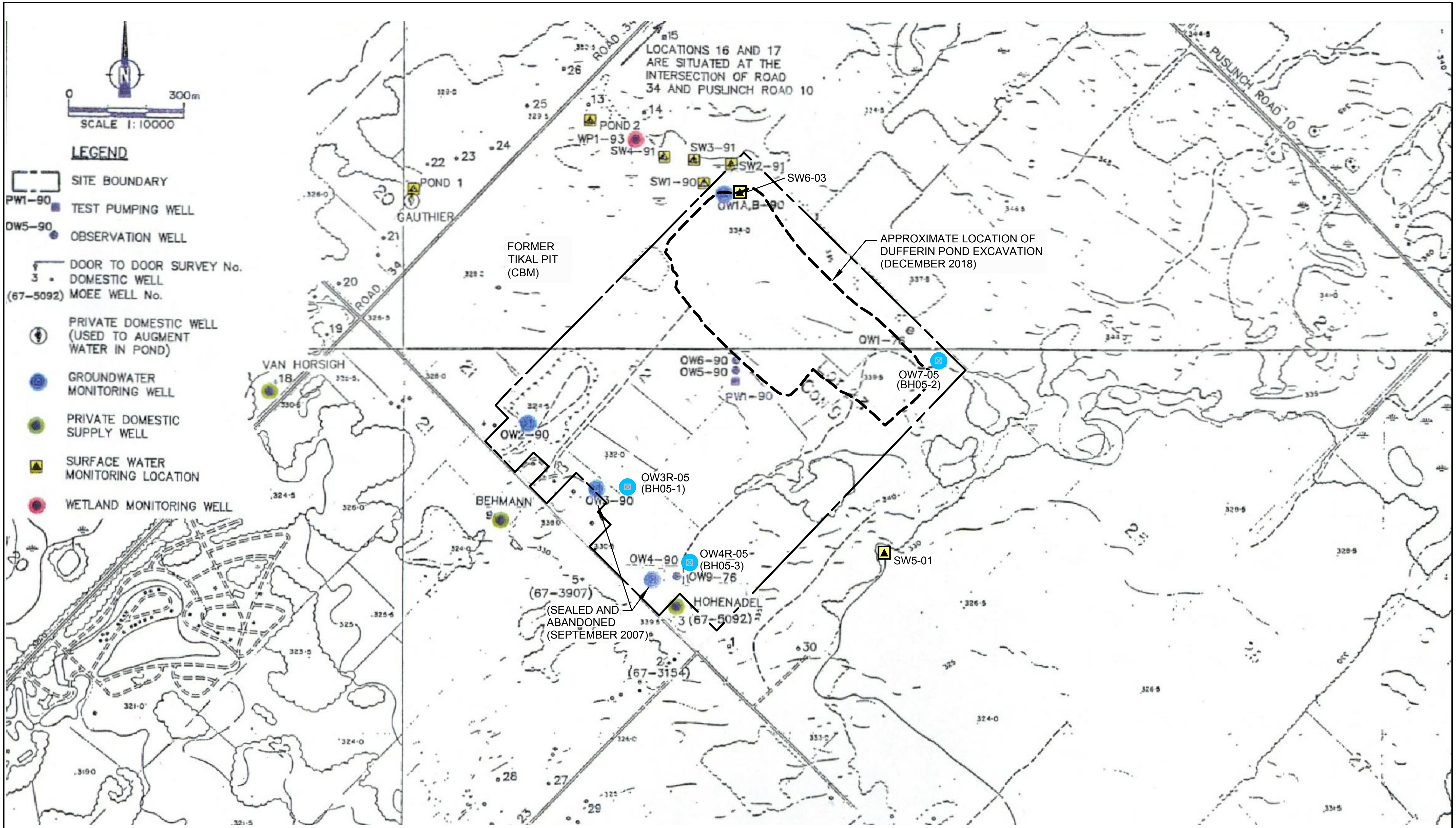


figure 3.1

SURFACE WATER AND GROUNDWATER MONITORING LOCATIONS ABERFOYLE PIT No. 2

Dufferin Aggregates

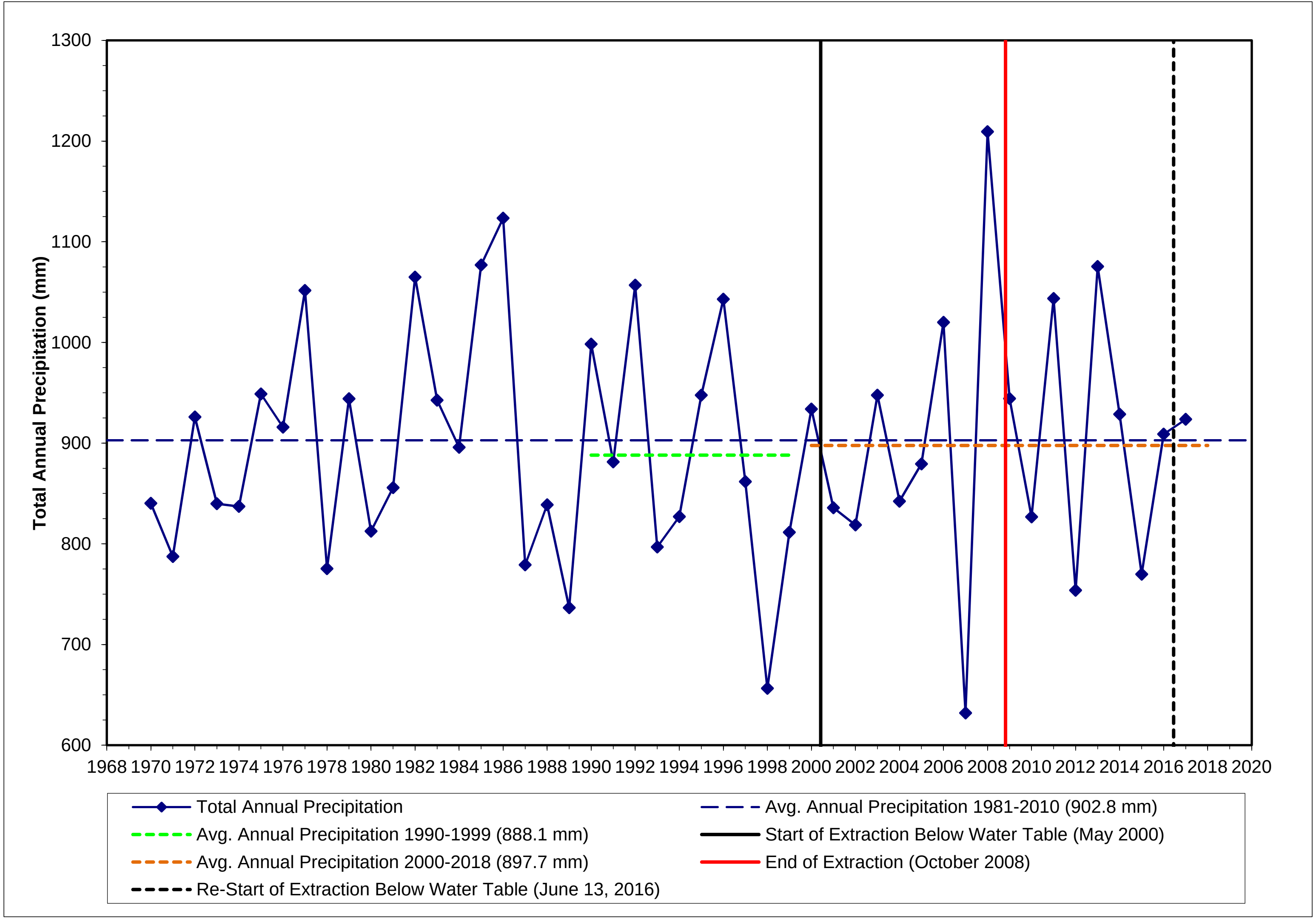
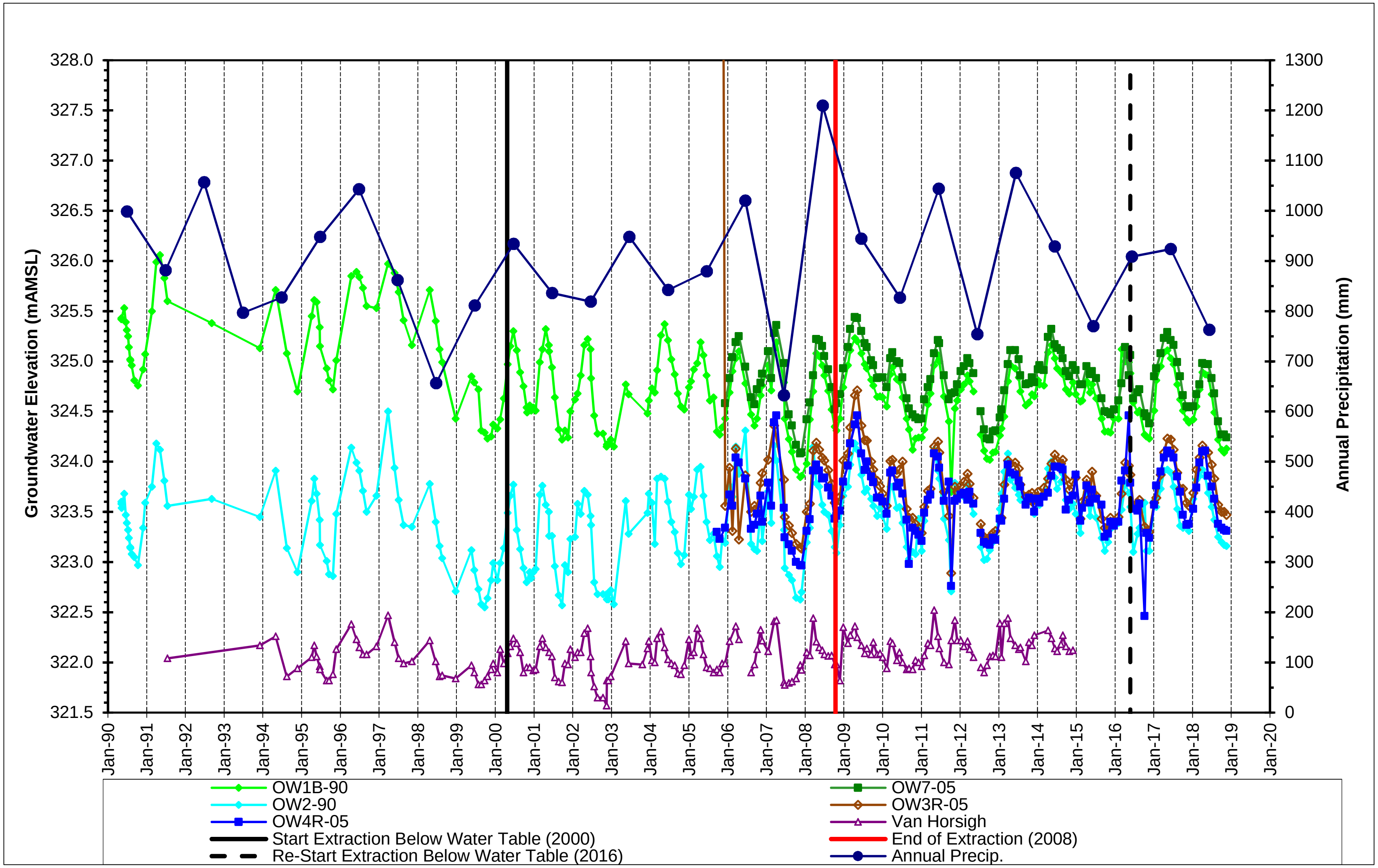


figure 3.2

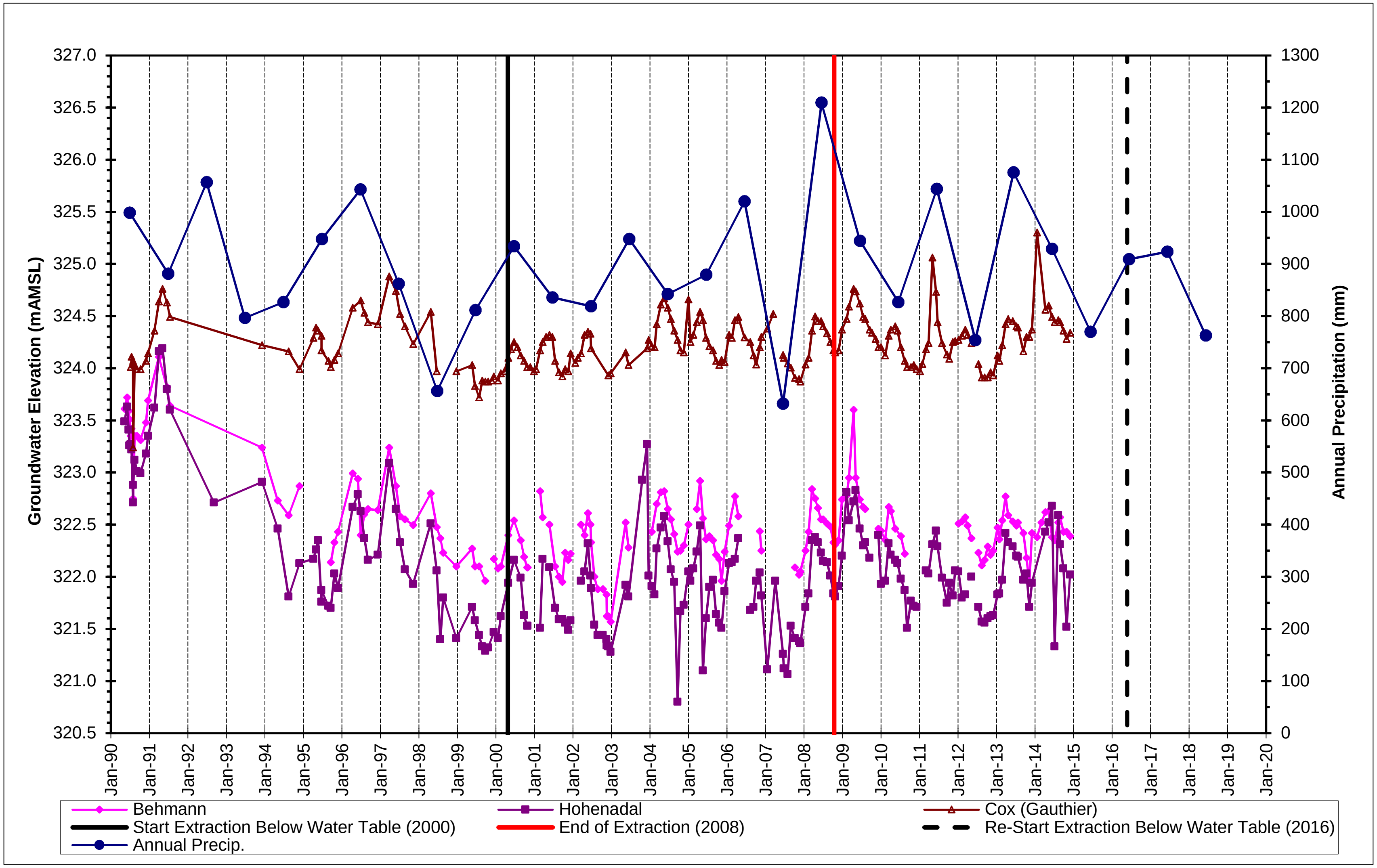
HISTORICAL ANNUAL PRECIPITATION
ABERFOYLE PIT No. 2

Dufferin Aggregates



Notes:
All monitoring wells are installed in the sand and gravel (water table) aquifer.
The Van Horsigh well (~ 2.4 m deep) may be installed in sand and gravel.

figure 3.3
REPRESENTATIVE GROUNDWATER ELEVATIONS
ABERFOYLE PIT No. 2
Dufferin Aggregates

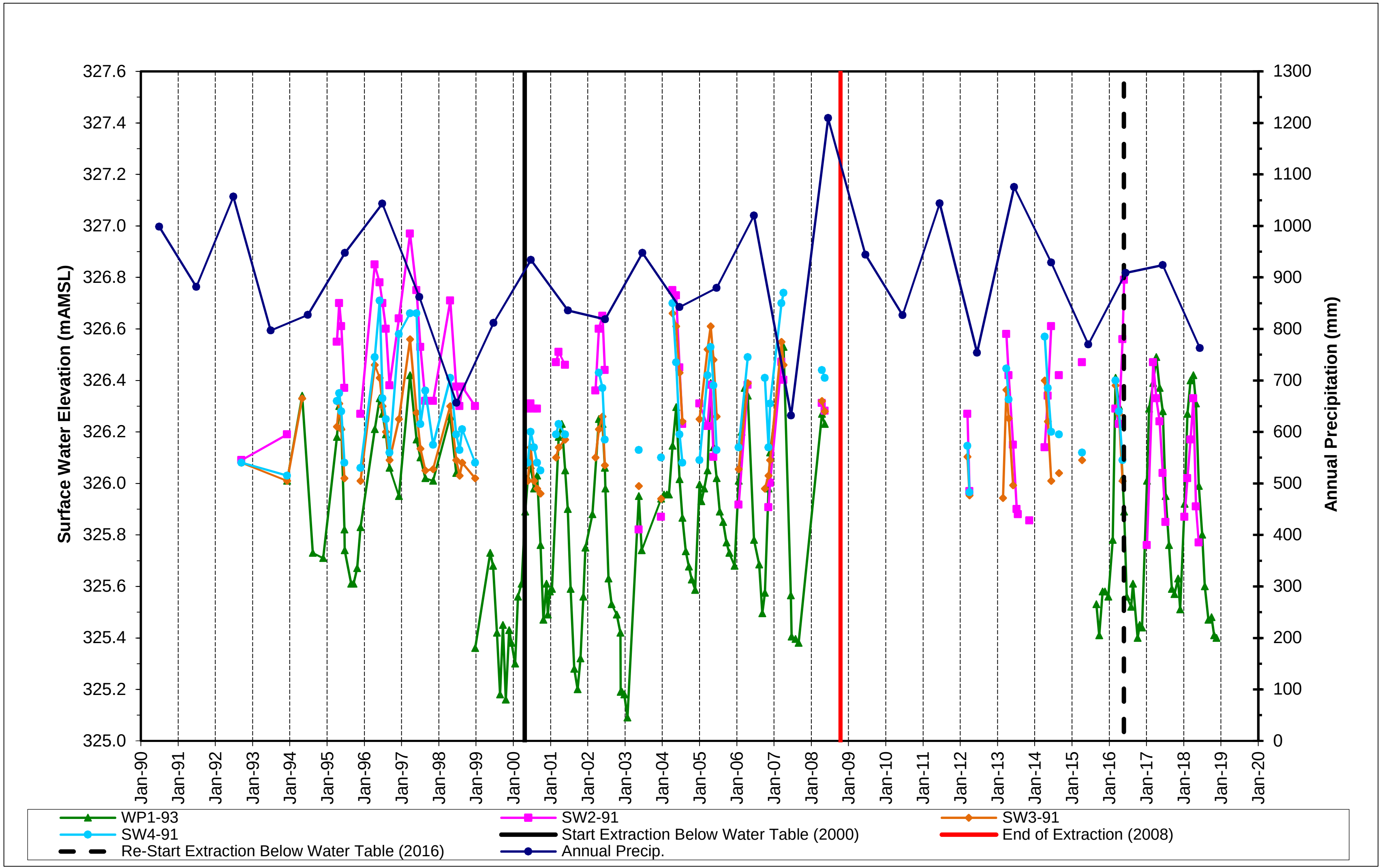


Notes:
The Hohenadel well is installed in a confined sand and gravel unit.
The Behmann well, based on its depth, is also likely installed in a confined overburden unit.
The Cox (former Gauthier) well is installed in Guelph Formation bedrock.

figure 3.4

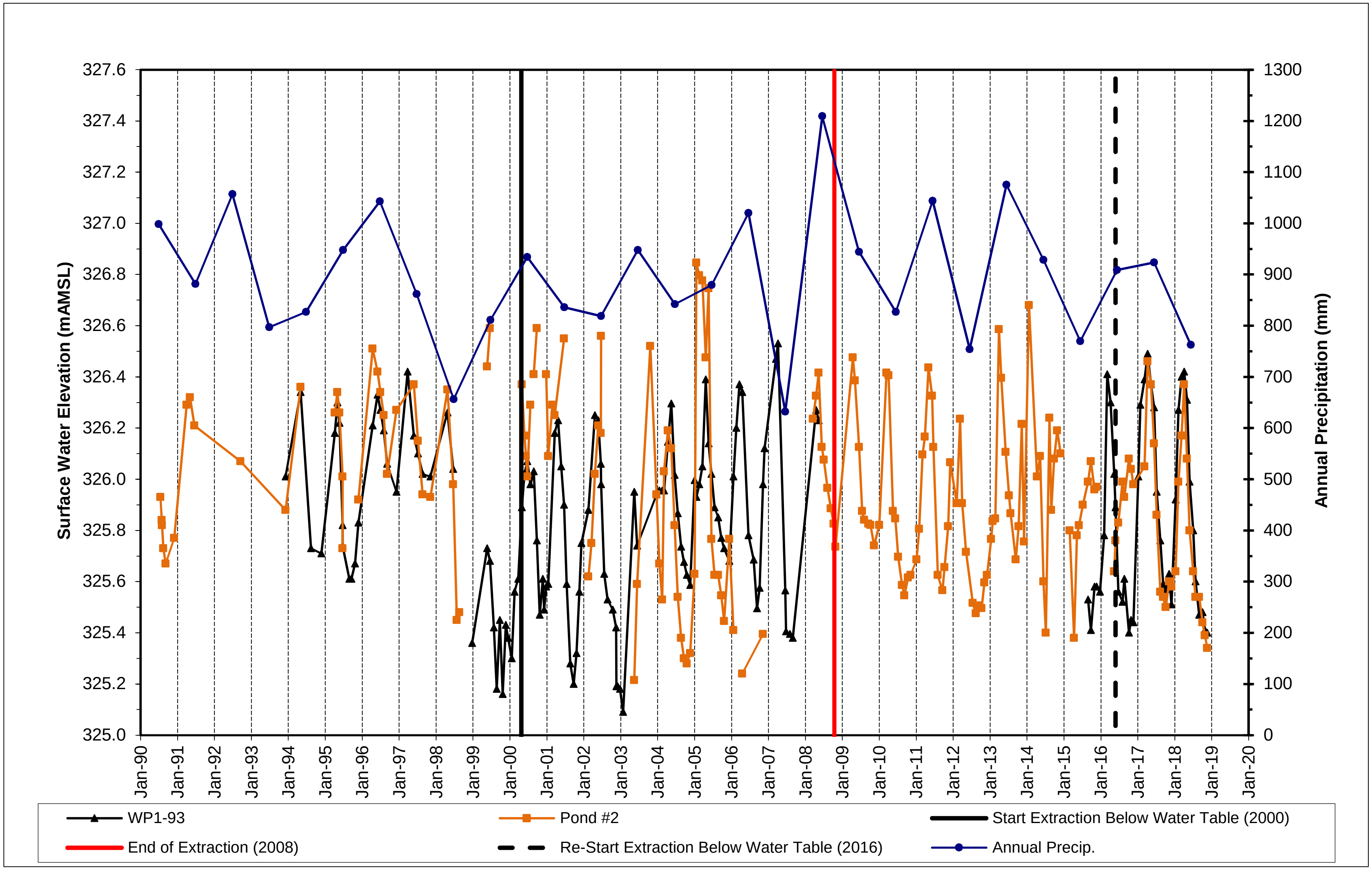
PRIVATE WELL GROUNDWATER ELEVATIONS
ABERFOYLE PIT No. 2

Dufferin Aggregates



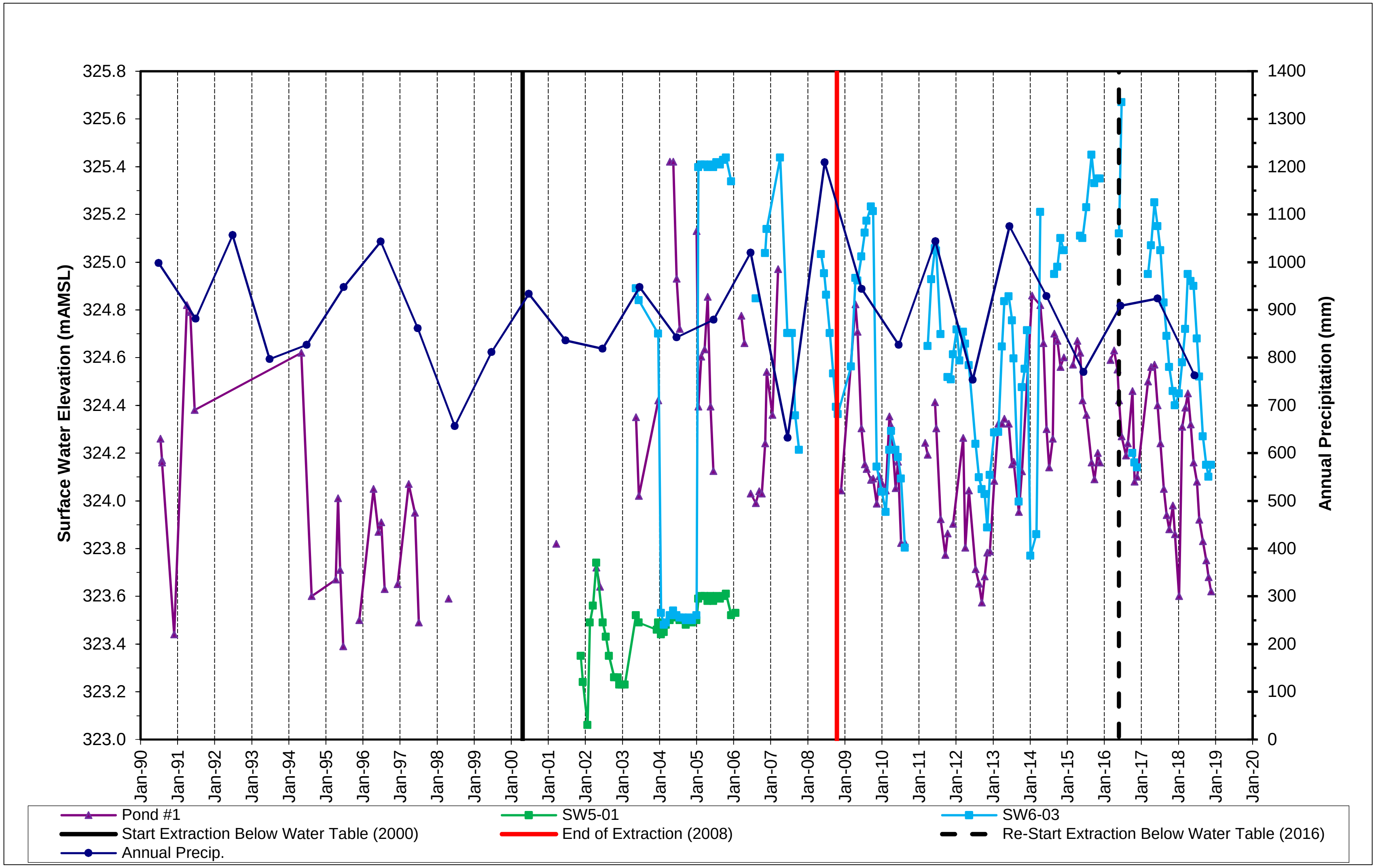
Note:
Data gaps indicate frozen or "dry" (water level below bottom of t-bar) conditions;
SW2-91 t-bar was not in place between Jul. to Dec. 2002, therefore no water level taken.
WP1-93 not monitored Jun. 2008 to Jan. 2012 at request of owner; blocked from Feb. 2012 to Aug. 2015; monitored thereafter.
SW2, SW3 and SW4 not monitored Jun. 2008 to Jan. 2012 at request of owner.

figure 3.5
SURFACE WATER ELEVATIONS (1)
ABERFOYLE PIT No. 2
Dufferin Aggregates



Note:
Data gaps indicate frozen or "dry" (water level below bottom of t-bar or staff gauge) conditions.
WP1-93 not monitored Jun. 2008 to Jan. 2012 at request of owner; blocked from Feb. 2012 to Aug. 2015; monitored thereafter.

figure 3.6
SURFACE WATER ELEVATIONS (2)
ABERFOYLE PIT No. 2
Dufferin Aggregates



SW5-01 not monitored at owners request as of Mar. 2006.

figure 3.7

SURFACE WATER ELEVATIONS (3)

ABERFOYLE PIT No. 2

Dufferin Aggregates

GHD

Table 3.1

Well Construction Details
Aberfoyle Pit No. 2
Dufferin Aggregates

Monitoring Well No.	Ground Surface Elevation (m)	Reference Elevation (m)	Total Depth Drilled (m)	Screened Interval		Screened Material
				Depth (m bgs)	Elevation (m)	
Surficial (Water Table) Aquifer						
OW1A-90	329.89	330.67	20.42	18.29-19.81	311.60-310.08	Sand and Gravel
OW1B-90	329.92	330.83	11.28	9.14-10.67	320.78-319.25	Sand
OW2-90	325.83	326.84	9.75	5.18-6.71	320.65-319.12	Sand and Gravel
OW3-90 (abandoned)	334.01	334.85	10.67	4.88-6.40	329.13-327.61	Sand and Gravel
OW3R-05 (BH05-1) (1)	324.27	325.21	13.4	3.4-6.6 (1)	320.87-317.67 (1)	Sand and Gravel
OW4-90 (abandoned)	334.94	335.78	9.3	7.16-8.69	327.78-326.25	Silt (Till)
OW4R-05 (BH05-3) (1)	339.51	340.38	26.8	20.0-23.4 (1)	319.51-316.11 (1)	Sand and Gravel
OW5-90	325.53	326.57	19.2	11.89-13.41	313.58-312.06	Sand
OW6-90	325.49	326.46	14.94	11.58-13.20	313.91-312.37	Sand
PW1-90	325.47	326.52	13.41	11.89-13.41	313.58-312.06	Sand
OW7-05 (BH05-2) (1)	333.41	334.38	23.8	11.2-14.3 (1)	322.21-319.11 (1)	Gravelly Sand
Van Horsigh (2)	323.39	323.90	2.46	0 - 2.46	323.39-320.93	Unknown
Confined Overburden						
Hohenadel, J.(3)	339.17	338.01	26.82	~25.91-26.82	~313.26-312.35	Gravel
Behmann (4)	328.07	328.35	≥ 21.37	?-≥ 21.37	?-≤306.70	Unknown
Bedrock (Guelph Formation)						
Cox (former Gauthier) (5)	325.10	325.92	22.16	19.20-22.16	305.90-302.94	Bedrock

Notes:

(1) Installed by Jagger Hims Limited. Screened intervals based on estimate from borehole logs.
(2) Depth of Van Horsigh well measured during water well inventory conducted by CRA in June 1991.
(3) Water Well Record for J. Hohenadel property is 67-05092 based on information obtained during water well inventory conducted by CRA in May 1990. The screened interval was assumed to extend from the top of the sand and gravel to the total depth drilled (3 feet).
(4) Depth of Behmann well was measured during water well inventory conducted by CRA in May 1990. The actual depth of the well may be greater than that measured since the measured value may represent the top of the pump or other obstruction.
(5) Drilling of the Cox (former Gauthier) well was supervised by CRA in July 1990.

Table 3.2

Historical Annual Precipitation
Aberfoyle Pit No. 2
Dufferin Aggregates

Year	Total Annual Precipitation (mm)	
1970	840.2	
1971	787.4	
1972	926	
1973	839.8	
1974	837.1	
1975	948.9	
1976	915.9	
1977	1051.7	
1978	775.4	
1979	944.1	
1980	812.5	
1981	855.8	
1982	1064.9	
1983	942.7	
1984	895.8	
1985	1076.9	
1986	1123.4	
1987	779.1	
1988	838.8	
1989	736.5	
1990	998.4	
1991	881.4	
1992	1056.9	
1993	796.8	
1994	827.0	
1995	947.6	
1996	1043.0	
1997	861.8	
1998	656.5	
1999	811.4	
2000	933.9	
2001	835.8	
2002	818.7	
2003	947.7	
2004	842.3	
2005	879.4	
2006	1020.0	
2007	632.0	
2008	1209.3	
2009	944.2	
2010	826.7	
2011	1,043.7	
2012	753.8	
2013	1,075.4	
2014	928.7	
2015	769.8	
2016	908.9	
2017	923.7	
2018	762.7	
Average Precipitation (1981 to 2010)	902.8	30-year mean
Average Precipitation (1990 to 1999)	888.1	prior to extraction below water table
Average Precipitation (2000 to 2018)	897.7	after start of extraction below water table*

* extraction below water table conducted between May 2000 and October 2008, and again commencing June 2016.

Source of Precipitation Data:

1970 - Nov. 1973:	Guelph OAC station (Stone Road)
Dec. 1973 - Jul. 1975:	Estimated for Guelph based on weighted average of Waterloo-Wellington, Fergus and Georgetown stations.
Aug. 1975 - 1989:	Guelph Arboretum station
1990 - 2009*:	Waterloo-Wellington Airport (Guelph not classified as an official station after 1989).
2010 - 2018*:	Kitchener/Waterloo

* From 2004-2017, the data used for Jan to Mar, part of Apr and Nov-Dec was from Station 6149389 (Waterloo-Wellington 2). This station backs onto the airport. It is manually operated and was more accurate for the winter months during which it is operated (Nov. to mid-Apr.). No data available for

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	7-May-90	8-May-90	11-May-90	5-Jun-90	19-Jun-90	28-Jun-90	10-Jul-90	17-Jul-90	31-Jul-90	1-Aug-90	15-Aug-90	7-Sep-90	11-Oct-90	30-Nov-90	20-Dec-90	21-Feb-91	3-Apr-91	7-May-91	18-Jun-91	17-Jul-91
Monitoring Well No.																						
OW1-76	333.23	333.75	--	dry	--	325.59	325.39	325.40	--	dry	--	325.39	dry	--	dry	--	325.45	325.53	326.11	326.28	325.39	325.75
OW9-76	332.45	333.30	dry	dry	--	dry	324.21	324.21	dry	dry	dry	dry	dry	--	dry	dry	dry	325.51	324.25	324.27	324.21	324.21
OW1A-90	329.89	330.71	325.43	325.42	--	325.53	325.39	325.32	325.24	325.14	325.02	324.92	324.96	324.82	324.77	324.92	325.07	325.51	325.98	326.06	325.85	325.61
OW1B-90	329.92	330.84	325.43	325.42	--	325.53	325.39	325.31	325.25	325.14	325.02	325.01	324.96	324.81	324.76	324.92	325.07	325.50	325.99	326.06	325.83	325.60
OW2-90	325.83	326.87	323.60	323.58	323.54	323.68	323.47	323.39	323.32	323.24	323.15	323.14	323.08	323.05	322.97	323.34	323.59	323.75	324.18	324.12	323.81	323.56
OW3-90	334.01	334.85	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW4-90	334.94	335.78	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW5-90	325.53	326.58	--	--	--	--	--	324.16	324.27	324.07	324.07	324.06	324.00	323.91	323.84	324.02	324.18	324.40	324.98	325.11	324.66	324.06
OW6-90	325.49	326.44	--	--	--	--	--	324.54	324.63	324.52	324.46	324.44	324.39	324.29	324.24	324.40	324.57	324.88	325.36	325.49	325.12	324.88
PW1-90	325.47	326.54	--	--	--	--	--	324.14	324.13	324.02	323.93	323.92	323.87	323.77	323.71	323.89	324.05	324.35	324.85	324.98	324.62	324.38
OW3R-05 (BH05-1)	324.27	325.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW4R-05 (BH05-3)	339.51	340.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW7-05 (BH05-2)	333.41	334.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Private Well Location																						
Behmann	328.07	328.26	--	--	323.61	323.72	323.59	323.51	323.35	323.42	323.35	322.75	323.35	323.35	323.31	323.48	323.69	--	324.11	--	323.82	323.64
Hohenadal	339.17	338.01	--	--	323.49	323.63	323.41	323.26	323.27	323.22	322.71	322.88	323.12	323.01	322.99	323.18	323.35	323.62	324.16	324.19	323.80	323.60
Gauthier (now Cox)	325.10	325.92	--	--	--	--	--	--	324.01	324.11	324.07	323.24	324.03	323.99	323.99	324.07	324.14	324.36	324.64	324.76	324.63	324.49
Van Horsigh	323.39	323.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	322.04

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	7-Sep-92	8-Dec-93	6-May-94	18-Aug-94	28-Nov-94	11-Apr-95	5-May-95	26-May-95	26-Jun-95	27-Jun-95	31-Aug-95	22-Sep-95	27-Oct-95	30-Nov-95	19-Apr-96	6-Jun-96	4-Jul-96	6-Aug-96	10-Sep-96	12-Dec-96
Monitoring Well No.																						
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	325.38	325.13	325.71	325.07	324.70	325.45	325.60	325.58	325.33	326.15	324.93	324.79	324.72	325.00	325.85	325.87	325.83	325.73	325.55	325.53
OW1B-90	329.92	330.84	325.38	325.13	325.71	325.08	324.70	325.45	325.61	325.59	325.34	325.15	324.93	324.81	324.72	325.01	325.85	325.89	325.84	325.73	325.55	325.53
OW2-90	325.83	326.87	323.63	323.45	323.91	323.14	322.90	323.61	323.83	323.68	323.42	323.17	323.01	322.88	322.86	323.48	324.14	323.99	323.91	323.71	323.50	323.66
OW3-90	334.01	334.85	327.71	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW4-90	334.94	335.78	dry	dry	dry	dry	dry	dry	dry	--	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW5-90	325.53	326.58	--	--	--	--	323.70	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW6-90	325.49	326.44	--	--	--	--	323.74	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PW1-90	325.47	326.54	--	--	--	--	323.69	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW3R-05 (BH05-1)	324.27	325.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW4R-05 (BH05-3)	339.51	340.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW7-05 (BH05-2)	333.41	334.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Private Well Location																						
Behmann	328.07	328.26	--	323.24	322.73	322.59	322.87	--	--	--	--	--	--	322.14	322.33	322.43	322.99	322.94	322.40	322.60	322.65	322.64
Hohenadal	339.17	338.01	322.71	322.91	322.46	321.81	322.13	322.17	322.26	322.35	321.76	321.87	321.72	321.70	322.03	321.89	322.67	322.79	322.63	322.37	322.16	322.21
Gauthier (now Cox)	325.10	325.92	322.11	324.22	--	324.16	323.99	324.29	324.39	324.36	324.31	324.17	324.07	324.01	324.08	324.14	324.58	--	324.65	324.53	324.44	324.42
Van Horsigh	323.39	323.90	--	322.17	322.26	321.86	321.94	322.05	322.17	322.06	321.96	321.93	321.82	321.82	321.88	322.13	322.38	322.23	322.15	322.08	322.08	322.16

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	31-Mar-97 (2-Apr-97)	2-Jun-97	11-Jul-97	27-Aug-97	13-Nov-97	30-Apr-98	26-Jun-98	31-Jul-98	26-Aug-98	30-Dec-98	28-May-99	25-Jun-99	2-Aug-99	31-Aug-99	30-Sep-99	28-Oct-99	30-Nov-99	21-Dec-99
Monitoring Well No.																				
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	325.96	325.88	325.69	325.41	325.16	325.71	325.40	325.13	325.01	324.52	324.87	324.74	324.65	324.35	324.30	324.23	324.25	324.37
OW1B-90	329.92	330.84	325.97	325.88	325.69	325.41	325.16	325.71	325.40	325.12	324.99	324.43	324.85	324.79	324.72	324.31	324.29	324.23	324.25	324.37
OW2-90	325.83	326.87	324.50	323.94	323.62	323.37	323.35	323.78	323.40	323.16	323.04	322.71	323.12	322.92	322.73	322.58	322.55	322.64	322.82	322.99
OW3-90	334.01	334.85	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW4-90	334.94	335.78	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW5-90	325.53	326.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW6-90	325.49	326.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PW1-90	325.47	326.54	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW3R-05 (BH05-1)	324.27	325.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW4R-05 (BH05-3)	339.51	340.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW7-05 (BH05-2)	333.41	334.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Private Well Location																				
Behmann	328.07	328.26	323.24*	322.87	322.58	322.55	322.50	322.80	322.48	322.37	322.23	322.10	322.27	322.10	322.10	--	321.96	--	--	322.17
Hohenadal	339.17	338.01	323.09*	322.65	322.33	322.07	321.93	322.51	322.06	321.40	321.80	321.41	321.71	321.58	321.44	321.33	321.29	321.32	--	321.47
Gauthier (now Cox)	325.10	325.92	324.88*	324.74	324.52	324.40	324.23	324.54	323.97	--	--	323.97	324.03	323.83	323.72	323.88	323.87	323.87	323.88	323.92
Van Horsigh	323.39	323.90	322.47*	322.20	322.04	321.99	322.01	322.22	322.01	321.86	321.87	321.84	321.97	321.90	321.78	321.78	321.82	321.86	321.93	321.99

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	28-Jan-00	25-Feb-00 (28-Feb-00)	30-Mar-00	5-May-00	31-May-00 (16-Jun-00)	28-Jun-00	31-Jul-00 (11-Aug-00)	31-Aug-00	2-Oct-00 (21-Sep-00)	31-Oct-00 (3-Nov-00)	6-Nov-00	30-Nov-00	13-Dec-00
Monitoring Well No.															
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.34	324.42	324.59	324.97	325.16	325.31	325.13	324.89	324.72	324.54	324.51	324.57	324.52
OW1B-90	329.92	330.84	324.33	324.42	324.63	324.97	325.15	325.30	325.11	324.89	324.75	324.54	324.49	324.56	324.51
OW2-90	325.83	326.87	322.82	322.99	323.14	323.49	323.66	323.77	323.32	323.13	322.94	322.80	--	322.90	322.84
OW3-90	334.01	334.85	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	--	dry	dry
OW4-90	334.94	335.78	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	--	dry	dry
OW5-90	325.53	326.58	--	--	--	--	--	--	--	--	--	323.64*	323.63	323.73	--
OW6-90	325.49	326.44	--	--	--	--	--	--	--	--	--	323.49*	323.49	323.58	--
PW1-90	325.47	326.54	--	--	--	--	--	--	--	--	--	323.70*	323.71	323.81	--
OW3R-05 (BH05-1)	324.27	325.30	--	--	--	--	--	--	--	--	--	--	--	--	--
OW4R-05 (BH05-3)	339.51	340.27	--	--	--	--	--	--	--	--	--	--	--	--	--
OW7-05 (BH05-2)	333.41	334.32	--	--	--	--	--	--	--	--	--	--	--	--	--
Private Well Location															
Behmann	328.07	328.26	322.08	322.10*	--	322.40	322.54*	--	322.35*	--	322.19*	322.09*	--	--	--
Hohenadal	339.17	338.01	321.41	321.62*	--	321.94	322.16*	--	321.99*	--	321.63*	321.53*	--	--	--
Gauthier (now Cox)	325.10	325.92	323.88	323.95	323.97	324.10	324.18	324.25	324.20	324.12	324.07	324.01	--	324.01	--
Van Horsigh	323.39	323.90	321.90	322.13	321.99	322.09	322.16	322.24	322.19	322.10	321.90	321.95	--	321.95	--

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	3-Jan-01	24-Jan-01	5-Mar-01 (21-Mar-01)	29-Mar-01 (30-Mar-01)	30-Apr-01	29-May-01	1-Jun-01 (25-May-01)	28-Jun-01	24-Jul-01	30-Aug-01	2-Oct-01	29-Oct-01 (6-Nov-01)	26-Nov-01	18-Dec-01
Monitoring Well No.																
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.54	324.51	325.00	325.13	325.31	325.16	325.10	324.94	324.65	324.32	324.22	324.31	324.24	324.50
OW1B-90	329.92	330.84	324.54	324.51	324.99	325.12	325.32	325.16	325.10	324.94	324.64	324.32	324.22	324.31	324.24	324.50
OW2-90	325.83	326.87	322.90	322.93	323.67	323.76	323.63	323.50	323.26	323.26	322.96	322.67	322.57	322.97	322.90	323.23
OW3-90	334.01	334.85	dry	dry	dry	dry	327.71	327.71	--	--	--	--	--	--	dry	--
OW4-90	334.94	335.78	dry	dry	dry	dry	dry	dry	--	--	--	--	--	--	dry	--
OW5-90	325.53	326.58	323.62	323.60	324.11	324.20	324.25	324.24	324.19	324.03	323.78	323.56	323.48	323.59	323.55	323.82
OW6-90	325.49	326.44	323.67	323.66	324.16	324.27	324.32	324.70	324.22	324.06	323.80	323.60	323.50	323.64	323.59	323.87
PW1-90	325.47	326.54	323.61	323.59	324.11	324.19	324.23	324.19	324.15	323.98	323.73	323.53	323.43	323.57	323.53	323.80
OW3R-05 (BH05-1)	324.27	325.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW4R-05 (BH05-3)	339.51	340.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW7-05 (BH05-2)	333.41	334.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Private Well Location																
Behmann	328.07	328.26	--	--	332.48*	322.57*	--	--	322.50*	--	322.10	322.00	321.95	322.23*	322.16	322.22
Hohenadal	339.17	338.01	--	--	321.51	322.17*	--	--	322.09*	--	321.70	321.59	321.59	321.56*	321.49	321.58
Gauthier (now Cox)	325.10	325.92	323.97	323.99	324.17	324.25	324.30	--	324.32	324.30	324.07	323.96	323.92	323.99*	323.97	324.14
Van Horsigh	323.39	323.90	321.92	321.93	322.16	322.24	322.15	--	322.10	322.06	321.85	321.81	321.80	321.99*	321.98	322.13

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	1-Feb-02 (for Jan.)	25-Feb-02	27-Mar-02	30-Apr-02	1-Jun-02	27-Jun-02	1-Jul-02	1-Aug-02	2-Sep-02	23-Oct-02	26-Nov-02	29-Nov-02	12-Dec-02	3-Jan-03	3-Feb-03	26-May-03	23-Jun-03	########	17-Dec-03 (for Nov.)	31-Dec-03
Monitoring Well No.																						
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.63	324.69	324.87	325.18	325.23	325.12	324.84	324.47	324.29	324.29	324.16	324.16	324.16	324.22	324.15	324.77	324.67	--	324.49	324.62
OW1B-90	329.92	330.84	324.62	324.68	324.86	325.16	325.22	325.12	324.83	324.46	324.28	324.28	324.15	324.17	324.17	324.22	324.15	324.77	324.67	--	324.48	324.61
OW2-90	325.83	326.87	323.25	323.58	323.48	323.71	323.67	323.46	323.37	322.80	322.68	322.68	322.68	322.63	322.63	322.72	322.58	323.61	323.28	--	323.49	323.68
OW3-90	334.01	334.85	--	--	--	--	--	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	327.98
OW4-90	334.94	335.78	--	--	--	--	--	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW5-90	325.53	326.58	323.84	324.00	324.07	324.37	324.39	324.29	324.05	323.71	323.60	323.60	323.47	323.41	323.41	323.46	323.34	324.14	323.95	323.57	323.95	324.13
OW6-90	325.49	326.44	323.89	324.06	324.13	324.44	324.45	324.39	324.12	323.72	323.62	323.62	323.52	323.47	323.47	323.52	323.41	324.16	323.98	323.63	324.41	324.15
PW1-90	325.47	326.54	323.81	323.99	324.06	324.35	324.37	324.29	324.02	323.65	323.55	323.55	323.45	323.39	323.39	323.44	323.34	324.08	323.92	--	323.91	324.08
OW3R-05 (BH05-1)	324.27	325.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW4R-05 (BH05-3)	339.51	340.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW7-05 (BH05-2)	333.41	334.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Private Well Location																						
Behmann	328.07	328.26	F	--	322.50	322.40	322.61	322.50	322.33	322.00	321.88	321.88	321.83	321.62	321.62	321.57	--	322.52	322.28	--	--	319.51
Hohenadal	339.17	338.01	--	--	321.96	322.05	322.32	322.01	321.89	321.54	321.44	321.44	321.40	321.34	321.33	321.28	318.27	321.92	321.81	322.93	323.27	322.01
Gauthier (now Cox)	325.10	325.92	324.05	324.10	324.14	324.32	324.35	324.33	324.19	sealed	sealed	sealed	sealed	sealed	323.93	323.95	--	324.15	324.03	sealed	324.19	324.27
Van Horsigh	323.39	323.90	322.05	322.10	322.10	322.29	322.34	322.06	321.90	321.76	321.65	321.65	321.57	321.82	321.82	321.86	--	322.21	321.99	321.98	322.14	322.21

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	29-Jan-04	25-Feb-04	16-Mar-04	23-Apr-04	27-May-04	29-Jun-04	29-Jul-04	31-Aug-04	30-Sep-04	28-Oct-04	30-Nov-04	13-Jan-05 (for Dec.)	31-Jan-05	28-Feb-05	31-Mar-05	2-May-05 (for Apr.)	30-May-05	28-Jun-05	29-Jul-05
Monitoring Well No.																					
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.77	324.69	324.91	325.26	325.37	325.21	325.03	324.87	324.69	324.55	324.53	324.75	324.81	324.92	324.98	325.19	324.86	324.87	324.61
OW1B-90	329.92	330.84	324.73	324.69	324.91	325.26	325.37	325.21	325.02	324.87	324.68	324.55	324.52	324.74	324.80	324.92	324.98	325.19	325.06	324.86	324.61
OW2-90	325.83	326.87	323.59	323.18	323.83	323.85	323.83	323.60	323.40	323.30	323.09	322.98	323.07	323.67	323.53	323.65	323.92	323.95	323.66	323.40	323.22
OW3-90	334.01	334.85	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW4-90	334.94	335.78	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW5-90	325.53	326.58	324.03	323.99	324.36	324.61	324.70	324.54	324.37	324.25	324.04	323.90	323.91	324.25	324.13	324.22	324.38	324.67	324.50	324.22	324.09
OW6-90	325.49	326.44	324.54	324.46	324.81	325.08	325.18	325.02	324.87	324.74	324.50	324.36	324.36	324.69	324.58	324.67	324.83	325.14	324.98	324.69	324.48
PW1-90	325.47	326.54	324.01	323.95	324.31	324.57	324.66	324.50	324.35	324.22	324.00	323.86	323.86	324.20	324.08	324.18	324.33	324.62	324.46	324.18	324.04
OW3R-05 (BH05-1)	324.27	325.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW4R-05 (BH05-3)	339.51	340.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW7-05 (BH05-2)	333.41	334.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Private Well Location																					
Behmann	328.07	328.26	322.43	F	322.70	322.81	322.82	322.65	322.55	322.41	322.24	322.25	322.30	322.50	F	F	322.65	322.92	322.56	322.36	322.39
Hohenadal	339.17	338.01	321.91	321.83	322.27	322.47	322.58	322.34	322.07	321.95	320.80	321.67	321.73	322.05	321.96	322.08	322.24	322.49	321.10	321.60	321.90
Gauthier (now Cox)	325.10	325.92	324.21	324.20	324.42	324.61	324.67	324.58	324.47	324.36	324.27	324.17	324.15	324.66	324.25	324.32	324.44	324.54	324.46	324.29	324.21
Van Horsigh	323.39	323.90	322.02	322.00	322.24	322.31	322.15	322.03	321.99	321.97	321.89	321.88	321.97	322.23	322.07	322.10	322.34	322.24	322.08	321.95	321.94

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	2-Sep-05 (for Aug.)	3-Oct-05 (for Sep.)	31-Oct-05	22-Nov-05	21-Dec-05	1-Feb-06 (for Jan.)	Feb-06	Mar-06	Apr-06	May-06	30-Jun-06	Jul-06	21-Aug-06	22-Sep-06	17-Oct-06	21-Nov-06	5-Dec-06
Monitoring Well No.																			
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.65	324.30	324.28	324.34	324.43	324.70	324.91	325.04	325.09	--	324.80	--	324.47	324.36	324.45	324.65	325.07
OW1B-90	329.92	330.84	324.64	324.30	324.27	324.34	324.43	324.69	324.90	325.03	325.10	--	324.78	--	324.47	324.36	324.43	324.66	324.76
OW2-90	325.83	326.87	323.28	323.06	322.95	323.22	323.19	323.76	323.65	324.15	323.88	--	324.31	--	323.18	323.13	323.11	323.54	323.21
OW3-90	334.01	334.85	dry	--	--	dry	--	dry	dry	dry	dry	--	dry	--	dry	dry	dry	dry	dry
OW4-90	334.94	335.78	dry	--	--	dry	--	--	--	--	--	--	--	--	--	dry	--	dry	dry
OW5-90	325.53	326.58	324.07	323.84	323.78	323.84	323.89	324.17	325.31	324.52	324.53	--	324.20	--	323.92	323.87	323.93	324.08	324.20
OW6-90	325.49	326.44	324.46	324.30	324.23	323.90	324.34	324.23	324.38	324.59	324.62	--	324.28	--	323.99	323.93	323.86	324.15	324.26
PW1-90	325.47	326.54	324.02	323.80	323.74	323.83	323.84	324.16	325.29	324.51	324.32	--	324.19	--	323.92	323.95	323.81	324.27	324.15
OW3R-05 (BH05-1)	324.27	325.30	--	323.52	323.45	--	323.56	323.94	F	F	323.23	--	323.87	--	323.50	323.56	323.54	323.79	323.89
OW4R-05 (BH05-3)	339.51	340.27	--	323.30	323.23	--	323.34	323.67	323.56	324.04	323.99	--	323.83	--	323.33	323.37	323.48	323.66	323.40
OW7-05 (BH05-2)	333.41	334.32	324.52	--	324.48	324.51	324.58	324.83	325.04	325.19	325.25	--	324.95	--	324.64	324.57	324.72	324.79	324.88
Private Well Location																			
Behmann	328.07	328.26	322.35	322.21	322.17	321.96	322.24	322.49	--	322.77	322.58	--	--	--	--	--	--	322.44	322.25
Hohenadal	339.17	338.01	321.97	321.64	321.56	321.51	321.86	322.13	322.14	322.17	322.37	--	--	--	321.68	321.71	321.96	322.04	321.82
Gauthier (now Cox)	325.10	325.92	324.17	324.07	324.03	324.08	324.06	324.32	324.29	324.46	324.49	--	324.30	--	324.25	324.12	324.04	324.20	324.30
Van Horsigh	323.39	323.90	321.90	321.93	321.90	321.99	321.99	322.21	--	322.36	322.23	--	--	--	321.90	321.98	322.13	322.33	322.22

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	30-Jan-07	28-Feb-07	29-Mar-07	18-Apr-07	1-May-07	29-Jun-07	7-Jul-07	14-Aug-07	12-Sep-07	22-Oct-07	30-Nov-07	12-Dec-07	30-Jan-08	28-Feb-08	31-Mar-08	30-Apr-08	26-May-08	25-Jun-08	15-Jul-08	20-Aug-08
Monitoring Well No.																						
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.96	324.74	325.12	325.19	--	324.80	324.44	324.26	324.12	323.92	323.86	323.87	324.25	324.43	324.71	325.11	325.05	324.97	324.87	324.72
OW1B-90	329.92	330.84	324.96	324.71	325.12	325.19	--	324.79	324.43	324.23	324.10	323.92	323.85	323.86	323.98	324.42	324.70	325.08	325.05	324.96	324.86	324.71
OW2-90	325.83	326.87	323.71	323.39	324.16	324.01	--	323.32	322.94	322.87	322.82	322.65	322.63	322.70	323.20	323.34	324.15	323.79	323.75	323.57	323.50	323.47
OW3-90	334.01	334.85	F	--	--	--	--	--	--	--	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW4-90	334.94	335.78	F	--	--	--	--	--	--	--	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW5-90	325.53	326.58	324.33	324.13	324.53	324.60	--	324.17	323.89	323.77	323.66	323.53	323.47	323.50	323.84	323.94	324.38	324.02	324.49	324.44	324.37	324.26
OW6-90	325.49	326.44	324.40	324.17	324.61	324.70	--	324.25	323.96	323.83	323.72	323.59	323.53	323.52	323.90	324.01	324.40	324.59	324.54	324.49	324.43	324.33
PW1-90	325.47	326.54	324.31	324.01	324.52	324.59	--	324.16	323.88	323.76	323.65	323.52	323.46	323.45	323.83	323.93	324.34	324.27	324.44	324.38	324.34	324.25
OW3R-05 (BH05-1)	324.27	325.30	324.02	F	324.36	--	--	323.82	323.45	323.37	323.29	323.18	323.15	323.14	323.50	323.58	324.11	324.19	324.12	324.04	324.01	323.92
OW4R-05 (BH05-3)	339.51	340.27	323.79	323.56	324.39	324.46	--	323.54	323.25	323.18	323.11	323.00	322.97	322.97	326.31	323.43	323.91	323.97	323.91	323.83	323.84	323.74
OW7-05 (BH05-2)	333.41	334.32	325.10	324.83	325.28	325.36	--	324.98	324.67	324.47	324.36	324.17	324.08	324.09	324.42	324.59	324.86	325.22	325.21	325.15	325.05	324.92
Private Well Location																						
Behmann	328.07	328.26	F	F	--	--	--	--	--	--	--	322.09	322.02	322.05	322.25	322.43	322.84	322.75	322.66	322.55	322.55	322.51
Hohenadal	339.17	338.01	321.11	(1)	--	321.96	--	321.26	321.12	321.07	321.53	321.41	321.38	321.36	321.71	321.84	322.35	322.38	322.33	322.23	322.15	322.14
Gauthier (now Cox)	325.10	325.92	324.38	--	324.52	--	--	324.13	324.10	324.05	324.01	323.91	323.90	323.87	324.04	324.10	324.36	324.50	324.45	324.45	324.40	324.34
Van Horsigh	323.39	323.90	322.11	--	322.41	322.42	--	321.80	321.78	321.80	321.81	321.84	321.98	321.93	322.10	322.07	322.44	322.21	322.15	322.12	322.08	322.07

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	22-Sep-08	20-Oct-08	7-Nov-08	8-Dec-08	9-Jan-09	23-Feb-09	17-Mar-09	30-Apr-09	21-May-09	29-Jun-09	31-Jul-09	19-Aug-09	30-Sep-09	21-Oct-09	26-Nov-09	22-Dec-09
Monitoring Well No.																		
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.54	324.37	324.34	324.46	324.80	324.98	325.18	325.28	325.26	325.21	325.04	324.99	324.87	324.82	324.71	324.70
OW1B-90	329.92	330.84	324.52	324.35	324.31	324.43	324.75	324.97	325.12	325.24	325.21	325.09	324.98	324.94	324.83	324.77	324.66	324.66
OW2-90	325.83	326.87	323.31	323.15	323.09	323.37	323.69	323.78	324.00	324.21	324.15	323.90	323.73	323.76	323.66	323.59	323.49	323.57
OW3-90	334.01	334.85	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW4-90	334.94	335.78	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW5-90	325.53	326.58	324.12	323.98	323.95	324.07	324.32	324.46	324.63	324.88	324.91	324.71	324.59	324.56	324.39	324.31	324.19	324.16
OW6-90	325.49	326.44	324.19	324.05	324.02	324.10	324.32	324.51	324.68	324.91	324.91	324.73	324.61	324.58	324.43	324.35	324.33	324.20
PW1-90	325.47	326.54	324.11	323.96	323.94	324.03	324.28	324.45	324.63	324.84	324.87	324.67	324.56	324.53	324.39	324.32	324.19	324.16
OW3R-05 (BH05-1)	324.27	325.30	323.78	323.59	323.56	323.65	324.10	324.17	324.43	324.75	324.80	324.45	324.31	324.30	324.09	324.01	323.90	323.85
OW4R-05 (BH05-3)	339.51	340.27	323.66	323.43	323.46	323.51	323.69	323.85	324.07	324.26	324.35	323.97	323.81	323.89	323.74	323.69	323.53	323.53
OW7-05 (BH05-2)	333.41	334.32	324.74	324.52	324.58	324.67	324.87	325.08	325.26	325.38	325.37	325.24	325.12	325.08	324.95	324.90	324.77	324.78
Private Well Location																		
Behmann	328.07	328.26	322.48	322.33	322.31	322.35	322.65	322.69	322.86	323.51	322.86	322.65	322.58	322.56	--	--	--	322.37
Hohenadal	339.17	338.01	322.01	321.84	321.81	321.91	322.20	322.81	322.54	322.72	322.83	322.46	322.30	322.33	322.18	--	--	<322.40
Gauthier (now Cox)	325.10	325.92	324.25	324.17	324.15	324.17	324.37	324.47	324.59	324.76	324.74	324.62	324.49	324.47	324.37	324.34	324.28	324.20
Van Horsigh	323.39	323.90	322.07	321.98	321.98	321.82	322.35	322.19	322.27	322.36	322.25	322.17	322.09	322.14	322.08	322.20	322.08	322.09

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	15-Jan-10	24-Feb-10	30-Mar-10	19-Apr-10	31-May-10	23-Jun-10	23-Jul-10	31-Aug-10	22-Sep-10	28-Oct-10	23-Nov-10	21-Dec-10	21-Jan-11	14-Feb-11	20-Mar-11	14-Apr-11	19-May-11	23-Jun-11	07-Jul-11
Monitoring Well No.																					
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.69	324.61	324.93	324.98	324.87	323.84	324.72	324.21	324.36	324.30	324.17	324.64	324.28	324.41	324.61	324.70	325.01	325.10	325.05
OW1B-90	329.92	330.84	324.65	324.56	324.88	324.95	324.83	324.81	324.65	324.44	324.33	324.13	324.24	324.25	324.25	324.33	324.58	324.69	324.97	325.07	325.01
OW2-90	325.83	326.87	323.49	323.36	323.78	323.78	323.57	323.58	323.42	323.18	323.06	323.13	323.11	323.46	323.14	323.44	323.67	323.71	324.15	323.94	323.86
OW3-90	334.01	334.85	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW4-90	334.94	335.78	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW5-90	325.53	326.58	324.13	324.03	324.34	324.41	324.32	324.36	324.56	324.03	323.92	323.88	323.80	323.75	323.75	324.02	324.10	324.16	324.48	324.59	324.48
OW6-90	325.49	326.44	324.17	324.07	324.39	324.38	324.34	324.37	324.55	324.03	323.92	323.87	323.83	323.81	323.74	323.93	324.09	324.14	324.51	324.60	324.51
PW1-90	325.47	326.54	324.15	324.04	324.35	324.37	324.29	324.32	324.55	323.99	323.88	323.85	323.80	323.76	323.73	323.91	324.08	324.12	324.48	324.56	324.46
OW3R-05 (BH05-1)	324.27	325.30	323.77	323.65	324.10	324.11	323.97	324.01	324.09	323.62	323.53	323.53	323.47	323.43	323.38	323.64	323.80	323.82	324.24	324.29	324.18
OW4R-05 (BH05-3)	339.51	340.27	323.49	323.37	323.78	323.80	323.64	323.68	323.57	323.31	322.87	323.23	323.20	323.16	323.10	323.38	323.51	323.56	323.97	323.94	323.83
OW7-05 (BH05-2)	333.41	334.32	324.78	324.68	324.97	325.03	324.94	324.92	324.78	324.57	324.47	324.41	324.38	324.36	324.37	324.56	324.68	324.76	325.02	325.15	325.12
Private Well Location																					
Behmann	328.07	328.26	322.35	322.27	322.58	322.54	322.37	--	322.30	322.13	--	--	--	--	--	--	--	--	--	--	--
Hohenadal	339.17	338.01	321.93	321.96	322.32	322.21	322.16	322.13	321.98	321.87	321.51	321.77	321.72	321.71	--	--	322.06	322.03	322.31	322.44	322.29
Gauthier (now Cox)	325.10	325.92	324.20	324.12	324.31	324.37	324.40	324.36	324.20	324.07	324.01	324.01	324.03	323.99	323.97	324.04	324.18	324.24	325.06	324.73	324.44
Van Horsigh	323.39	323.90	322.05	321.94	322.21	322.19	322.02	322.10	322.00	321.93	321.94	321.93	322.02	322.00	321.96	322.07	322.19	322.17	322.52	322.26	322.14

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	19-Aug-11	05-Oct-11	26-Oct-11	30-Nov-11	21-Dec-11	24-Jan-12	23-Feb-12	28-Mar-12	17-Apr-12	24-May-12	Jun-12	30-Jul-12	31-Aug-12	28-Sep-12	26-Oct-12	22-Nov-12	18-Dec-12
Monitoring Well No.																			
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.69	324.44	323.76	324.56	324.65	324.76	324.80	324.91	324.84	324.75	--	324.32	324.15	324.07	324.06	324.14	324.14
OW1B-90	329.92	330.84	324.66	324.41	323.71	324.54	324.62	324.73	324.78	324.87	324.81	324.71	--	324.28	324.12	324.04	324.03	324.10	324.11
OW2-90	325.83	326.87	323.46	323.25	322.74	323.82	323.71	323.71	323.68	323.80	323.66	323.51	--	323.18	323.05	323.06	323.15	323.23	323.28
OW3-90	334.01	334.85	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW4-90	334.94	335.78	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW5-90	325.53	326.58	324.20	323.97	323.37	324.18	324.08	324.21	324.18	324.27	324.22	324.16	--	323.88	323.73	323.68	323.70	323.73	323.73
OW6-90	325.49	326.44	324.20	323.97	324.11	324.16	324.11	324.07	324.22	324.28	324.21	324.17	--	323.89	323.74	323.67	323.68	323.71	323.72
PW1-90	325.47	326.54	324.16	323.93	323.33	324.14	324.08	324.17	324.18	324.24	324.19	324.12	--	323.85	323.71	323.66	323.66	323.69	323.71
OW3R-05 (BH05-1)	324.27	325.30	323.79	323.55	322.98	323.84	323.79	323.85	323.89	323.97	323.87	323.73	--	323.47	323.34	323.32	323.34	323.38	323.40
OW4R-05 (BH05-3)	339.51	340.27	323.50	323.69	322.65	323.50	323.52	323.56	323.58	323.51	323.59	323.47	--	323.18	323.09	323.07	323.06	323.13	323.11
OW7-05 (BH05-2)	333.41	334.32	324.80	324.56	324.62	324.63	324.71	324.84	324.89	324.97	324.92	324.82	--	324.44	324.26	324.17	324.16	324.24	324.25
Private Well Location																			
Behmann	328.07	328.26	--	--	--	322.37	322.38	322.42	322.44	322.48	322.40	322.28	--	322.14	322.02	322.07	322.20	322.12	322.16
Hohenadal	339.17	338.01	321.99	321.75	321.94	321.82	322.06	322.05	321.80	321.83	--	322.00	--	321.71	321.57	321.56	321.60	321.62	321.63
Gauthier (now Cox)	325.10	325.92	324.24	324.13	324.09	324.25	324.26	324.27	324.31	324.37	324.32	324.24	--	324.04	323.91	323.91	323.91	323.96	323.93
Van Horsigh	323.39	323.90	322.00	321.98	322.22	322.42	322.22	322.22	322.16	322.21	322.13	322.05	--	321.95	321.90	321.97	322.06	322.07	322.06

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	29-Jan-13	13-Feb-13	12-Mar-13	15-Apr-13	09-May-13	21-Jun-13	25-Jul-13	09-Aug-13	30-Sep-13	29-Oct-13	27-Nov-13	20-Dec-13	23-Jan-14	7-Feb-14	21-Mar-14	28-Apr-14	29-May-14	30-Jun-14	24-Jul-14
Monitoring Well No.																					
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.31	324.38	324.50	324.84	325.00	324.98	324.87	324.78	324.61	324.64	324.70	324.68	324.74	324.77	324.76	325.09	325.15	325.02	324.92
OW1B-90	329.92	330.84	324.27	324.34	324.46	324.81	324.97	324.94	324.85	324.71	324.57	324.60	324.68	324.66	324.81	324.77	324.76	325.09	325.16	325.03	324.93
OW2-90	325.83	326.87	323.56	323.71	323.93	324.11	323.85	323.77	323.70	323.65	323.65	323.63	323.63	323.51	323.64	323.57	323.68	323.93	324.00	323.84	323.73
OW3-90	334.01	334.85	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW4-90	334.94	335.78	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW5-90	325.53	326.58	--	323.96	324.18	324.34	324.40	324.42	324.38	324.25	324.14	324.16	324.15	324.17	324.17	324.17	324.22	324.51	324.67	324.50	324.44
OW6-90	325.49	326.44	324.04	324.11	324.14	324.34	324.40	324.44	324.40	324.23	324.14	324.13	324.14	324.15	324.18	324.16	324.11	324.40	324.70	324.55	324.48
PW1-90	325.47	326.54	324.03	324.11	324.13	324.30	324.36	324.38	324.33	324.18	324.11	324.13	324.13	324.15	324.13	324.12	324.30	324.59	324.63	324.45	324.39
OW3R-05 (BH05-1)	324.27	325.30	--	323.53	323.86	324.10	324.07	324.08	324.02	323.86	323.74	323.76	323.78	323.67	323.70	323.64	323.74	323.83	323.98	324.07	324.01
OW4R-05 (BH05-3)	339.51	340.27	323.32	323.30	323.52	323.86	323.78	323.76	323.70	323.64	323.46	323.53	323.52	323.39	323.63	323.59	323.65	323.69	323.86	323.95	323.95
OW7-05 (BH05-2)	333.41	334.32	324.38	324.46	324.65	324.91	325.05	325.05	324.96	324.80	324.71	324.72	324.78	324.73	324.92	324.96	324.91	325.24	325.32	325.17	325.13
Private Well Location																					
Behmann	328.07	328.26	322.38	322.27	322.45	322.68	322.50	322.44	322.40	322.43	322.33	322.09	321.85	322.33	--	322.38	322.52	322.62	322.63	322.38	322.35
Hohenadal	339.17	338.01	321.83	321.84	321.97	322.42	322.33	322.29	322.20	322.19	321.97	322.03	321.71	321.94	--	--	--	322.43	322.52	322.68	321.33
Gauthier (now Cox)	325.10	325.92	324.12	324.07	324.22	324.42	324.47	324.45	324.40	324.39	323.16	324.30	324.30	324.37	--	325.30	--	324.56	324.60	324.49	324.44
Van Horsigh	323.39	323.90	322.39	322.05	322.39	322.44	322.24	322.17	322.13	322.15	321.01	322.20	322.17	322.27	--	--	--	322.32	322.24	322.14	322.11

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	29-Aug-14	15-Sep-14	15-0ct-14	14-Nov-14	18-Dec-14	15-Jan-15	27-Feb-15	18-Mar-15	29-Apr-15	29-May-15	19-Jun-15	27-Jul-15	19-Aug-15	16-Sep-15	15-Oct-15	18-Nov-15	9-Dec-15
Monitoring Well No.																			
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.88	324.85	324.71	324.67	324.75	324.67	324.60	324.60	324.79	324.69	324.83	324.64	324.57	324.42	324.29	324.30	324.29
OW1B-90	329.92	330.84	324.89	324.87	324.72	324.68	324.79	324.67	324.60	324.61	324.80	324.69	324.77	324.63	324.59	324.43	324.30	324.30	324.29
OW2-90	325.83	326.87	323.80	323.88	323.62	323.53	323.58	323.48	323.29	323.57	323.70	323.46	323.62	323.44	323.41	323.24	323.11	323.20	323.33
OW3-90	334.01	334.85	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW4-90	334.94	335.78	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW5-90	325.53	326.58	324.40	324.39	324.27	324.18	324.20	324.05	323.98	324.13	324.24	324.16	324.25	324.17	324.12	323.97	323.85	323.83	323.78
OW6-90	325.49	326.44	324.45	324.46	324.32	324.19	324.15	324.10	324.00	324.13	324.26	324.19	324.27	324.19	324.16	324.00	323.86	323.83	323.78
PW1-90	325.47	326.54	324.34	324.39	324.24	324.12	324.15	324.04	323.93	324.08	324.19	324.12	324.20	324.12	324.08	323.92	323.80	323.78	323.72
OW3R-05 (BH05-1)	324.27	325.30	323.98	324.02	323.82	323.72	323.80	323.84	323.43	323.60	323.82	323.64	323.90	323.66	323.64	323.43	323.34	323.35	323.44
OW4R-05 (BH05-3)	339.51	340.27	323.94	323.92	323.52	323.62	323.66	323.87	323.41	323.54	323.76	323.59	323.72	323.63	323.56	323.57	323.25	323.28	323.40
OW7-05 (BH05-2)	333.41	334.32	325.11	325.03	324.90	324.85	324.96	324.91	324.77	324.77	324.95	324.87	324.90	324.83	324.75	324.63	324.50	324.49	324.47
Private Well Location																			
Behmann	328.07	328.26	322.52	322.57	322.43	322.43	322.39	--	--	--	--	--	--	--	--	--	--	--	--
Hohenadal	339.17	338.01	322.59	322.31	322.08	321.52	322.02	--	--	--	--	--	--	--	--	--	--	--	--
Gauthier (now Cox)	325.10	325.92	324.46	324.44	324.36	324.28	324.34	--	--	--	--	--	--	--	--	--	--	--	--
Van Horsigh	323.39	323.90	322.18	322.27	322.16	322.11	322.12	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	12-Jan-16	23-Feb-16	23-Mar-16	26-Apr-16	31-May-16	15-Jun-16	11-Jul-16	23-Aug-16	9-Sep-16	26-Oct-16	14-Nov-16	9-Dec-16	25-Jan-17	14-Feb-17	28-Mar-17	28-Apr-17	31-May-17	30-Jun-17
Monitoring Well No.																				
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.31	324.43	325.13	324.99	324.97	324.88	324.58	324.49	324.51	324.25	324.24	324.20	324.51	324.76	324.93	325.09	325.10	325.03
OW1B-90	329.92	330.84	324.43	324.43	325.12	325.00	324.99	324.88	324.59	324.49	324.51	324.27	324.25	324.23	324.51	324.81	324.95	325.09	325.11	325.03
OW2-90	325.83	326.87	323.42	323.39	323.52	323.78	323.69	323.55	323.10	323.28	323.34	323.59	323.11	323.11	323.61	323.55	323.73	323.91	323.92	323.89
OW3-90	334.01	334.85	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW4-90	334.94	335.78	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW5-90	325.53	326.58	323.89	323.94	324.10	324.42	324.40	324.31	324.09	324.06	324.06	323.81	323.75	323.74	324.03	324.09	324.27	324.45	324.65	324.65
OW6-90	325.49	326.44	323.88	323.97	324.10	324.45	324.44	324.34	324.11	324.09	324.10	323.82	323.77	323.75	324.04	324.10	324.31	324.51	324.69	324.69
PW1-90	325.47	326.54	323.84	323.88	324.05	324.39	324.37	324.27	323.85	324.02	324.05	323.74	323.72	323.74	323.98	324.03	324.23	324.44	324.61	324.61
OW3R-05 (BH05-1)	324.27	325.30	323.41	323.45	323.68	323.99	323.96	323.87	323.56	323.59	323.62	323.35	323.31	323.30	323.59	323.64	323.87	324.09	324.23	324.22
OW4R-05 (BH05-3)	339.51	340.27	323.36	323.40	323.81	323.91	324.46	323.79	323.53	323.51	323.58	322.46	323.29	323.24	323.57	323.76	323.90	324.04	324.11	324.08
OW7-05 (BH05-2)	333.41	334.32	324.52	324.61	324.78	325.14	324.86	325.06	324.63	324.69	324.72	324.48	324.45	324.38	324.85	324.93	325.08	325.23	325.29	325.21
Private Well Location																				
Behmann	328.07	328.26	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hohenadal	339.17	338.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gauthier (now Cox)	325.10	325.92	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Van Horsigh	323.39	323.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.3

Historical and 2018 Groundwater Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Well	Ground Elevation (m AMSL)	Measuring Point Elevation (m AMSL)	28-Jul-17	31-Aug-17	28-Sep-17	24-Oct-17	28-Nov-17	19-Dec-17	29-Jan-18	28-Feb-18	30-Mar-18	26-Apr-18	22-May-18	19-Jun-18	23-Jul-18	16-Aug-18	21-Sep-18	23-Oct-18	16-Nov-18	10-Dec-18
Monitoring Well No.																				
OW1-76	333.23	333.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW9-76	332.45	333.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OW1A-90	329.89	330.71	324.98	324.78	324.62	324.54	324.45	324.42	324.45	324.59	324.75	324.91	324.89	324.88	324.70	324.52	324.23	324.15	324.11	324.15
OW1B-90	329.92	330.84	324.97	324.77	324.62	324.51	324.42	324.39	324.42	324.55	324.72	324.89	324.87	324.86	324.67	324.49	324.22	324.12	324.09	324.13
OW2-90	325.83	326.87	323.75	323.53	323.36	323.34	323.37	323.31	323.63	323.82	323.86	323.92	323.85	323.69	323.55	323.42	323.25	323.20	323.17	323.16
OW3-90	334.01	334.85	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW4-90	334.94	335.78	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A	S&A
OW5-90	325.53	326.58	324.55	324.35	324.23	324.13	324.01	323.92	324.11	324.24	324.33	324.43	324.48	324.47	324.34	324.19	323.96	323.87	323.83	323.80
OW6-90	325.49	326.44	324.59	324.41	324.33	324.16	324.00	323.93	324.10	324.21	324.29	324.47	324.46	324.49	324.35	324.21	323.97	323.88	323.84	323.81
PW1-90	325.47	326.54	324.50	324.32	324.19	324.13	323.98	323.93	324.10	324.23	324.32	324.42	324.44	324.43	324.30	324.18	323.97	323.86	323.81	323.77
OW3R-05 (BH05-1)	324.27	325.30	324.12	323.89	323.73	323.73	323.59	323.56	323.69	323.92	324.04	324.16	324.11	324.09	323.97	323.83	323.57	323.50	323.50	323.47
OW4R-05 (BH05-3)	339.51	340.27	324.04	323.85	323.70	323.47	323.37	323.38	323.53	323.74	323.99	324.10	324.11	323.86	323.75	323.63	323.38	323.34	323.32	323.31
OW7-05 (BH05-2)	333.41	334.32	325.16	324.99	324.85	324.66	324.55	324.54	324.55	324.67	324.77	324.98	324.97	324.97	324.83	324.68	324.40	324.27	324.27	324.24
Private Well Location																				
Behmann	328.07	328.26	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hohenadal	339.17	338.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gauthier (now Cox)	325.10	325.92	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Van Horsigh	323.39	323.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

mAMSL	Metres above mean sea level
--	Water level not measured
323.59*	water level taken on second date noted
S&A	Monitoring well was properly sealed and abandoned
	Reference points re-surveyed on October 5, 2017

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	7-Jun-90	19-Jun-90	28-Jun-90	10-Jul-90	17-Jul-90	31-Jul-90	1-Aug-90	15-Aug-90	7-Sep-90	11-Oct-90	30-Nov-90	20-Dec-90	21-Feb-91	3-Apr-91	7-May-91	18-Jun-91	17-Sep-92	8-Dec-93
SW1-90	326.36	326.10	325.91	dry	dry	325.52	dry	dry	dry	325.13	325.24	325.42	325.69	F	326.16	326.21	326.16	--	326.16
SW2-91	326.59	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	326.09	326.19
SW3-91	327.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	326.08	326.01
SW4-91	327.14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	326.08	326.03
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pond 1	324.60	--	--	--	--	324.26	324.17	324.16	--	--	--	323.44	--	--	324.82	324.79	324.38	--	--
Pond 2	326.64	--	--	--	--	325.93	325.84	325.82	325.73	325.67	--	325.77	F	F	326.29	326.32	326.21	326.07	325.88
WP1-93	327.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	326.01

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	6-May-94	18-Aug-94	28-Nov-94	11-Apr-95	5-May-95	26-May-95	26-Jun-95	27-Jun-95	31-Aug-95	22-Sep-95	27-Oct-95	30-Nov-95	19-Apr-96	6-Jun-96	4-Jul-96	6-Aug-96	10-Sep-96	12-Dec-96
SW1-90	326.36	--	326.03	dry	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	--	dry	dry	326.55	326.70	326.61	326.37	dry	dry	dry	dry	326.27	326.85	326.78	326.70	326.60	326.38	326.64
SW3-91	327.10	326.33	dry	dry	326.22	326.31	326.21	326.02	dry	dry	dry	dry	326.01	326.46	326.41	326.30	326.20	326.09	326.25
SW4-91	327.14	--	dry	dry	326.32	326.35	326.28	326.08	dry	dry	dry	dry	326.06	326.49	326.71	326.33	326.25	326.12	326.58
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pond 1	324.60	324.62	323.60	--	323.67	324.01	323.71	323.39	--	--	--	--	323.50	324.05	323.87	323.91	323.63	dry	323.65
Pond 2	326.64	326.36	dry	dry	326.26	326.34	326.26	326.01	325.73	dry	dry	dry	325.92	326.51	326.42	326.34	326.25	326.02	326.27
WP1-93	327.05	326.34	325.73	325.71	326.18	326.30	326.22	325.82	325.74	325.61	325.61	325.67	325.83	326.21	326.33	326.27	326.19	326.06	325.95

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	31-Mar-97	2-Apr-97	2-Jun-97	11-Jul-97	27-Aug-97	13-Nov-97	30-Apr-98	26-Jun-98	31-Jul-98	26-Aug-98	30-Dec-98	28-May-99	25-Jun-99	2-Aug-99	31-Aug-99	30-Sep-99	28-Oct-99	30-Nov-99	21-Dec-99
SW1-90	326.36	--	--	--	--	326.26	326.26	325.71	326.05	326.26	326.30	--	dry	dry	dry	dry	dry	dry	dry	dry
SW2-91	326.59	326.97	--	326.75	326.53	326.32	326.32	326.71	326.38	326.30	326.38	326.30	dry	dry	dry	dry	dry	dry	dry	dry
SW3-91	327.10	326.56	--	326.28	326.14	326.05	326.06	326.24	326.03	325.97	326.02	325.96	dry	dry	dry	dry	dry	dry	dry	dry
SW4-91	327.14	326.66	--	326.66	326.23	326.36	326.15	326.22	326.00	325.94	326.02	325.89	dry	dry	dry	dry	dry	dry	dry	dry
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pond 1	324.60	--	324.07	323.95	323.49	dry	dry	323.59	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
Pond 2	326.64	--	F	326.37	326.15	325.94	325.93	326.35	325.98	325.45	325.48	dry	326.44	326.59	dry	dry	dry	dry	dry	dry
WP1-93	327.05	326.42	--	326.17	326.10	326.02	326.01	326.33	326.11	dry	dry	325.43	325.80	325.75	325.49	325.25	325.52	325.23	325.50	325.45

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	28-Jan-00	25-Feb-00	28-Feb-00	30-Mar-00	5-May-00	31-May-00	16-Jun-00	28-Jun-00	31-Jul-00	11-Aug-00	31-Aug-00	2-Oct-00	31-Oct-00	30-Nov-00	13-Dec-00
SW1-90	326.36	dry	dry	--	dry	dry	326.06	--	326.16	326.26	--	326.21	326.26	dry	dry	--
SW2-91	326.59	dry	dry	--	dry	dry	326.29	--	326.31	326.29	--	326.29	dry	dry	dry	--
SW3-91	327.10	dry	dry	--	dry	dry	326.01	--	326.14	326.01	--	325.98	325.96	dry	dry	--
SW4-91	327.14	dry	dry	--	dry	dry	326.08	--	326.20	326.14	--	326.08	326.05	dry	dry	--
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pond 1	324.60	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	--	--
Pond 2	326.64	dry	dry	dry	dry	326.37	326.17	326.09	326.01	326.29	dry	326.41	326.59	dry	--	--
WP1-93	327.05	325.30	325.56	--	325.61	325.89	326.02	--	326.07	325.98	--	326.03	325.76	325.47	325.61	325.49

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	3-Jan-01	24-Jan-01	5-Mar-01	29-Mar-01 (30-Mar-01)	30-Apr-01	1-Jun-01	28-Jun-01	24-Jul-01	30-Aug-01	2-Oct-01	29-Oct-01 (6-Nov-01)	26-Nov-01	18-Dec-01
SW1-90	326.36	dry	--	326.04 F	325.98	--	325.90	muck	dry (muck)	dry	dry	dry	dry	dry
SW2-91	326.59	dry	--	326.47 F	325.51	>327.21	326.46	dry	dry	dry	dry	dry	dry	dry
SW3-91	327.10	dry	--	326.10 F	326.08	--	326.11	dry	dry	dry	dry	dry	dry	dry
SW4-91	327.14	dry	--	326.19 F	326.04	--	326.00	dry	dry	dry	dry	dry	dry	dry
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	323.35	323.24
SW6-03	325.00	--	--	--	--	--	--	--	--	--	--	--	--	--
Pond 1	324.60	--	--	--	323.82*	--	--	dry	dry	dry	dry	dry	dry	dry
Pond 2	326.64	326.41	326.09 (snow)	326.29 (snow)	326.25	--	--	326.55	dry	dry	dry	dry*	dry	dry
WP1-93	327.05	325.65	325.66	326.05 F	326.25	326.30	326.12	325.97	325.66	325.35	325.27	325.39	325.63	325.82

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	1-Feb-02 (for Jan.)	25-Feb-02	27-Mar-02	30-Apr-02	3-Jun-02	27-Jun-02	1-Jul-02	1-Aug-02	2-Sep-02	23-Oct-02	26-Nov-02	29-Nov-02	12-Dec-02	3-Jan-03	3-Feb-03	26-May-03	23-Jun-03	30-Oct-03	17-Dec-03 (for Nov.)	31-Dec-03
SW1-90	326.36	dry	dry	fallen	--	--	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	--	--	--	--	--
SW2-91	326.59	dry	dry	326.36	326.60	326.65	326.44	fallen	fallen	fallen	fallen	fallen	dry	fallen	dry	dry	325.61	dry	--	--	325.66
SW3-91	327.10	dry	dry	326.04	326.15	326.20	326.01	dry	dry	dry	dry	dry	dry	dry	dry	dry	325.93	dry	--	--	325.88
SW4-91	327.14	dry	dry	F	326.24	326.18	325.98	dry	dry	dry	dry	dry	dry	dry	dry	dry	325.94	dry	--	--	325.91
SW5-01	324.06	323.06 F	323.49	323.56	323.74	--	--	323.49	323.43	323.35	323.26	323.26	--	323.23 F	323.23 F	323.23 F	323.52	323.49	--	323.46	323.49
SW6-03	325.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pond 1	324.60	dry	dry	dry	323.72	323.64	dry	dry	dry	dry	dry	dry	--	dry	--	--	323.47	323.14	--	--	323.54
Pond 2	326.64	F	325.62	325.75	326.02	326.21	326.18	326.56	dry	dry	dry	dry	--	dry	dry	dry	325.22	325.59	326.52	--	325.63
WP1-93	327.05	F	325.95	F	326.32	326.30	326.13	326.05	325.70	325.60	325.56	325.49	325.26	325.26	325.25	325.16	326.02	325.81	--	--	326.05

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	29-Jan-04	25-Feb-04	16-Mar-04	23-Apr-04	27-May-04	29-Jun-04	29-Jul-04	31-Aug-04	30-Sep-04	28-Oct-04	30-Nov-04	13-Jan-05	31-Jan-05	28-Feb-05	31-Mar-05	2-May-05	30-May-05	28-Jun-05	29-Jul-05
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	dry	dry	F	326.13	326.11	325.83	325.61	dry	dry	dry	dry	325.69	F	F	326.01	326.17	325.89	dry	dry
SW3-91	327.10	dry	dry	F	326.60	326.55	326.37	326.18	dry	dry	dry	dry	326.19	F	F	326.46	326.55	326.42	326.20	dry
SW4-91	327.14	dry	dry	F	326.51	326.28	326.00	325.89	dry	dry	dry	dry	325.90	F	F	326.23	326.34	326.19	325.94	dry
SW5-01	324.06	323.65	323.64	323.61	323.59	323.57	323.58	323.59	323.59	323.61	323.59	323.60	323.59	323.59	323.60	323.60	323.58	323.60	323.58	323.60
SW6-03	325.00	--	--	325.06	324.89	324.94	324.85	324.68	324.54	324.36	324.22	324.19	324.24	F	F	F	324.84	324.73	324.32	324.54
Pond 1	324.60	dry	dry	F	323.89	323.89	323.40	323.19	dry	dry	dry	dry	323.60	323.51	323.72	323.75	323.97	323.51	323.24	dry
Pond 2	326.64	325.62	325.48	324.98	325.14	325.21	325.51	325.49	325.33	325.25	dry	325.27	325.58	325.54	325.49	325.47	325.17	325.44	325.46	325.32
WP1-93	327.05	326.06	326.06	326.06	326.25	326.40	326.12	325.97	325.84	325.78	325.73	325.69	326.10	326.00	326.05	326.12	326.46	326.21	326.09	325.96

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	2-Sep-05 (for Aug.)	3-Oct-05 (for Sep.)	31-Oct-05	22-Nov-05	21-Dec-05	1-Feb-06 (for Jan.)	Feb-06	Mar-06	Apr-06	May-06	30-Jun-06	Jul-06	21-Aug-06	22-Sep-06	17-Oct-06	21-Nov-06	5-Dec-06
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	dry	dry	dry	dry	dry	325.71	F	F	326.17	--	dry	--	dry	dry	dry	325.70	325.79
SW3-91	327.10	dry	dry	dry	dry	dry	326.00	F	F	326.33	--	dry	--	dry	dry	325.92	325.97	326.03
SW4-91	327.14	dry	dry	dry	dry	dry	325.95	F	F	326.30	--	dry	--	dry	dry	326.22	325.95	326.12
SW5-01	324.06	323.59	323.60	323.61	323.50	323.52	323.53	No Longer Monitored at Request of Owner				--	--	--	--	No Longer Monitored at Request of Owner		
SW6-03	325.00	324.59	324.61	324.54	dry	--	--	F	--	--	--	--	--	324.45	--	--	324.64	324.74
Pond 1	324.60	dry	dry	dry	323.19	dry	F	F	323.90	323.78	--	323.15	--	323.11	323.16	323.15	323.36	F
Pond 2	326.64	325.32	325.24	325.14	325.00	325.46	325.36	324.24	F	F	--	--	--	--	--	--	325.35	F
WP1-93	327.05	325.92	325.84	325.80	325.72	325.75	326.08	326.27	326.44	326.41	--	325.85	--	325.76	325.57	325.65	326.05	326.19

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	30-Jan-07	28-Feb-07	29-Mar-07	18-Apr-07	1-May-07	29-Jun-07	7-Jul-07	14-Aug-07	12-Sep-07	22-Oct-07	30-Nov-07	12-Dec-07	30-Jan-08	28-Feb-08	31-Mar-08	30-Apr-08	26-May-08
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	F	F	326.26	326.19	--	dry	dry	dry	dry	dry	dry	dry	dry	dry	--	326.31	326.28
SW3-91	327.10	F	F	326.49	326.40	--	dry	dry	dry	dry	dry	dry	dry	dry	dry	--	326.32	326.28
SW4-91	327.14	F	F	326.51	326.55	--	dry	dry	dry	dry	dry	dry	dry	dry	dry	not acc.	326.44	326.41
SW5-01	324.06		--	--	--	--	--	--	--	No Longer Monitored at Request of Owner				--	--	--	--	--
SW6-03	325.00	F	F	F	325.04	--	324.30	324.30	324.30	323.96	dry	F	--	F	F	SG Missing	SG Missing	325.03
Pond 1	324.60	323.48	F	324.09	--	--	dry	dry	dry	dry	dry	Not Accessible (owner has area taped off)				not acc.	not acc.	not acc.
Pond 2	326.64	F	F	--	--	--	dry	dry	dry	1.87	1.920	1.920	1.920		F	326.24	326.33	326.42
WP1-93	327.05	F	F	326.54	326.60	--	325.64	325.48	325.47	325.45	--	--	--	--	--	--	326.34	326.30

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	**Measuring Point Elevation (m AMSL)**	**25-Jun-08**	**15-Jul-08**	**20-Aug-08**	**22-Sep-08**	**20-Oct-08**	**7-Nov-08**	**8-Dec-08**	**9-Jan-09**	**23-Feb-09**	**17-Mar-09**	**30-Apr-09**	**21-May-09**	**29-Jun-09**	**31-Jul-09**	**19-Aug-09**	**30-Sep-09**	**21-Oct-09**	**26-Nov-09**	**22-Dec-09**
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	No Longer Monitored at Request of Owner				--	--	--	No Longer Monitored at Request of Owner				--	--	--	--	--	--	--	--
SW3-91	327.10	No Longer Monitored at Request of Owner				--	--	--	No Longer Monitored at Request of Owner				--	--	--	--	--	--	--	--
SW4-91	327.14	No Longer Monitored at Request of Owner				--	--	--	No Longer Monitored at Request of Owner				--	--	--	--	--	--	--	--
SW5-01	324.06	No Longer Monitored at Request of Owner				--	--	--	No Longer Monitored at Request of Owner				--	--	--	--	--	--	--	--
SW6-03	325.00	324.95	324.86	324.70	324.53	324.39	324.36	324.46 F	324.46 F	324.42 F	324.56	324.93	324.92	325.02	325.12	325.17	325.23	325.21	324.14	324.04 F
Pond 1	324.60	Not Accessible (owner has area taped off)				not acc.	not acc.	324.04	324.07 F	324.45 F	not acc.	324.82	324.71	324.30	324.15	324.13	324.09	324.09	323.99	324.10
Pond 2	326.64	326.13	326.08	325.97	325.89	325.83	325.74	325.87 F	325.84 F	326.35 F	326.50 F	326.48	326.39	326.13	325.88	325.84	325.83	325.82	325.74	325.86 F
WP1-93	327.05	No Longer Monitored at Request of Owner				--	--	--	No Longer Monitored at Request of Owner				--	--	--	--	--	--	--	--

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	**Measuring Point Elevation (m AMSL)**	**15-Jan-10**	**24-Feb-10**	**30-Mar-10**	**19-Apr-10**	**31-May-10**	**23-Jun-10**	**23-Jul-10**	**31-Aug-10**	**22-Sep-10**	**28-Oct-10**	**23-Nov-10**	**21-Dec-10**	**21-Jan-11**	**14-Feb-11**	**20-Mar-11**	**14-Apr-11**	**19-May-11**	**23-Jun-11**	**7-Jul-11**
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW3-91	327.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW4-91	327.14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	324.04	323.95	324.21	324.29	324.21	324.18	324.09	323.80	<324.48	<324.48	<324.48	--	<324.91 F	<324.91 F	324.56 F	324.65	324.93	325.06	325.05
Pond 1	324.60	324.07	324.04	324.35	324.31	324.05	324.16	323.82	323.82	--	--	--	--	--	--	324.24	324.19	too deep	324.41	324.30
Pond 2	326.64	325.82	325.79 F	326.42	326.41	325.88	325.85	325.70	325.59	325.55	325.62	325.63	F	325.69	325.81	326.10 F	326.17	326.44	326.33	326.13
WP1-93	327.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Pond 1 located on Gauthier (now Cox) property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
For September to November 2010: Water receded too far from staff gauge to measure (water level assumed to be >1.500 m below top of staff gauge plate)
m AMSL - metres Above Mean Sea Level
Pond 2 located on Whittle property
-- - water level not measured
* - water level measured on second date indicated
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	19-Aug-11	5-Oct-11	26-Oct-11	30-Nov-11	21-Dec-11	24-Jan-12	23-Feb-12	28-Mar-12	17-Apr-12	24-May-12	Jun-12	30-Jul-12	31-Aug-12	28-Sep-12	26-Oct-12	22-Nov-12	18-Dec-12
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	--	--	--	--	--	--	325.99 F	326.27	325.97	dry	--	dry	dry	dry	dry	dry	dry
SW3-91	327.10	--	--	--	--	--	--	326.07 F	326.10	325.95	dry	--	dry	dry	dry	dry	dry	dry
SW4-91	327.14	--	--	--	--	--	--	326.04 F	326.15	325.97	dry	--	dry	dry	dry	dry	dry	dry
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	324.70	<324.48	324.52	324.51	324.61	324.72	324.59	324.71	324.66	324.57	--	324.24	324.10	324.05	324.03	323.89	324.11
Pond 1	324.60	323.92	323.77	323.86	--	323.90	324.21 F	324.19 F	324.26	323.80	324.04	--	323.71	323.65	323.57	323.68	323.78	323.79
Pond 2	326.64	325.63	325.57	325.66	325.82	326.07	325.98 F	325.91	326.24	325.91	325.72	--	325.52	325.48	325.51	325.50	325.60	325.63
WP1-93	327.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Pond 1 located on Gauthier (now Cox) property
Pond 2 located on Whittle property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
-- - water level not measured
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	29-Jan-13	13-Feb-13	12-Mar-13	15-Apr-13	9-May-13	21-Jun-13	25-Jul-13	9-Aug-13	30-Sep-13	29-Oct-13	27-Nov-13	23-Jan-14	7-Feb-14	21-Mar-14	28-Apr-14	29-May-14	30-Jun-14	24-Jul-14
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	dry	--	dry	326.58	326.42	326.15	325.90	325.88	dry	dry	325.86	--	--	--	326.21	326.41	326.68	--
SW3-91	327.10	dry	--	325.94	326.36	326.25	325.99	dry	dry	dry	dry	325.96	--	--	--	326.34	326.18	325.95	--
SW4-91	327.14	dry	--	dry	326.45	326.33	dry	dry	dry	dry	dry	326.01	--	--	--	326.38	326.37	326.01	--
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	324.29	324.31 F	324.29	324.65	324.84	324.86	324.76	324.60	324.00	324.48	324.55	324.68	--	324.77	325.21	--	--	--
Pond 1	324.60	324.08	324.05 F	324.32	324.32	324.34	324.32	324.15	324.16	323.95	324.12	324.17 F	--	324.86	--	324.82	324.66	324.30	324.14
Pond 2	326.64	325.77	325.84	325.85	326.59	326.40	326.11	325.94	325.87	325.69	325.82	326.22	--	326.68	--	326.01	326.09	325.60	325.40
WP1-93	327.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Pond 1 located on Gauthier (now Cox) property
Pond 2 located on Whittle property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
-- - water level not measured
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	29-Aug-14	15-Sep-14	15-Oct-14	14-Nov-14	18-Dec-14	15-Jan-15	27-Feb-15	18-Mar-15	29-Apr-15	29-May-15	19-Jun-15	27-Jul-15	19-Aug-15	16-Sep-15	15-0ct-15	18-Nov-15	9-Dec-15
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	--	326.49	--	--	--	--	--	--	326.47	--	--	--	--	--	--	--	--
SW3-91	327.10	--	325.98	--	--	--	--	--	--	326.09	--	--	--	--	--	--	--	--
SW4-91	327.14	--	326.00	--	--	--	--	--	--	326.12	--	--	--	--	--	--	--	--
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	--	324.95	324.98	325.10	325.05	--	--	--	--	325.11	325.10	325.23	325.46	325.45	325.33	325.35	325.35
Pond 1	324.60	324.26	324.70	324.67	324.56	324.60	--	--	324.57	324.67	324.62	324.42	324.36	324.35	324.16	324.09	324.20	324.16
Pond 2	326.64	326.24	325.88	326.08	326.19	326.10	--	--	325.80	325.38	325.78	325.82	325.90	325.90	325.99	326.07	325.96	325.97
WP1-93	327.05	--	--	--	--	--	--	--	--	--	--	--	--	--	325.53	325.41	325.58	325.58

Notes:

Pond 1 located on Gauthier (now Cox) property
Pond 2 located on Whittle property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
-- - water level not measured
F - frozen

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	12-Jan-16	23-Feb-16	23-Mar-16	26-Apr-16	31-May-16	15-Jun-16	11-Jul-16	23-Aug-16	9-Sep-16	26-Oct-16	14-Nov-16	9-Dec-16	25-Jan-17	14-Feb-17	28-Mar-17	28-Apr-17	31-May-17
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	--	--	326.29	326.23	326.56	326.79	dry	dry	--	--	--	--	325.76	F	326.47	326.33	326.24
SW3-91	327.10	--	--	326.38	326.27	326.01	--	--	--	--	--	--	--	--	--	--	--	--
SW4-91	327.14	--	--	326.40	326.28	326.09	--	--	--	--	--	--	--	--	--	--	--	--
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	F	F	--	--	--	325.12	325.67	--	--	324.20	324.16	324.14	--	F	324.95	325.07	325.25
Pond 1	324.60	--	--	324.59	324.63	324.55	324.42	324.27	324.19	324.24	324.46	324.08	324.10	F	F	324.50	324.56	324.57
Pond 2	326.64	--	--	--	--	325.64	325.76	325.83	325.99	325.93	326.08	326.04	325.98	F	F	326.05	326.46	326.37
WP1-93	327.05	325.56	325.78	326.41	326.30	326.02	325.89	325.56	325.52	325.61	325.40	325.45	325.44	326.01	326.29	326.39	326.49	326.37

Notes:

Pond 1 located on Gauthier (now Cox) property
Pond 2 located on Whittle property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
-- - water level not measured
F - frozen
Reference points re-surveyed on October 5, 2017

Table 3.4

Historical and 2018 Surface Water Elevations
Aberfoyle Pit No. 2
Dufferin Aggregates

Surface Water Location	Measuring Point Elevation (m AMSL)	30-Jun-17	28-Jul-17	31-Aug-17	28-Sep-17	24-Oct-17	28-Nov-17	19-Dec-17	29-Jan-18	28-Feb-18	30-Mar-18	26-Apr-18	22-May-18	19-Jun-18	23-Jul-18	16-Aug-18	21-Sep-18	23-Oct-18	16-Nov-18	10-Dec-18
SW1-90	326.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW2-91	326.59	326.04	325.85	dry	dry	dry	dry	dry	325.87	326.02	326.17	326.33	325.91	325.77	dry	dry	dry	dry	dry	dry
SW3-91	327.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW4-91	327.14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW5-01	324.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW6-03	325.00	325.15	325.05	324.83	324.69	324.56	324.46	324.40	324.45	324.58	324.72	324.95	324.92	324.90	324.68	324.52	324.27	324.15	324.10	324.15
Pond 1	324.60	324.40	324.24	324.05	323.94	323.88	323.98	323.86	323.60	324.31	324.39	324.45	324.32	324.16	324.08	323.92	323.83	323.75	323.68	323.62
Pond 2	326.64	326.14	325.86	325.56	325.54	325.50	325.60	325.58	325.64	325.99	326.17	326.37	326.08	325.80	325.64	325.54	325.54	325.44	325.39	325.34
WP1-93	327.05	326.28	325.95	325.76	325.59	325.57	325.63	325.51	325.92	326.27	326.40	326.42	326.31	325.99	325.80	325.60	325.47	325.48	325.41	325.40

Notes:

Pond 1 located on Gauthier (now Cox) property
Pond 2 located on Whittle property
SW5-01 is Hayden Pond
SW6-03 located near OW1A/B-90
m AMSL - metres Above Mean Sea Level
-- - water level not measured
F - frozen
Reference points re-surveyed on October 5, 2017

Table 3.5

Chemistry Results for Monitoring Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

Parameter	MOE ODWS (1)	OW1A-90											
		6/28/1990	5/26/1995	7/30/1999	8/24/2000	12/13/2000	5/29/2001	11/26/2001	11/29/2002	12/31/2003	12/30/2004	11/22/2005	11/21/2006
pH	6.5 - 8.5	7.7	7.3	7.6	6.84	7.16	7.28	7.21	7.37	7.68	7.34	7.06	7.03
Conductivity (μmhos/cm)	--	500	400	339	463	458	458	440	449	416	602	425	494
Chloride (as Cl)	250	9	2.7	7.52	2.37	<3.0	<3.0	<3.0	2.2	3.4	3.7	4	5
Sulphate (as SO_4)	500	30	25.6	15.5	25.5	20.9	16.3	17	19.4	22.7	20.2	19	14
Nitrate (as N)	10.0	<0.05	<0.10	0.8	<0.04	0.34	0.29	0.12	<0.2	<0.2	0.3	<0.1	<0.1
Nitrite (as N)	1.0	<0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.2	<0.2	<0.2	<0.1	<0.1
Total Phosphorus	--	0.02	0.05	0.11	0.01	0.12	<0.01	0.008	0.015	2.92	0.75	2.50	1.05
Calcium (as Ca)	--	69.7	67.5	60.7	356	413	67.9	58.9	53.1	51.3	52.7	64.5	53.2
Iron (as Fe)	0.3	0.64	0.77	<0.01	0.413	0.302	0.155	0.1	0.10	0.09	<0.03	0.06	0.09
Magnesium (as Mg)	--	24.8	33.3	30.6	39.9	36.4	35.4	30.2	28.5	28.4	28.9	35.6	30.7
Potassium (as K)	--	3.25	1.24	1.2	1.97	1.9	1.1	1.3	1.1	0.9	1.1	2	<1
Sodium (as Na)	200	3.6	4.49	6.5	6.34	6.4	5.2	5.1	5.0	4.9	4.9	5.4	5.0
TPH (Gas/Diesel) (µg/L)	--	--	--	--	--	--	--	<100	--	--	--	--	--
TPH (Heavy Oils)	--	--	--	--	--	--	--	<1	--	--	--	--	--

Notes:

All concentrations expressed in mg/L unless otherwise noted.
(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Table 3.5

Chemistry Results for Monitoring Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	OW1A-90											
Parameter	**ODWS [(1)]**	**12/27/2007**	**12/8/2008**	**1/15/2010**	**12/21/2010**	**12/21/2011**	**12/18/2012**	**11/27/2013**	**9/15/2014**	**8/19/2015**	**9/9/2016**	**10/24/2017**	**9/21/2018**
pH	6.5 - 8.5	7.00	7.35	7.43	6.97	7.57	8.45	8.06	7.49	7.52	7.53	6.15	7.20
Conductivity (µmhos/cm)	--	530	523	558	410	539	751	559	556	447	560	562	587
Chloride (as Cl)	250	7	20	9.7	10.7	11.5	13.0	13.4	15.3	17.4	17.9	18.8	21.2
Sulphate (as SO_4)	500	40	23	20.5	21.6	21.9	22.0	21.5	22.3	23.1	22.6	22.6	21.6
Nitrate (as N)	10.0	<0.1	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.020	<0.020	<0.020	<0.020
Nitrite (as N)	1.0	0.4	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
Total Phosphorus	--	0.42	1.40	0.962	1.07	0.516	1.04	0.565	0.357	0.595	0.936	0.320	0.0397
Calcium (as Ca)	--	62.6	57.0	65.3	63.0	66.5	70.4	65.4	66.2	67.2	64.3	64.3	64.6
Iron (as Fe)	0.3	<0.05	<0.05	<0.050	<0.050	<0.050	1.07	0.957	1.01	0.973	0.859	1.09	1.00
Magnesium (as Mg)	--	22.4	37.0	34.7	34.4	34.2	38.3	32.9	31.9	35.6	34.4	34.2	33.1
Potassium (as K)	--	<1	<1	1.1	<1.0	<1.0	1.2	<1.0	<1.0	1.18	1.28	1.02	1.06
Sodium (as Na)	200	4.2	6.0	5.11	5.28	6.00	6.22	5.89	6.22	6.91	6.69	7.46	7.25
TPH (Gas/Diesel) (µg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (Heavy Oils)	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

All concentrations expressed in mg/L unless otherwise noted.
(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Table 3.5

Chemistry Results for Monitoring Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	OW1B-90												
Parameter	**ODWS (1)**	**6/28/1990**	**8/12/1993**	**5/26/1995**	**7/30/1999**	**8/24/2000**	**12/13/2000**	**5/29/2001**	**11/26/2001**	**11/29/2002**	**12/31/2003**	**12/30/2004**	**11/22/2005**	**11/21/2006**
pH	6.5 - 8.5	7.5	6.6	7.0	6.99	7.01	6.86	6.95	6.87	7.17	7.47	7.2	6.96	6.89
Conductivity (µmhos/cm)	--	570	300	500	398	587	596	604	574	546	518	769	492	564
Chloride (as Cl)	250	14	--	16.3/16.2	19.0/16.7	12.8	13.8	10.9/11.1	15.3	22.9	22.6	39.4	35	44
Sulphate (as SO_4)	500	69	--	27.2/27.1	10.4/8.82	71.8	39.9	52.8/53.8	52.1	50.3	57.4	22.4	23	15
Nitrate (as N)	10.0	<0.05	--	<0.10/<0.10	0.38/0.67	<0.04	0.17	0.18/<0.04	<0.04	<0.2	<0.2	<0.2	<0.1	<0.1
Nitrite (as N)	1.0	0.08	--	<0.10/<0.10	<0.10/<0.10	<0.10	<0.10	<0.10/<0.10	<0.10	<0.2	<0.2	<0.2	<0.1	<0.1
Total Phosphorus	--	0.105	--	0.03/0.03	0.13/0.13	0.19	0.07	<0.01/<0.01	0.032	0.030	0.044	0.13	0.13	0.05
Calcium (as Ca)	--	78.6	--	80.4/81.0	95.9/95.4	156	122	130/108	94.6	77.0	76.7	74.1	87.5	71.8
Iron (as Fe)	0.3	2.51	--	0.28/0.24	1.43/1.40	1.67	2.18	2.08/2.09	2.04	1.68	1.64	1.52	0.82	0.90
Magnesium (as Mg)	--	24.3	--	25.2/25.3	26.6/26.4	47.2	39.3	34.9/34.7	29.3	23.9	24.8	23.7	28.7	24.3
Potassium (as K)	--	3.37	--	1.44/1.42	0.8/0.7	1.54	1.0	0.9/0.9	0.9	0.6	0.6	0.7	1	<1
Sodium (as Na)	200	3.4	--	6.93/6.93	8.4/8.4	10.2	7.5	7.6/7.3	5.7	7.4	8.9	13.1	16.0	17.7
TPH (Gas/Diesel) (µg/L)	--	--	<20/<20	<10/<10	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TPH (Heavy Oils)	--	--	--/--	--	<1	<1	<1	<1	<1	<3	<1	<1	<1	1/<1 (2)

Notes:

All concentrations expressed in mg/L unless otherwise noted.
(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.
(2) 1/<1 (TPH) - November 21, 2006/February 1, 2007.

Table 3.5

Chemistry Results for Monitoring Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	OW1B-90											
Parameter	**ODWS (1)**	**12/27/2007**	**12/8/2008**	**1/15/2010**	**12/21/2010**	**12/21/2011**	**12/18/2012**	**11/27/2013**	**9/15/2014**	**8/19/2015**	**9/9/2016**	**10/24/2017**	**9/21/2018**
pH	6.5 - 8.5	6.83	7.05	7.19	6.85	7.51	8.86	7.47	7.24	7.26	7.83	6.13	7.00
Conductivity (µmhos/cm)	--	634	581	613	449	597	1,040	583	634	461	539	626	613
Chloride (as Cl)	250	41	51	39.7	36.4	39.8	38.7	41.1/41.0	57.4	43.7	49.7	59.7	60.9
Sulphate (as SO_4)	500	13	12	4.5	9.0	9.2	18.0	9.0/9.1	<3.0	3.67	13.9	5.21	7.68
Nitrate (as N)	10.0	<0.1	0.4	<0.10	<0.10	<0.10	<0.10	<0.10/<0.10	<0.10	<0.020	<0.020	<0.020	<0.020
Nitrite (as N)	1.0	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10/<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
Total Phosphorus	--	0.07	0.07	0.0230	0.076	0.064	0.068	0.048/0.054	0.041	0.039	0.0345	0.0312	0.0359
Calcium (as Ca)	--	74.5	70.9	79.4	71.2	81.9	79.4	81.7/78.2	73.0	71.9	65.0	69.2	65.7
Iron (as Fe)	0.3	1.77	1.45	0.991	0.929	0.936	1.58	1.18/1.14	1.040	1.02	0.886	0.928	0.841
Magnesium (as Mg)	--	24.6	27.2	23.2	24.0	25.6	26.8	26.0/24.7	1.04	24.0	21.3	23.8	21.8
Potassium (as K)	--	<1	<1	1.1	<1.0	1.1	<1.0	1.3/1.2	1.1	1.04	1.02	1.34	1.64
Sodium (as Na)	200	17.6	20.0	18.9	17.8	21.0	20.8	20.3/20.5	27.0	22.0	21.9	30.1	25.7
TPH (Gas/Diesel) (µg/L)	--	<100	<100	<100	<100	<100	440 /<100 (2)	<100	<100	<100	<100	<100	<100
TPH (Heavy Oils)	--	<1	<1	<1.0	<1.0	2.3	<1.0/<1.0 (2)	<2.0	<2.0	2.4	<2.0	<2.0	<2.0

Notes:

All concentrations expressed in mg/L unless otherwise noted.

(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

(2) 440/<100 (TPH) - December 18, 2012/April 12, 2013.

Table 3.5

Chemistry Results for Monitoring Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	OW2-90												
Parameter	**ODWS (1)**	**6/28/1990**	**8/12/1993**	**5/26/1995**	**7/30/1999**	**8/24/2000**	**12/13/2000**	**5/29/2001**	**11/26/2001**	**11/29/2002**	**12/31/2003**	**12/30/2004**	**11/22/2005**	**11/21/2006**
pH	6.5 - 8.5	7.8	7.2	7.1	7.14	7.21	7.00	7.12	6.88	7.04	7.21	7.36	6.94	6.49
Conductivity (µmhos/cm)	--	540	200	400	431	532	525	534	651	588	693	684	504	695
Chloride (as Cl)	250	37	--	4.29	32.4	21.7/22.0	14.3/14.0	6.6	7.7	18.9	7.4	17.9	13	5
Sulphate (as SO_4)	500	32	--	21.3	48.4	22.3/22.3	28.7/30.1	15.9	16.1	25.8	24.6	31.2	24	16
Nitrate (as N)	10.0	<0.05	--	1.06	1.9	0.31/0.30	0.80/0.72	0.78	2.12	0.8	4.7	0.4	0.6	2.6
Nitrite (as N)	1.0	0.07	--	<0.10	<0.10	<0.10/<0.10	<0.10/<0.10		<0.10	<0.2	<0.2	<0.2	<0.1	<0.1
Total Phosphorus	--	<0.005	--	0.03	0.17	0.13/0.13	0.17/0.17	<0.01	0.006	0.004	0.335	0.31	0.49	<0.03
Calcium (as Ca)	--	69.7	--	78.9	99.2	172/177	169/192	98.9	107	81.7	117	73.3	107	111
Iron (as Fe)	0.3	2.28	--	<0.02	<0.01	0.024/0.017	0.005/<0.00	0.016	<0.01	<0.03	<0.03	<0.03	0.10	0.20
Magnesium (as Mg)	--	19.9	--	24.4	28.3	46.8/48.6	44.1/48.8	30.5	32.2	25.9	33.9	23.6	34.7	32.9
Potassium (as K)	--	4.7	--	1.44	1.1	2.26/2.18	1.4/1.5	1.1	1.8	1.2	1.6	1.2	2	2
Sodium (as Na)	200	3.2	--	2.21	3.7	3.34/3.31	3.5/3.6	2.5	1.9	3.4	1.5	3.5	3.8	1.2
TPH (Gas/Diesel) (µg/L)	--	--	<20	<10	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TPH (Heavy Oils)	--	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1	3/<1 (2)	2/<1 (3)

Notes:

All concentrations expressed in mg/L unless otherwise noted.

(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

(2) 3/<1 (TPH) - November 22, 2005/May 14, 2006.

(3) 2/<1 (TPH) - November 21, 2006/February 1, 2007.

Table 3.5

Chemistry Results for Monitoring Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	OW2-90											
Parameter	ODWS [1]	12/27/2007	12/8/2008	1/15/2010	12/21/2010	12/21/2011	12/18/2012	11/27/2013	9/15/2014	8/19/2015	9/9/2016	10/24/2017	9/21/2018
pH	6.5 - 8.5	6.70	7.09	7.29	6.73	7.49	7.98	7.41	7.32	6.97	7.05	6.01	7.13
Conductivity (µmhos/cm)	--	738	569	586	468	586	1170	549	507	397	514	482	533
Chloride (as Cl)	250	25	20	7.0	4.4	<2.0	2.9	3.8	10.8	11.2	11.4	14.8	16.4
Sulphate (as SO_4)	500	25	20	24.8	19.8	12.8	14.1	11.3	12.0	14.6	27.3	12.4	13.6
Nitrate (as N)	10.0	1.1	0.7	0.25	0.48	2.38	0.47	0.26	<0.10	<0.020	0.084	<0.020	<0.020
Nitrite (as N)	1.0	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
Total Phosphorus	--	0.03	0.19	0.0042	0.039	0.065	0.111	<0.030	<0.030	<0.030	0.0124	0.0187	0.0065
Calcium (as Ca)	--	107	77.9	88.0	85.7	93.1	91.5	89.0	70.9	71.5	73.3	67.5	72.4
Iron (as Fe)	0.3	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Magnesium (as Mg)	--	33.1	28.9	26.7	28.5	27.2	29.1	28.0	21.5	24.6	24.7	22.2	22.8
Potassium (as K)	--	1	1	1.2	1.1	1.1	1.3	1.2	1.0	1.10	1.18	1.85	2.88
Sodium (as Na)	200	2.0	2.9	3.84	2.80	1.78	2.28	2.75	4.17	4.99	4.93	5.25	5.61
TPH (Gas/Diesel) (µg/L)	--	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TPH (Heavy Oils)	--	<1	<1	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Notes:

All concentrations expressed in mg/L unless otherwise noted.
(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Table 3.5

Chemistry Results for Monitoring Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	OW3R-05													
Parameter	**ODWS [(1)]**	**11/22/2005**	**11/21/2006**	**12/27/2007**	**12/8/2008**	**1/15/2010**	**12/21/2010**	**12/21/2011**	**12/18/2012**	**11/27/2013**	**9/15/2014**	**8/19/2015**	**9/9/2016**	**10/24/2017**	**9/21/2018**
pH	6.5 - 8.5	7.08	6.96	6.98	7.34	7.35	7.09	7.76	8.33	7.72	7.43	7.17	7.30	6.13	7.42
Conductivity (µmhos/cm)	--	410	446	512	476	492	372	471	901	444	438	360	424	428	458
Chloride (as Cl)	250	12	13	12	25	13.7	15.2	14.5	14.2	14.5	13.3	14.8	14.0	14.4	16.8
Sulphate (as SO_4)	500	42	42	48	54	46.9	45.9	40.1	39.8	37.9	30.3	33.8	31.5	29.1	31.0
Nitrate (as N)	10.0	0.3	0.2	0.1	0.4	0.12	<0.10	<0.10	0.17	<0.10	<0.10	0.036	0.044	<0.020	0.100
Nitrite (as N)	1.0	<0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
Total Phosphorus	--	1.01	1.25	0.46	0.55	0.389	0.195	0.089	0.250	<0.030	<0.030	<0.030	0.0091	0.199	0.0808
Calcium (as Ca)	--	72.0	63.5	68.6	59.6	66.6	61.2	68.8	63.1	61.0	52.6	57.5	53.0	51.3	51.1
Iron (as Fe)	0.3	0.07	0.11	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Magnesium (as Mg)	--	24.6	21.1	23.9	24.9	21.7	22.1	24.6	25.7	24.3	20.9	24.1	23.1	22.7	22.7
Potassium (as K)	--	1	<1	1	<1	<1.0	<1.0	1.0	1.1	<1.0	<1.0	0.965	1.00	1.08	1.17
Sodium (as Na)	200	4.4	3.2	5.8	5.6	4.78	4.97	5.62	5.74	5.33	4.81	5.75	5.37	5.10	5.70
TPH (Gas/Diesel) (µg/L)	--	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
TPH (Heavy Oils)	--	<1	5/1 [(2)]	<1	<1	<1.0	<1.0	1.3	<1.0	<2.0	<2.0	<2.0	3.0	<2.0	<2.0

Notes:

All concentrations expressed in mg/L unless otherwise noted.
(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.
(2) 5/1 (TPH) - November 21, 2006/February 1, 2007.

Table 3.5

Chemistry Results for Monitoring Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	OW4R-05													
Parameter	**ODWS (1)**	**11/22/2005**	**11/21/2006**	**12/27/2007**	**12/8/2008**	**1/15/2010**	**12/21/2010**	**12/21/2011**	**12/18/2012**	**11/27/2013**	**9/15/2014**	**8/19/2015**	**9/9/2016**	**10/24/2017**	**9/21/2018**
pH	6.5 - 8.5	6.98	7.03	7.07	7.34	7.50	7.12	7.83	8.05	7.77	7.46	7.31	7.57	6.27	7.20
Conductivity (µmhos/cm)	--	409	475	489	470	417	315	407	520	389	400	339	395	416	426
Chloride (as Cl)	250	17	33	22/22	38	13.3	13.3	13.1	14.0/14.0	12.1	11.6/11.6	14.7/14.7	13.0/12.7	13.7/13.6	14.6/14.7
Sulphate (as SO_4)	500	33	36	40/40	43	34.4	33.6	31.0	33.3/33.4	29.4	27.3/27.4	31.5/31.5	27.5/26.7	35.0/34.8	29.9/30.1
Nitrate (as N)	10.0	0.5	0.6	0.4/0.4	0.7	0.24	0.16	0.14	0.16/0.17	0.16	0.15/0.15	0.113/0.113	0.153/0.147	0.201/0.189	0.346/0.347
Nitrite (as N)	1.0	<0.1	<0.1	<0.1/<0.1	<0.1	<0.10	<0.10	<0.10	<0.10/<0.10	<0.10	<0.10/<0.10	<0.010/<0.010	<0.010/<0.010	<0.010/<0.010	<0.010/<0.010
Total Phosphorus	--	0.32	0.32	0.42/0.04	0.60	0.165	0.178	0.030	0.059/0.106	0.192	0.109/0.100	0.058/0.053	0.103/0.0946	0.0339/0.0567	0.0398/0.0393
Calcium (as Ca)	--	78.6	64.1	62.6/62.4	54.3	55.9	52.8	59.1	55.2/55.7	54.0	48.6/49.1	53.5/53.7	49.4/48.9	51.0/49.0	46.6/47.4
Iron (as Fe)	0.3	0.08	0.11	<0.05/<0.05	<0.05	<0.050	<0.050	<0.050	<0.050/<0.050	<0.050	<0.050/<0.050	<0.010/<0.010	<0.010/<0.010	<0.010/<0.010	<0.010/<0.010
Magnesium (as Mg)	--	26.9	23.4	22.4/20.8	22.5	19.3	18.7	20.8	21.6/22.3	21.3	18.7/19.4	22.3/22.3	21.7/21.6	22.2/22.8	21.8/21.6
Potassium (as K)	--	2	<1	<1/<1	<1	<1.0	<1.0	<1.0	1.1/1.1	1.0	<1.0/1.0	1.06/1.07	1.03/1.03	1.12/1.13	1.12/1.13
Sodium (as Na)	200	3.5	2.4	4.2/4.3	4.8	4.36	4.55	4.57	5.33/5.30	4.35	4.45/4.39	5.59/5.51	5.16/5.34	5.10/5.19	5.83/5.82
TPH (Gas/Diesel) (µg/L)	--	--	--	--	--	--	--	--	--	-	--	--	--	--	--
TPH (Heavy Oils)	--	--	--	--	--	--	--	--	--	-	--	--	--	--	--

Notes:

All concentrations expressed in mg/L unless otherwise noted.
(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.
(2) 5/1 (TPH) - November 21, 2006/February 1, 2007.

Table 3.6

Chemistry Results For Private Domestic Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

Parameter	MOE ODWS (1)	Behmann											
		6/28/1990	8/10/1999	8/24/2000	12/13/2000	5/29/2001	11/26/2001	11/29/2002	12/31/2003	12/30/2004	11/22/2005	11/21/2006	12/27/2007
pH	6.5 - 8.5	7.6	7.38	7.58	7.26	7.09	7.27	7.28	7.72	7.26	6.97	6.96	7.20
Conductivity (µmhos/cm)	--	600	531	569	567	556	546	580	597	722	485	242	586
Chloride (as Cl)	250	16	12.2	12.9	11.2	11.8	12.6	14.4/14.4	14.6	15.3	14	13/13	13
Sulphate (as SO_4)	500	51	45.8	54.1	67.3	43.9	50.6	50.1/49.4	51.4	54.4	53	56/56	52
Nitrate (as N)	10.0	<0.05	<0.10	<0.04	0.33	<0.04	<0.04	<0.2/<0.2	<0.2	<0.2	<0.1	<0.1/0.1	<0.1
Nitrite (as N)	1.0	<0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.2/<0.2	<0.2	<0.2	<0.1	<0.1/<0.1	<0.1
Total Phosphorus	--	0.014	0.11	0.01	0.05	<0.01	0.006	0.009/0.007	<0.002	0.006	<0.03	<0.03/0.07	<0.03
Calcium (as Ca)	--	63.3	69.1	73.3	74.8	80.7	70.3	64.8/65.2	64.0	60.7	69.6	53.4/63.0	67.4
Iron (as Fe)	0.3	0.53	0.87	0.287	0.061	0.563	0.43	1.02/1.01	1.05	0.72	0.07	0.46/0.52	<0.05
Magnesium (as Mg)	--	31.6	32.1	43.6	38.5	44.7	37.3	33.4/33.3	36.5	34.3	40.9	31.6/36.4	34.8
Potassium (as K)	--	2.82	0.8	1.78	1.2	1.2	1.5	1.1/1.1	1.1	1.2	2	<1/1	1
Sodium (as Na)	200	5.5	8.7	9.65	7.8	8.2	8.0	7.5/7.5	8.6	7.9	9.9	7.6/8.9	7.9

Notes:

All concentrations expressed in mg/L unless otherwise noted.

(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Table 3.6

Chemistry Results For Private Domestic Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

Parameter	MOE ODWS (1)	Behmann						
		12/8/2008	1/15/2010	12/21/2010	12/21/2011	12/18/2012	11/27/2013	9/15/2014
pH	6.5 - 8.5	7.42	7.41	7.20	7.88	8.09	7.56	7.43
Conductivity (µmhos/cm)	--	533	566	434	574	1090	543	627
Chloride (as Cl)	250	15	13.9	13.4	13.5	13.4	13.8	13.7
Sulphate (as SO_4)	500	57	54.6	54.7	56.8	53.7	56.2	57.5
Nitrate (as N)	10.0	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1.0	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Phosphorus	--	0.04	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Calcium (as Ca)	--	55.8	66.3	61.3	65.4	60.9	56.1	62.2
Iron (as Fe)	0.3	<0.05	<0.050	<0.050	0.483	0.949	0.579	0.478
Magnesium (as Mg)	--	35.5	34.5	36.5	41.4	34.5	33.3	38.3
Potassium (as K)	--	1	1.3	1.2	1.3	1.2	1.1	1.2
Sodium (as Na)	200	9.0	8.34	8.70	9.61	8.14	8.01	9.19

Notes:

All concentrations expressed in mg/L unless otherwise noted.

(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Table 3.6

Chemistry Results For Private Domestic Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	**Hohenadel**												
Parameter	**ODWS [(1)]**	**6/28/1990**	**5/26/1995**	**8/10/1999**	**8/24/2000**	**12/13/2000**	**5/29/2001**	**11/26/2001**	**11/29/2002**	**12/31/2003**	**12/30/2004**	**11/22/2005**	**11/21/2006**	**12/27/2007**
pH	6.5 - 8.5	7.8	7.1	7.35	7.59	7.07	7.1	7.12	7.27	7.57	7.25	6.89	7.19	7.15
Conductivity (µmhos/cm)	--	420	500	422	523	526	527	503	528	488	671	436	203	522
Chloride (as Cl)	250	5	4.88	1.54	8.44	6.8	6.1	8.5	9.6	11.9	13.1/13.2	12	14	15
Sulphate (as SO_4)	500	22	41.6	15.9	46.0	54.5	35.1	42.0	43.7	45.7	46.8/47.3	46	48	48
Nitrate (as N)	10.0	<0.05	<0.10	0.2	<0.04	0.33	0.11	0.09	<0.2	<0.2	0.2/0.2	0.2	<0.1	<0.1
Nitrite (as N)	1.0	<0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.2	<0.2	<0.2/<0.2	<0.1	<0.1	<0.1
Total Phosphorus	--	NS	<0.01	0.11	<0.01	0.01	<0.01	<0.004	<0.002	<0.002	0.002/<0.00	<0.03	<0.03	<0.03
Calcium (as Ca)	--	36.9	82.2	51.6	82.8	87.6	96.9	82	73.0	72.4	69.9/69.6	80.5	65.9	70.3
Iron (as Fe)	0.3	0.57	0.57	0.14	0.172	0.370	0.524	0.15	0.17	0.13	0.11/0.10	0.07	0.33	<0.05
Magnesium (as Mg)	--	27.2	28.6	22.1	32.7	30.7	34.5	28.5	26.1	26.1	25.1/25.0	29.7	25.0	25.3
Potassium (as K)	--	2.63	1.28	0.6	1.31	1.0	0.9	1.2	0.9	0.9	1.0/1.0	2	<1	1
Sodium (as Na)	200	5.3	2.35	5.2	2.88	2.9	3.2	2.8	2.7	2.9	2.9/2.9	3.9	2.7	4.1

Notes:

All concentrations expressed in mg/L unless otherwise noted.
(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Table 3.6

Chemistry Results For Private Domestic Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	Hohenadel						
Parameter	**ODWS (1)**	**12/28/2008**	**1/15/2010**	**12/21/2010**	**12/21/2011**	**12/18/2012**	**11/27/2013**	**9/15/2014**
pH	6.5 - 8.5	7.38	7.45	7.74	8.01	--	7.64	7.51
Conductivity (µmhos/cm)	--	472	495	359	469	--	449	471
Chloride (as Cl)	250	16	15.4/15.1	13.8/13.8	14.0	14.0	14.1	14.2
Sulphate (as SO_4)	500	52	47.6/47.7	45.3/45.3	42.1	39.9	40.2	38.1
Nitrate (as N)	10.0	<0.1	<0.10/<0.10	<0.10/<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1.0	<0.1	<0.10/<0.10	<0.10/<0.10	<0.10	<0.10	<0.10	<0.10
Total Phosphorus	--	0.06	<0.030/<0.030	<0.030/<0.030	<0.030	<0.030	<0.030	<0.030
Calcium (as Ca)	--	57.9	67.6/67.4	61.9/60.0	65.5	61.5	60.3	58.7
Iron (as Fe)	0.3	<0.05	<0.050/<0.050	<0.050/<0.050	0.292	<0.050	0.058	0.230
Magnesium (as Mg)	--	25.0	24.4/22.7	22.6/21.6	25.6	21.2	22.2	21.7
Potassium (as K)	--	<1	1.1/1.1	1.0/<1.0	1.0	1.0	<1.0	<1.0
Sodium (as Na)	200	5.0	4.35/4.20	4.73/4.48	5.40	4.73	5.20	5.14

Notes:

All concentrations expressed in mg/L unless otherwise noted.

(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Table 3.6

Chemistry Results For Private Domestic Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

	MOE	Van Horsigh											
Parameter	**ODWS (1)**	**5/26/1995**	**7/30/1999**	**8/24/2000**	**12/13/2000**	**5/29/2001**	**11/26/2001**	**11/29/2002**	**12/31/2003**	**12/30/2004**	**11/22/2005**	**11/21/2006**	**12/27/2007**
pH	6.5 - 8.5	7.1	7.35	7.49	7.46	7.4	7.39	7.28	7.76	7.49	7.05	7.24	7.23
Conductivity (µmhos/cm)	--	700	658	693	857	715	824	1020	671	876	929	842	1,170
Chloride (as Cl)	250	133	168	80.6	162	89.6	151	162	99.0/100	131	237	138	196
Sulphate (as SO_4)	500	15.8	15.7	14.8	15.3	10	14.7	15.7	16.1/16.2	16.2	17	15	17
Nitrate (as N)	10.0	0.84	0.99	1.89	1.71	3.01	2.77	1.5	1.7/1.7	1.6	1.4	1.9	1.8
Nitrite (as N)	1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.2	<0.2/<0.2	<0.2	<0.1	<0.1	<0.1
Total Phosphorus	--	<0.01	0.10	<0.01	<0.01	<0.01	<0.004	<0.002	0.004/0.002	<0.002	0.08	<0.03	<0.03
Calcium (as Ca)	--	83.8	86.9	81.5	78.6	92.9	74.9	70.4	67.0/65.4	69.6	84.6	67.8	86.3
Iron (as Fe)	0.3	0.14	<0.01	0.031	0.032	0.014	0.02	<0.03	<0.03/<0.03	<0.03	0.09	0.13	<0.05
Magnesium (as Mg)	--	22.1	17.8	21.8	19.6	23.8	18	17.2	18.0/17.4	17.8	22.7	18.8	23.2
Potassium (as K)	--	1.06	1.0	1.38	1.1	0.8	1.2	0.8	0.6/0.6	0.8	2	<1	<1
Sodium (as Na)	200	67.2	107	52.0	77.2	49.1	99.2	100	59.5/57.9	76.4	122	78.5	105

Notes:

All concentrations expressed in mg/L unless otherwise noted.

(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Table 3.6

Chemistry Results For Private Domestic Wells
Aberfoyle Pit No. 2
Dufferin Aggregates

Parameter	MOE ODWS (1)	Van Horsigh						
		12/8/2008	1/15/2010	12/21/2010	12/21/2011	12/18/2012	11/27/2013	9/15/2014
pH	6.5 - 8.5	7.38	7.55	6.83	7.90	7.20	7.77	7.24
Conductivity (µmhos/cm)	--	858	1160	1000	840	1660	--	876
Chloride (as Cl)	250	151	227	188	113/113	211	135	93.7
Sulphate (as SO_4)	500	21	17.4	19.4	19.7/19.7	19.2	19.1	18.0
Nitrate (as N)	10.0	2.2	1.24	1.30	1.19/1.20	0.89	1.03	0.55
Nitrite (as N)	1.0	<0.1	<0.10	<0.10	<0.10/<0.10	<0.10	<0.10	<0.10
Total Phosphorus	--	0.04	<0.030	<0.030	<0.030/<0.030	<0.030	<0.030	<0.030
Calcium (as Ca)	--	70.1	94.4	72.3	79.9/77.8	78.2	78.0	87.8
Iron (as Fe)	0.3	<0.05	<0.050	<0.050	<0.050/<0.050	<0.050	<0.050	<0.050
Magnesium (as Mg)	--	22.6	23.2	18.6	22.3/21.8	17.6	20.8	24.8
Potassium (as K)	--	<1	<1.0	<1.0	1.0/1.0	1.1	1.1	1.2
Sodium (as Na)	200	91	128	146	87.8/89.3	133	89.6	67.8

Notes:

All concentrations expressed in mg/L unless otherwise noted.

(1) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ontario Ministry of the Environment, June 2003, revised June 2006.

Appendices

Appendix A

Section 9.0 of August 1991 Final Monitoring Report (Proposed Monitoring Program) and Follow-Up Correspondence/Approvals from MNR and MOE

Correspondence from Harden Environmental

FINAL MONITORING REPORT
DUFFERIN AGGREGATES
ABERFOYLE PIT NO. 2

Township of Puslinch, County of Wellington

AUGUST 1991
REF. NO. 1644 (4)

CONESTOGA-ROVERS & ASSOCIATES

9.0 PROPOSED MONITORING PROGRAM

A comprehensive monitoring program will be implemented during the operation of the Site particularly below the water table, in order to evaluate the potential impact on surface water and groundwater levels.

The proposed monitoring program will consist of monitoring of existing on-Site monitoring nest OW1A-90, OW1B-90, OW2-90, OW3-90 and OW4-90 and the shallow domestic well designated as domestic well No. 18 in the door-to-door survey. This well, located approximately 600 m (1970 feet) northwest of the Site is completed in the water table aquifer to a depth of 3 m (10 feet). The shallow domestic well designated as domestic well No. 19 in the door-to-door survey could not be included in the monitoring program because this well cannot be made accessible. Although the Behmann and J. Hohenadel domestic wells do not appear to be completed in the water table aquifer but in the deeper confined sands and gravels, it is proposed to monitor groundwater levels at these locations. It is proposed to install a shallow monitoring well in the wetland to provide hydraulic data for the shallow water table aquifer at this location. All the groundwater monitoring locations are shown on Figure 8.1.

The proposed monitoring program will include monitoring of the surface water levels at the locations shown on Figure 8.1. These surface water monitoring locations include monitoring locations SW1, SW2, SW3 and SW4-91 located in the wetland area. In addition, it is

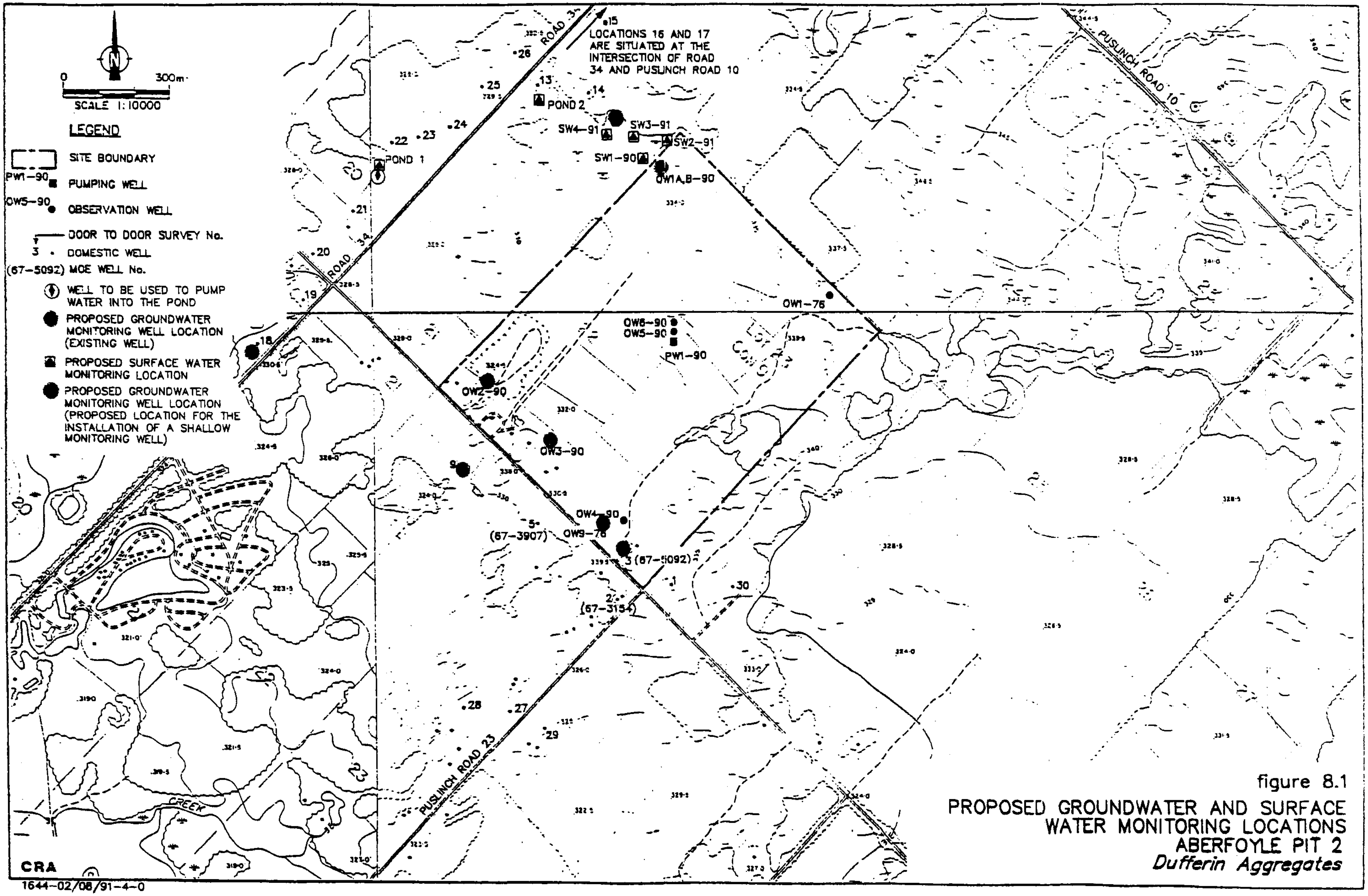


figure 8.1

PROPOSED GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS
ABERFOYLE PIT 2
Dufferin Aggregates

proposed to monitor ponds designated as 1 and 2 located in the Gauthier a Wittle properties, respectively.

It is proposed to collect groundwater and surface water level data on a monthly basis prior to and during the initial year of the mining operation below the water table. It should be noted that the frequen of water level data collection thereafter will be assessed and revised accordingly. In the unlikely event of adverse impact on water levels, the operation below the water table would decrease or cease until such time tha levels recovered sufficiently.

Ontario
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Ministère de l'Environnement
West Central Region
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Rec'd CRA
SEP 18 1992

COPY
MINISTRY OF ENVIRONMENT
400 CLYDE ROAD
P. O. BOX 219
CAMBRIDGE, ONT. N1R 5W6

September 15, 1992

Mr. A.D. Carr, Area Supervisor
Ministry of Natural Resources
Box 21048
605 Beaverdale Road
Cambridge, Ontario N3C 2W1

Dear Mr. Carr:

RE: SITE PLAN AMENDMENT REQUEST- DUFFERIN AGGREGATES ABERFOYLE PIT #2, TOWNSHIP OF PUSLINCH

In response to your letter of August 28, 1992, the Ministry of the Environment have completed a review of the Final Monitoring Report by Conestoga-Rovers and Site Plans by Skelton, Brumwell, supporting the above amendment request.

Dufferin Aggregates wish to extract materials from below the water table utilizing a dragline such that dewatering by pumping will not occur. As aggregate is extracted below the water table, groundwater will flow into the excavation equal to the volume of aggregate removed. Conestoga-Rovers have concluded that this activity will cause a limited cone of water table depression, thus changing the natural direction of shallow groundwater flow in a manner similar to a pumping well. However this interruption will be temporary (for the duration of aggregate removal), and should not adversely affect nearby surface or groundwater supplies.

Our Technical Assessment Section in Hamilton has reviewed the report by Conestoga-Rovers with respect to the above. Comments prepared by Mr. J. Wills are attached. We concur with Mr. Wills comments and request that Dufferin Aggregates address these issues prior to mining below the water table.

In addition, the Cambridge District Office provides the following comments regarding the plan amendment request which must be addressed by Dufferin Aggregates prior to such removal:

FINAL MONITORING REPORT

1. Section 9.0, Page 35

    The scope of the monitoring program should include water quality analyses for general chemistry compounds as illustrated on Table 7.1 of the report, and a total petroleum hydrocarbon scan at the sampling locations.

The frequency of water quality monitoring must be proposed by the consultant and should include semi-annual events for the initial two (2) years. In addition, the consultant should select a representative number of monitoring wells and private wells for each sampling event, allowing for a systematic rotation to include different wells in subsequent rounds.

2. Section 10.0 Page 38.

In the unlikely event that any water supply was adversely affected by on-Site mining as determined by the Ministry of the Environment, a new well shall be constructed by Dufferin Aggregates for the private owner in an expeditious manner. A temporary alternate potable water supply shall be supplied to the affected private owner by Dufferin Aggregates as necessary.

DWG 75194-2 of 5

3. (D)-Drainage and Siltation

Permanent swales conveying surface drainage to adjacent property should be designed to minimize erosion and/or sediment transport.

Surface drainage as sheet-flow from the Site to adjacent property should be controlled by means of properly installed and maintained siltation fence or hay bale dykes until a good vegetative cover over such areas has been established.

4. (H)-Fuel Storage

Petroleum waste materials should be stored on an impermeable pad with containment walls. Dufferin Aggregates should be registered with the Ministry as a waste generator of these materials. Wastes should be transported by a licensed hauler to a licensed disposal site.

5. (L)-Monitoring Program

In conjunction with the Final Monitoring Report, monitoring results should be forwarded to the MOE on a semi-annual basis for the initial two years and thereafter according to the frequency of water quality analyses as agreed to by MOE.

Such submissions should also include the Consultants' interpretation of the data, and any recommendations for revisions to the monitoring scope or operation procedures, which may be necessary.

Should any of the on-Site observation well(s) become damaged or disabled during the course of operations, such well(s) shall be repaired or re-installed by Dufferin Aggregates in a timely manner.

Once the observation wells are no longer required as determined by the Ministry of the Environment, these wells shall be properly closed by Dufferin Aggregates according to Ministry requirements.

6. (M)-Dust Suppressant

Chemical dust suppressants must not be used in any area of the pit where the application may cause contamination of the groundwater. Other methods of dust control (eg. water spraying) must be used in sensitive areas.

GENERAL

7. Spill Response Plan

Potential groundwater contamination from spills is a serious concern when mining below the water table. Any spill or release is to be reported immediately to the MOE's Spills Action Centre (SAC) by telephone at 1-800-268-6060.

Dufferin Aggregates must develop a detailed Spill Response Plan for submission to the MOE which addresses the reporting and prompt clean-up of spills.

8. Pesticide Usage

Dufferin Aggregates should refrain from using pesticides or herbicides in the licensed pit area where surface water drainage is directed to the below water table excavation.

Summary

This Ministry has no objection to this Site Plan Amendment request by Dufferin Aggregates subject to the above comments being properly addressed and implemented.

We trust the above is satisfactory to your needs at this time, however should there be any questions regarding the above please contact us.

Yours truly

John Cooke

John Cooke,
Area Supervisor

encl.

cc [redacted]
Dan Joyner, MOE
FILE IN-50-07-21

Ministry of the Environment
Ministère de l'Environnement
Ontario

West Central Region
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January 4, 1992

To: John Cooke
District Supervisor, Abatement
Cambridge District Office

From: Jamie Wills
Hydrogeologist
West central Region

**Re: Final Monitoring Report, Dufferin Aggregates
Aberfoyle Pit No. 2
Township of Puslinch, County of Wellington**

As requested, I have completed my review of the above report and offer the following general and specific comments for your consideration.

General Comments

Conestoga-Rovers & Associates Limited (CRA) believe that, based on their understanding of the hydrogeology and in view of the proposed aggregate extraction method, the aggregate mine should not result in prolonged or significant groundwater quantity or quality interference on surrounding properties. In support of this belief, CRA discuss several issues which I have summarized in brief below.

(1) The proposed method of aggregate extraction involves draglining rather than dewatering thus minimizing the volume of groundwater removed from the ground.

(2) The proposed pit will be operational for only approximately six (6) months and thus any off-site temporal water table fluctuations associated with the aggregate extraction should dissipate quickly once the aggregate extraction terminates.

(3) Most of the domestic wells proximal to the proposed pit draw water from the bedrock aquifer which is separated from the water table aquifer by an aquitard. Therefore, due to the aquitard one would not expect the bedrock wells to be significantly effected by temporal fluctuations of the water table.

(4) A reconnaissance investigation (Ecoplans Limited) of the wetland to the north (N) of the property indicates that no adverse effects to the wetland are anticipated as a result of temporal water table fluctuations associated with the aggregate extraction.

(5) A contingency plan has been designed such that if the aggregate extraction adversely effects either groundwater or surface waters on surrounding properties, the extraction process below the water table will be adjusted appropriately.

In general, I am in agreement with the conclusions, recommendations and contingency plan indicated by CRA. However, in addition to the proposed groundwater and surface water monitoring program, it may be prudent to also monitor the headwaters of Aberfoyle Creek located adjacent to the southeast (SE) property boundary. Such an area may be within the cone of influence of the proposed aggregate test pit.

Specific Comments

(1) In Table 3.2, the ground elevation (m AMSL) of wells OW5-90, OW6-90, and PW1-90 are listed as 325.53 m, 325.49 m, and 325.47 respectively. However, a review of Ontario Ministry of Natural Resources (MNR) maps (Sheets 10 17 5700 48100 and 10 17 5700 48150) indicate that the ground elevation in the vicinity of these wells is approximately 335 m AMSL - a difference of approximately 10 m to that reported by CRA. The ground elevation of all other wells listed in the table are comparable to those indicated on the MNR maps. If the elevations listed on the MNR maps are correct, this infers that there is a local groundwater flow divide on the property such that the majority of groundwater flow in the water table aquifer is to the west (W) and northwest (NW) rather than in a southerly (S) direction away from the northern (N) swamp as reported by CRA (P20, paragraph 5). Such an westerly (W) overburden groundwater flow direction would be consistent with the bedrock groundwater flow direction reported by CRA (P21, last paragraph). In view of this apparent inconsistency between the ground elevations (and therefore possibly groundwater levels) reported by CRA and those obtained from the MNR maps, it would seem prudent to confirm the ground surface elevations of the above wells with regards to further assessing groundwater flow direction in the water table aquifer, and any implications of such a groundwater flow system.

(2) Page 20, paragraph 5 states "The available water level data indicates that the general direction of groundwater flow within the Water table Aquifer Unit occurs in a general southerly direction away from the wetland". Please refer to specific comment (1).

(3) Page 24, paragraph three indicates that the aquifer performance data obtained from the 72 hour pumping test is not significantly different from that reported in the November 1988 CRA report. Since CRA did not include the 1988 data in the August 1991 report, I am unable to make such a comparative aquifer performance data assessment.

(4) Page 26, second paragraph, second sentence which states "The measured decline in OW2-90 was considered to be partially due to a boundary effect likely caused by a reduction in aquifer thickness". It would be useful to the reader if the authors could expand on the evidence which supports this belief.

(5) Page 34, second paragraph which states "The water quality analyses obtained during this investigation are consistent with analyses from wells located at Dufferin Aggregates Pit No. 1 as presented in Table 4.4 of the November 1980 CRA Hydrogeological Investigation and Test Well Evaluation Report.". It would be useful to the reader if the referenced data was included in the August 1991 report to allow the reader to make an independent assessment.

If any of the above is unclear, or if I may be of further assistance please do not hesitate to contact me at (416) 521-7718.

Jamie Wills

Jamie Wills

cc: B. Blackport MOE
A. McLarty MOE

CRA
Consulting Engineers

CONESTOGA-ROVERS & ASSOCIATES LIMITED
651 Colby Drive,
Waterloo, Ontario, Canada N2V 1C2
(519) 884-0510

November 11, 1992

Reference No. 1644

Mr. John Cooke, Area Supervisor
Ontario Ministry of the Environment
400 Clyde Road
P.O. Box 219
Cambridge, Ontario
N1R 5W6

Dear Mr. Cooke:

Re: Response to MOE Comments Regarding the
Final Monitoring Report and Site Plans
Dufferin Aggregates Aberfoyle Pit No. 2, Township of Puslinch

In support of the Site Plan Amendment, the Final Monitoring Report prepared by CRA and Site Plans prepared by Skelton, Brumwell & Associates Inc. were submitted for review to the Ministry of the Environment (MOE). The MOE Technical Assessment Section in Hamilton reviewed the Final Monitoring Report and the Cambridge District Office reviewed the Final Monitoring Report and the Site Plans. Comments by the MOE concerning the report and the site plans were directed to the Ministry of Natural Resources and received by CRA on September 18, 1992.

Attachment A to this letter provides responses to the comments by the Cambridge District Office. Attachment B provides responses to the comments by the Technical Assessment Section in Hamilton.

A copy of the attached responses is also being forwarded to the MNR. On completion of your review and concurrence with these responses, it would be greatly appreciated if your office could request a letter of concurrence from the MNR.

If you should have any questions or require further information, please do not hesitate to contact our office at your convenience.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Greg M. Pucovsky

Greg M. Pucovsky, M.Sc.

GIL/jw

c.c. Tony White - Dufferin Aggregates
Anne Guiot - Skelton, Brumwell & Associates Inc.
Robin Smith - Skelton, Brumwell & Associates Inc.
Bob Gibson - MNR

ATTACHMENT A

RESPONSE TO MOE CAMBRIDGE DISTRICT OFFICE
COMMENTS REGARDING THE FINAL MONITORING REPORT AND SITE PLANS
DUFFERIN AGGREGATES ABERFOYLE PIT NO. 2
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

RESPONSE TO MOE COMMENTS REGARDING THE FINAL MONITORING REPORT AND SITE PLAN IN SUPPORT OF THE SITE PLAN AMENDMENT REQUEST DUFFERIN AGGREGATES ABERFOYLE PIT NO.2 TOWNSHIP OF PUSLINCH

FINAL MONITORING REPORT

1. Comment

Section 9.0, Page 35

The scope of the monitoring program should include water quality analyses for general chemistry compounds as illustrated on Table 7.1 of the report, and a total petroleum hydrocarbon scan at the sampling locations.

The frequency of water quality monitoring must be proposed by the consultant and should include semi-annual events for the initial two (2) years. In addition, the consultant should select a representative number of wells and private wells for each sampling event, allowing for a systematic rotation to include different wells in subsequent rounds.

Response

The scope of the monitoring program will include water quality analyses for general chemistry parameters as illustrated on Table 7.1 of the report and also a total petroleum hydrocarbon scan.

Since one set of groundwater and surface water samples have already been collected and analyzed in 1990, it is recommended that a semi-annual sampling event only be conducted for the initial year and annually thereafter. It should also be noted that the analytical results from each sampling event will be carefully evaluated and the sampling frequency, if necessary, will be adjusted.

On-Site monitoring wells OW1A-90, OW1B-90 and OW2-90 will be sampled during all the events. Monitoring wells OW3-90 and OW4-90 have been historically dry but will be checked during the sampling events. If sufficient volumes of water are present in these wells, samples will be collected and analyzed.

Private wells designated as nos. 3, 9 and 18 on Figure 8.1 of the Final Monitoring Report will be sampled. These wells are completed in the overburden. In addition, the wetland piezometer to be installed in the property owned by Mr. Whittle will be sampled. A systematic rotation of the private wells will be implemented to include sampling of two of the above-noted wells per sampling event.

The purpose of installing monitoring wells OW5-90 and OW6-90 and pumping well PW1-90 was to obtain test pumping data. It is considered that these wells are not longer useful. Thus, it is proposed to retrieve the well construction material from these wells. The wells are completed in surficial sand and gravel and thus sealing according to Ontario Regulation 612/84 should not be necessary.

2. **Comment**

Section 10.0, Page 38

In the unlikely event that any water supply was adversely affected by on-Site mining as determined by the Ministry of the Environment, a new well shall be constructed by Dufferin Aggregates for the private owner in an expeditious manner. A temporary alternate potable water supply shall be supplied to the affected private owner by Dufferin Aggregates as necessary.

Response

It is agreed that in the unlikely event that any water supply was adversely affected by on-Site mining as determined by the Ministry of the Environment, a temporary alternate potable water supply (i.e. trucked water) would initially be supplied to the affected owner. A new bedrock well would subsequently be constructed by Dufferin Aggregates for the private owner in an expeditious manner thereafter.

3. **Comment**

DWG 75194-2 of 5

(D) - Drainage and Siltation

Permanent swales conveying surface drainage to adjacent property should be designed to minimize erosion and/or sediment transport.

Surface drainage as sheet-flow from the Site to adjacent property should be controlled by means of a properly installed and maintained siltation fence or hay bale dykes until a good vegetative cover over such areas has been established.

Response

All the work at grade has been completed and a vegetative cover is in place at the pit. Erosion at the pit is not considered an issue and as such, a siltation fence or hay bale dykes are not required. A representative from the MNR will visit the pit to inspect the existing conditions.

4. **Comment**

(H) - Fuel Storage

Petroleum waste materials should be stored on an impermeable pad with containment walls. Dufferin Aggregates should be registered with the Ministry as a waste generator of these materials. Wastes should be transported by a licensed hauler to a licensed disposal site.

Response

Dufferin Aggregates is registered with the MOE as a generator of petroleum waste materials. It is expected that the only petroleum product stored in the pit will be the fuel required to operate the working equipment. The fuel will be stored in an above-ground storage tank which will be placed on an impermeable pad.

5. **Comment**

(L) - Monitoring Program

In conjunction with the Final Monitoring Report, monitoring results should be forwarded to the MOE on a semi-annual basis for the initial two years and thereafter according to the frequency of water quality analyses as agreed to by MOE.

Such submissions should also include the Consultants' interpretation of the data, and any recommendations for revisions to the monitoring scope or operation procedures, which may be necessary.

Should any of the on-Site observation well(s) become damaged or disabled during the course of operations, such well(s) shall be repaired or re-installed by Dufferin Aggregates in a timely manner.

Once the observation wells are no longer required as determined by the Ministry of the Environment, these wells shall be properly closed by Dufferin Aggregates according to Ministry requirements.

Response

It is agreed that in conjunction with the Final Monitoring Report, monitoring results will be forwarded to the MOE on a semi-annual basis for the initial year and yearly thereafter.

The submissions will include interpretation of the data, and any recommendations for revisions to the scope of monitoring or operating procedures, which may be necessary.

If any of the on-Site monitoring well(s) become damaged during the course of operations, the well(s) will be repaired or replaced by Dufferin Aggregates in a timely manner.

Once the monitoring wells are no longer required, the wells completed in fine grained material will be properly sealed by Dufferin Aggregates according to Ministry requirements (Ontario Regulation 612/84).

6. Comment

(M) - Dust Suppressant

Chemical dust suppressants must not be used in any area of the pit where the application may cause contamination of the groundwater. Other methods of dust control (e.g. water spraying) must be used in sensitive areas.

Response

Water and/or dust suppressants will be used in accordance with MOE requirements to control dust. Calcium chloride may be used as a dust suppressant in the pit.

7. Comment

Spill Response Plan

Potential groundwater contamination from spills is a serious concern when mining below the water table. Any spill or release is to be reported immediately to the MOE's Spills Action Centre (SAC) by telephone at 1-800-268-6060.

Dufferin Aggregates must develop a detailed Spill Response Plan for submission to the MOE which addresses the reporting and prompt clean-up of spills.

Response

Any spill or release will be reported immediately to the MOE's Spills Action Centre (SAC).

Dufferin Aggregates is in the process of developing a detailed Spill Response Plan that will be submitted to the MOE prior to commencement of the 1993 operation. This plan will address the reporting and clean-up of spills.

8. Comment

Pesticide Usage

Dufferin Aggregates should refrain from using pesticides or herbicides in the licensed pit area where surface water drainage is directed to the below water table excavation.

Response

Dufferin Aggregates will refrain from using pesticides or herbicides in the licensed pit area.

ATTACHMENT B

RESPONSE TO COMMENTS FROM THE
MOE TECHNICAL ASSESSMENT SECTION IN HAMILTON
TO THE FINAL MONITORING REPORT
DUFFERIN AGGREGATES ABERFOYLE PIT NO. 2
TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

RESPONSES TO THE COMMENTS BY THE MOE TECHNICAL ASSESSMENT SECTION IN HAMILTON TO THE FINAL MONITORING REPORT DUFFERIN AGGREGATES ABERFOYLE PIT NO.2 TOWNSHIP OF PUSLINCH, COUNTY OF WELLINGTON

GENERAL COMMENTS

1. Comment

In general, I am in agreement with the conclusions, recommendations and contingency plan indicated by CRA. However, in addition to the proposed groundwater and surface water monitoring program, it may be prudent to also monitor the headwaters of Aberfoyle Creek located adjacent to the southeast (SE) property boundary. Such an area may be within the cone of influence of the proposed aggregate test pit.

Response

The surface water level at one location within the headwaters of Aberfoyle Creek located adjacent to the southeast property boundary will also be monitored.

SPECIFIC COMMENTS

1. Comment

In Table 3.2, the ground elevation (m AMSL) of wells OW5-90, OW6-90 and PW1-90 are listed as 325.53 m, 325.49 m and 325.47 respectively. However, a review of Ontario Ministry of Natural Resources (MNR) maps (Sheets 10 17 5700 48100 and 10 17 5700 48150) indicate that the ground elevation in the vicinity of these wells is approximately 335 m AMSL - a difference of approximately 10 m to that reported by CRA. The ground elevation of all other wells listed in the table are comparable to those indicated on the MNR maps. If the elevations listed on the MNR maps are correct, this infers that there is a local groundwater flow divide on the property such that the majority of groundwater flow in the water table aquifer is to the west (W) and northwest (NW) rather than in a southerly (S) direction away from the northern (N) swamp as reported by CRA (P20, paragraph 5). Such a westerly (W) overburden groundwater flow direction would be consistent with the bedrock groundwater flow direction reported by CRA (P21, last paragraph). In view of this apparent inconsistency between the ground elevations (and therefore possibly groundwater levels) reported by

CRA and those obtained from the MNR maps, it would seem prudent to confirm the ground surface elevations of the above wells with regards to further assessing groundwater flow direction in the water table aquifer, and any implications of such a groundwater flow system.

Response

The ground elevations of wells OW5-90, OW6-90 and PW1-90 reported as 325.53 m AMSL, 325.49 m AMSL and 325.47 m AMSL, respectively, in Table 3.2 are correct. The elevations cited in the Ontario Ministry of Natural Resources (MNR) maps were originally correct, but the ground elevations are now approximately 10 m lower due to extraction of aggregate above the water table within a significant portion of the Site.

The general direction of groundwater flow within the Water Table Aquifer Unit is generally southerly, away from the wetland.

2. **Comment**

Page 20, paragraph 5 states "The available water level data indicates that the general direction of groundwater flow within the Water Table Aquifer Unit occurs in a general southerly direction away from the wetland". Please refer to specific comment (1).

Response

As indicated in the response to comment 1, groundwater flow within the Water Table Aquifer Unit is generally in a southerly direction, away from the wetland.

3. **Comment**

Page 24, paragraph three indicates that the aquifer performance data obtained from the 72 hour pumping test is not significantly different from that reported in the November 1988 CRA report. Since CRA did not include the 1988 data in the August 1991 report, I am unable to make such a comparative aquifer performance data assessment.

Response

The data included in the November 1988 CRA report is included as Attachment B.1.

4. **Comment**

Page 26, second paragraph, second sentence which states "The measured decline in OW2-90 was considered to be partially due to a boundary effect likely caused by a reduction in aquifer thickness". It would be useful to the reader if the authors could expand on the evidence which supports this belief.

Response

The measured decline in water levels in OW2-90 is considered to reflect the presence of an impermeable boundary caused by the reduction in aquifer thickness. The lateral reduction in aquifer thickness is shown in the steepening of the drawdown curve for OW2-90. The surficial sands and gravels decrease in thickness from approximately 19.0 m at OW5-90 to approximately 6.0 m at OW2-90. In addition, the surficial material is only 2.0 meters thick at OW3-90 and OW4-90.

5. **Comment**

Page 34, second paragraph which states "The water quality analyses obtained during this investigation are consistent with analyses from wells located at Dufferin Aggregates Pit No. 1 as, presented in Table 4.4 of the November 1980 CRA Hydrogeological Investigation and Test Well Evaluation Report." It would be useful to the reader if the reference data was included in the August 1991 report to allow the reader to make an independent assessment.

Response

Table 4.4 of the November 1980 CRA Hydrogeological Investigation and Test Well Evaluation Report is provided in Attachment B.2.

ATTACHMENT B.1

DATA FROM THE NOVEMBER 1988 CRA REPORT

TRANSMISSIVITY

Based on grain size distribution curves for samples collected during the 1976 test drilling program, an average Hazen hydraulic conductivity of about 9 m/day was calculated. However, the hydraulic conductivity may be as high as 90 m/day, a value similar to that obtained for an overburden well located southwest of Aberfoyle.

Transmissivity is calculated according to the formula:

$$T = Kb$$

where:

T = Transmissivity (m^2/day)
K = Hydraulic Conductivity (m/day)
b = Average saturated thickness (m)

$$\begin{aligned} T &= (9 \text{ m/day}) \times (9 \text{ m}) \\ &= 81 \text{ m}^2\text{/day} \\ &= 5400 \text{ Igpd/ft} \end{aligned}$$

Similarly, using a hydraulic conductivity of 90 m/day, the transmissivity would be 54,000 Igpd/ft.

CALCULATION OF DRAWDOWN - INITIAL CONDITION

Theis equation $$s = \frac{Q}{4\pi T} W(u)$$

Where $u = \frac{r^2 S}{4Tt}$

where:

r = 1800 ft = 549 m
S = 0.1 and 0.2 (assumed)
T = 80 and 800 m^2/day (assumed)
t = 100 days*
Q = 160 Igpm = 1048 m^3/day

* assume no recharge during 100 days of summer.

i) for $T = 80\ m^2/day$ and $S = 0.2$
$u = 1.88$ and $W(u) = 0.056$
so $s = 1.04 \times 0.056 = 0.06\ m$ (0.2 feet)

ii) for $T = 800\ m^2/day$ and $S = 0.1$
$u = 0.094$ and $W(u) = 1.87$
so $s = 0.10 \times 1.87 = 0.2\ m$ (0.65 feet)

Assume that the initial excavation below the water table can be approximated by a well located central to the site and pumping at a rate of 160 Igpm.

The above calculated impact would be less during normal conditions and would be less if the total site extraction rate of 500,000 tons per year does not all take place below the water table.

CALCULATION OF DRAWDOWN - FINAL CONDITION

Assume can be approximated by considering removal of 160 Igpm over the whole area of the dewatered pit for 100 days of drought and 95 days of average water surplus.

Aquifer impact over final 6.5 month operating period is calculated as follows:

Equivalent Rate of Water Extraction - Recharge - Water Surplus Over Open Body of Water

$$= \frac{160 \times 195 \times 1440\ ft^3}{6.24} - \frac{64 \times 43560 \times 9.7 \times 95\ ft^3}{12 \times 365} - \frac{130 \times 43560 \times 5.7 \times 95\ ft^3}{12 \times 365}$$

$$= 5.9 \times 10^6\ ft^3$$

over the area of the excavation (130 acres)

= 1.03 foot drawdown at the boundary of the pond.

At the property boundary impact would be substantially reduced.

ATTACHMENT B.2

TABLE 4.4 OF THE NOVEMBER 1980
CRA HYDROGEOLOGICAL INVESTIGATION
AND TEST EVALUATION REPORT

TABLE 4.4

WATER QUALITY ANALYSIS
TW 3-80

DATE	05/27/80	05/27/80	06/05/80
ANALYST	C.R.& A.	Beak	C.R. & A.
PARAMETER			
Alkalinity	259		265
Cadmium			<0.01
Calcium as Ca	85		85
Chloride as Cl	20		59
Conductivity (umhos/cm)	510		610
Copper	0.2		0.02
Hardness as $CaCo_3$	322		324
Iron as Fe	0.4		0.04
Lead		0.02	
Magnesium as Mg*	27		27
Nickel		0.02	
Nitrogen-Ammonia		<0.05	
-Nitrate	0.1	0.05	<0.1
-Nitrite		<0.005	
-Kjeldahl		<0.05	
Oxygen-Dissolved	8.5		
pH	7.5		7.0
Phosphate-Total P		<0.01	
Solids - suspended at 105°C			<0.01
- dissolved at 105°C			0.40
- suspended at 550°C			<0.01
- dissolved at 550°C			0.23
Sulphate as SO_4	30		30

* Calculated Result

N.B. All results mg/l except pH, conductivity and turbidity

CONESTOGA-ROVERS & ASSOCIATES LIMITED
651 Colby Drive,
Waterloo, Ontario, Canada N2V 1C2
(519) 884-0510

Consulting Engineers

November 18, 1992

Reference No. 1644

Mr. John Cooke, Area Supervisor
Ontario Ministry of the Environment
400 Clyde Road
P.O. Box 219
Cambridge, Ontario
N1R 5W6

Dear Mr. Cooke:

Re: Clarification to MOE Comment Regarding
Water Quality Monitoring
Dufferin Aggregates Aberfoyle Pit No. 2

We provide hereunder clarification of the MOE comment regarding monitoring of water quality at the above noted site. With regard to Table 7.1, we recommend that dissolved rather than total iron be analyzed at the locations and that total phosphorus and temperature only be monitored for the surface water sample. In addition, the total petroleum hydrocarbon scan should only be conducted at locations OW1B-90, OW2-90 and OW3-90.

If you should have any questions or require further information, please do not hesitate to contact our office at your convenience.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Greg M. Pucovsky

Greg M. Pucovsky, M.Sc.

GMP/cm/1

c.c. Tony White - Dufferin Aggregates
Robin Smith - Skelton, Brumwell & Associates Inc.
Bob Gibson - MNR

Rec'd
NOV 20

Ontario
Ministry of the Environment
Ministère de l'Environnement

est Central Region
Région du Centre-Ouest

320 Pinebush Road
P.O. Box 219
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COPY
MINISTRY OF ENVIRONMENT
320 PINEBUSH ROAD
P. O. BOX 219
CAMBRIDGE, ONT. N1R 5T8

November 18, 1992

Mr. A.D. Carr, Area Supervisor
Ministry of Natural Resources
Box 21048
605 Beaverdale Road
Cambridge, Ontario N3C 2W1

Dear Mr. Carr:

RE: SITE PLAN AMENDMENT REQUEST- DUFFERIN AGGREGATES ABERFOYLE PIT #2, TOWNSHIP OF PUSLINCH

As you are aware, the Ministry of the Environment provided comments to your office on September 15, 1992 regarding the above plan amendment request.

Please be advised that we received a written response from Conestoga-Rovers & Associates dated November 11, 1992 addressing these comments. Upon review of CRA's letter, we must clarify Attachment A item #6- Dust Suppressant as follows:

Calcium chloride should be used only when absolutely necessary, under strict controls for application and subsequent to notifying the Cambridge District Office at (519) 622-8121.

This is due to a concern for chloride impact to groundwater and was discussed with CRA by telephone on November 17, 1992.

On November 18, 1992 CRA amended its' initial response to water quality monitoring per Attachment A item #1. This Ministry has no objection to CRA's amendment of November 18, 1992.

Subject to the above, this Ministry has no other outstanding items which need to be addressed at this time.

We trust the above is satisfactory to your needs, however should there be any questions regarding the above please contact us.

Yours truly

for
John Cooke,
Area Supervisor

encl.
cc. [redacted]
Dan Joyner, MOE
FILE IN-50-07-21

Conestoga-Rovers & Associates
651 Colby Drive
Waterloo, Ontario N2V 1C2
(519) 884-0510 Office (519) 884-0525 Fax

June 24, 1999

Reference No. 1644

Mr. John Cooke
Ministry of the Environment
1 Stone Road West
4th Floor
Guelph, Ontario
N1G 4Y2

Dear Mr. Cooke:

Re: Dufferin Aggregates
Aberfoyle Pit No. 2
Township of Puslinch

Conestoga-Rovers & Associates (CRA) previously liaised with the Ministry of the Environment during 1992 with respect to an application to mine aggregate material below the water table at Aberfoyle Pit No. 2 in the Township of Puslinch. Approval was subsequently received to mine aggregate below the water table. Dufferin Aggregates has historically mined above the water table at this site and conducted a hydraulic monitoring program. In addition, CRA has collected groundwater samples in order to establish background water quality.

The MOE indicated in a January 4, 1992 internal memorandum that it may be prudent to monitor the headwaters of Aberfoyle Creek located adjacent to the southeast property boundary. CRA, in conjunction with Dufferin Aggregates, located a suitable off-Site hydraulic monitoring location, as shown on attached Figure 1. However, during subsequent correspondence and liaison with the current property owner, an agreement with the owner could not be reached to allow access for monitoring. Monitoring of the creek further downstream of this property and adjacent to the road would not be representative of the headwater area. As such, it is requested that this off-Site monitoring location be deleted from the long-term monitoring program.

In addition, monitoring wells OW3-90 and OW4-90 were completed near the base of surficial sands and gravels which overlie fine-grained silt till and within the silt till, respectively. These locations have historically been dry. As such, it is requested that locations OW3-90 and OW4-90 be deleted from the long-term monitoring program.

If you should have any questions, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Greg M. Pucovsky

Greg M. Pucovsky, M.Sc.

GP/ls/1

c.c.: Sarah Lowe, Dufferin Aggregates
Sergio Carbone, Dufferin Aggregates
Paul Odom, MOE (Hamilton)

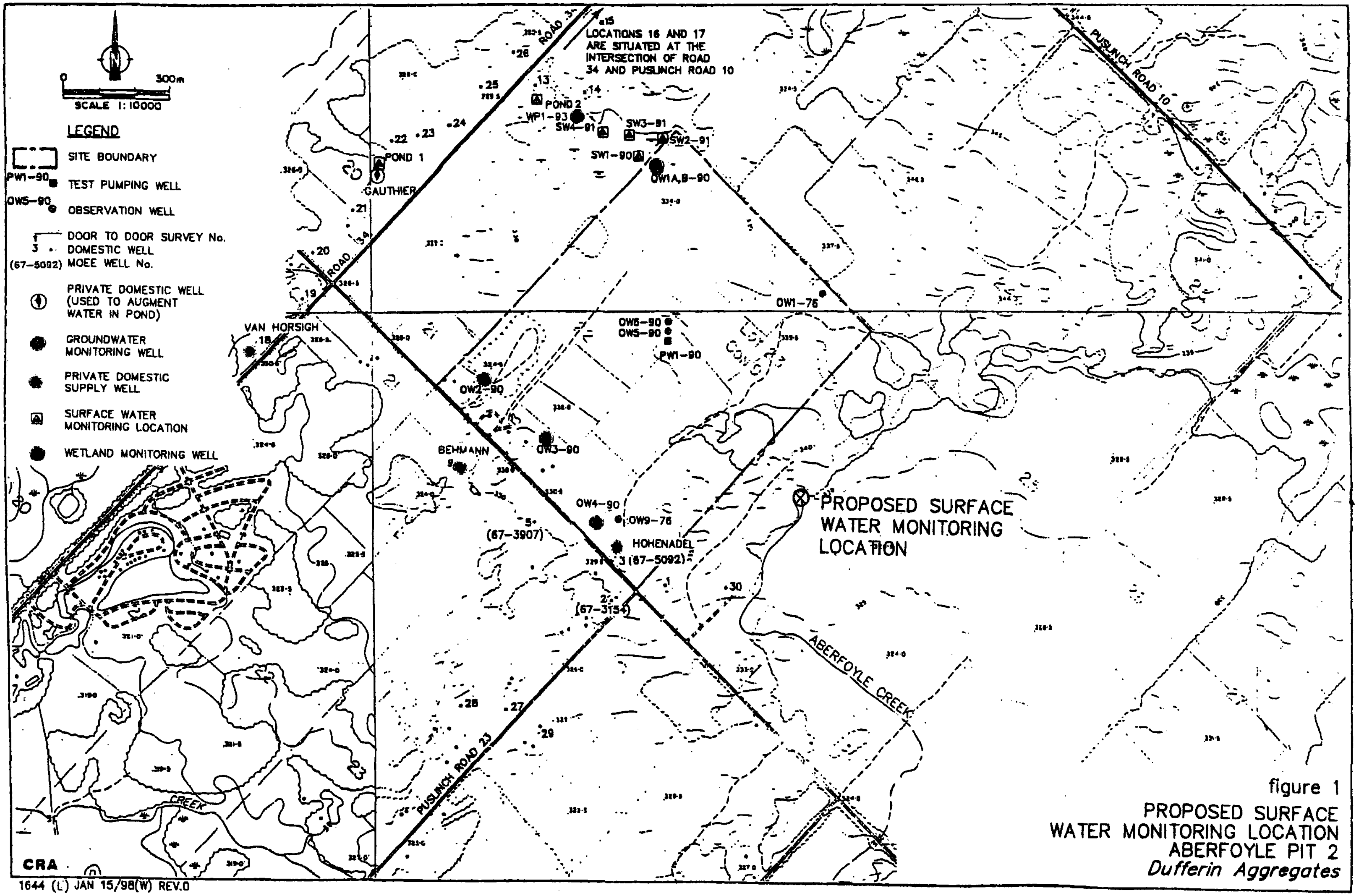

figure 1
PROPOSED SURFACE
WATER MONITORING LOCATION
ABERFOYLE PIT 2
Dufferin Aggregates

1644 (L) JAN 15/98(W) REV.0

CONESTOGA-ROVERS
& ASSOCIATES

651 Colby Drive, Waterloo, Ontario, N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

September 29, 2014

Reference No. 001644

Ms. Kristy Sutherland
Ministry of Natural Resources
1 Stone Road West, 1st Floor
Guelph, Ontario N1G 4Y2

Ms. Lynnette Armour
Ministry of the Environment
1 Stone Road West, 4th Floor
Guelph, Ontario N1G 4Y2

Dear Ms. Sutherland and Ms. Armour:

Re: 2013 Annual Monitoring Report
Dufferin Aggregates Aberfoyle Pit No. 2

Conestoga-Rovers & Associates (CRA), on behalf of Dufferin Aggregates, completed the 2013 Annual Monitoring Report for Aberfoyle Pit No. 2, Township of Puslinch. The report was provided to the Ministry of Natural Resources and the Ministry of the Environment offices in Guelph, Ontario. Based on the results of the 2013 Annual Monitoring program, the following recommendations were provided:

- The Van Horsigh, Behmann, Hohenadel, and Cox (formerly Gauthier) private wells be deleted from the monitoring program. The Van Horsigh private well is a shallow overburden well, and the Behmann and Hohenadel wells are deep overburden wells. Historical monitoring results indicate that water levels and water quality at these locations have not been affected by mining of aggregate at the site. In addition, the existing overburden monitoring wells located near the southwestern property boundary (OW2-90, OW3R-05, and OW4R-05) are suitably located to enable evaluation of water levels and overburden groundwater quality between the mining operation and off-Site private wells. The Cox (formerly Gauthier) well is installed in Guelph Formation bedrock. Water level fluctuations at this location are also similar to those in on-Site monitoring wells, and water quality is not monitored at this location.
- Surface water monitoring location SW5-01 be deleted from the monitoring program since the property owner has refused permission to access his property since February 2006.

In light of the above, we request formal permission to delete the above-noted private wells and surface water location from the monitoring program. Since the surface water location has not been accessible since 2006, this location has already been deleted from the monitoring program.

If you should have any questions, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Greg M. Pucovsky

Greg M. Pucovsky, M.Sc., P. Geo.

GP/jh/1

cc: Ron Van Ooteghem, Dufferin Aggregates

Ministry of the Environment
West Central Region

119 King Street West
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Ministère de l'Environnement

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Téléc. : 905 521-7820

Ontario

December 30, 2013

MEMORANDUM

TO: Lynnette Armour
Environmental Officer
Guelph District Office

FROM: Sarah Day
Surface Water Specialist
Technical Support Section, West Central Region

RE: Dufferin Aggregates Aberfoyle Pit 2 2012 Annual Monitoring Report

I have reviewed the following document for surface water issues with regard to the Dufferin Aggregates Aberfoyle Pit 2, Township of Puslinch, County of Wellington:

- 2012 Annual Monitoring Report Aberfoyle Pit No. 2 Township of Puslinch, Conestoga-Rovers & Associates (May 2013)

Background

The Dufferin Aggregate Aberfoyle Pit 2 is located on Lots 22 and 23, Concession 9, Township of Puslinch. The area licensed for extraction is 78.1 ha of which 68.0 ha will be extracted above the water table and 53.4 ha below the water table. Removal of the aggregate began May 1, 2000 and occurred between May to December from 2001 to 2003, 2005; April to October 2006; April to November 2007; and May to October 2008. Extraction of aggregates from either above or below the water table has not occurred from 2009 to 2012.

The original monitoring program was initiated in the summer of 1990 and a final monitoring program proposed in 1991. The final monitoring program consisted of monthly water level measurements at 4 locations (SW1-90, SW2-91, SW3-91 and SW4-91) in the wetland at the northern corner of the property, as well as at two ponds located on private property just north (Pond 2) and northwest (Pond 1) of the property along Wellington 34 Road. It was also recommended in 1992 that a surface water monitoring location be included on the headwaters of Aberfoyle Creek (SW5-01) located to the southeast of the property. It appears that surface water monitoring location WP1-93 (located in the northern wetland) and SW6-03 (located in the on-site pond) were added to the monitoring program at some point but no information was provided as to when or why. Locations SW1-90, SW2-91, SW3-91, SW4-91 and WP1-93 were not monitored between 2008 and 2011 as property access had been denied however monitoring resumed in 2012. WP1-93 was determined to be blocked and no longer suitable for monitoring. Access to SW5-01 has been denied since 2006.

Mill Creek is a coldwater system within the area of the Aberfoyle Pit 2 and has been identified by MNR as having brown trout, creek chub, brook trout, rock bass, fathead minnow, white sucker, brook stickleback, rainbow darter, central mudminnow, common shiner, bluntnose minnow and eastern blacknose dace fish species present. The wetland areas located to the north, northwest and southeast of the site are a part of the Provincially Significant Mill Creek Puslinch Wetland Complex.

Comments and Recommendations

Reporting and Documentation

1. Information on when WP1-93 and SW6-03 were added to the surface water monitoring program and the rationale for their inclusion needs to be provided.

2. It is not apparent from the mapping what SW1-90, SW2-91, SW3-91, SW4-91 and WP1-93 are monitoring. Are these locations located within a creek or are they just monitoring standing water within the wetland and no defined water course?

3. Additional information needs to be provided on how WP1-93 is blocked and why it is no longer suitable to monitor.

4. It is not clear from Figure 3.1 if the pond outlined in the northern portion of the property is the CBM Tikal Pit pond. Furthermore there is no mapping of the Aberfoyle Pit 2 pond. Figure 3.1 should be updated to include all surface water features, both natural and manmade.

5. Data for Pond 1 and SW6-03 were not included in Figure 3.5, 3.6 or 3.7.

6. Data points plotted in Figure 3.5 for SW2-91, SW3-91 and SW4-91 in 2012 include points when conditions were dry. This is misleading as it was thought that these were actual water level points.

7. A measurement was not obtained in June at any of the surface water monitoring locations. An explanation needs to be provided on why this did not occur.

Surface Water Impacts

1. There is minimal data available for 2012, only 2 non-frozen measurements (Mar and Apr) at SW2-91, SW3-91 and SW4-91 therefore no conclusion can be made on potential impact except that the 2 measurements fall within the historical range.

2. The on-site pond, as well as the two off-site ponds (Pond 1 and 2), have data for the majority of 2012. Data for the ponds appear to fall within their historical ranges. However, it should be noted that there has consistently been water in the ponds in the summer from 2009 to 2012 (i.e. since extraction stopped) while historical data prior to 2009 indicates dry conditions occurred in the summer from 1999 to 2008. It is possible that this may be a result of climatic conditions however annual precipitation data provided in the figures does not indicate that 2009 to 2012 has been any wetter than the years prior.

3. The existing monitoring program does not require thermal data to be collected. There is the potential that the on-site ponds created as a result of extraction could influence the thermal regime of nearby surface water receivers. It is suggested that the extent of the thermal plume in groundwater be determined and if this plume reaches either Mill Creek or Aberfoyle Creek.

4. The proponent is requesting that SW5-01 be removed from the monitoring program due to access issues. This is acceptable however, should ownership of the property change, then SW5-01 should be reinstated into the surface water monitoring program, pending an access agreement with the new land owners.

Should you have any questions or comments or require additional information, please feel free to contact me at (905) 521-7304 or Sarah.Day@ontario.ca.

Regards,

Sarah Day, M.Sc.

Cc Belinda Koblik, Supervisor, Water Resources Unit
Paul Odom, Surface Water Group Leader

The purpose of the preceding review is to provide advice to the Ministry of the Environment regarding surface water conditions based on a review of the information provided in the above referenced documents. The conclusions, opinions and recommendations of the reviewer are based on information provided by others, except where otherwise specifically noted. The Ministry cannot guarantee that the information that is provided by others is accurate or complete. A lack of specific comment by the reviewer is not to be construed as endorsing the content or views expressed in the reviewed material.

Ministry of the Environment and Climate Change
West Central Region

119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7640
Fax: 905 521-7820

Ministère de l'Environnement et de l'Action en matière de changement climatique
Région du Centre-Ouest

119 rue King ouest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél.: 905 521-7640
Téléc.: 905 521-7820

Ontario

Memorandum

Date: October 27, 2014

To: Lynnette Armour
Senior Environmental Officer, Guelph District Office (GDO)

From: Abdul Quyum
Hydrogeologist, Water Resources Unit, Technical Support Section (TSS)

Re: Dufferin Aggregates – Aberfoyle Pit
Township of Puslinch, County of Wellington

I have reviewed the following report for groundwater issues:

- *2013 Annual Monitoring Report, Dufferin Aggregates, Aberfoyle Pit No. 2, Conestoga-Rovers & Associates, dated September 2014.*

The purpose of the review was to assess impact on the overburden aquifer water level and groundwater quality caused by below the water table aggregate mining operations.

Background:

The site is located southeast of Victoria Road South and Wellington Road 34 East intersection, in the Township of Puslinch, Ontario. The site is currently approved for above and below water table extraction of sand and gravel aggregate. The below water table extraction does not involve pit dewatering. The below water table aggregate extraction operations commenced in 2000. As part of the approval to initiate aggregate mining below the water table, a groundwater monitoring program was developed and provided to the Ministry of the Natural Resources (MNR) in August 1991. The monitoring program was reviewed and endorsed by the MOE in 1992.

Hydrogeological Setting:

The geology consists of sand, and sand and gravel deposits. A surficial unconfined aquifer of about 12 m thick exists within the shallow sand and gravel deposits. The groundwater in the surficial overburden aquifer flows to the southwest. The overburden at the site is underlain by dolostone of the Guelph Formation which occurs at a depth of 15 to 30 m below the original ground surface.

Comments:

The review comments are outlined below:

1. The spatial and temporal trend of water level variation in the upper unconfined overburden aquifer follows the precipitation trend, i.e. an increase in water level with an increase in the amount of annual rainfall. Prior to the aggregate mining below the water table, the water level varied in the 1.5 to 2.0 m range between 1990 and 2000. Between 2000 and 2008 when aggregate mining below the water table occurred, the range of water elevation

variations (1.5 to 2 m) were comparable to the range of water elevation variations when aggregate extraction was limited to above water table. A marginally increasing trend in water level was observed during aggregate extraction below the water table until 2007 when the water level generally declined across the site. The observed declined in water level in 2007 correlated well with the below average rainfall received in 2007. Since 2007, a recovery in water level to the historical water level range has been observed. The below water table aggregate extraction operations do not appear to have caused unacceptable impact on the surficial overburden aquifer water levels.

2. The review of the groundwater quality data does not indicate that the surficial overburden groundwater quality has been influenced by the below water table aggregate mining operations. The groundwater quality at the Horsigh off-site shallow well was found different than the on-site groundwater quality in terms of chloride. The chloride concentrations at this off-site well were significantly elevated (80.6 to 237 mg/L) compared to the chloride level (10.9 to 44 mg/L) at upgradient monitor OW1B-90. Considering the inferred flow direction and the location of this off-site well close to the Wellington Road 34 and shallow depth, the chloride impact at this location is likely related to winter road maintenance operations.
3. With respect to the removal of off-site wells from the monitoring program, I found the consultant's recommendation reasonable and acceptable because a) dedicated on-site monitoring wells for hydraulic monitoring are available along the western property boundary, and b) the water quantity and quality have not been negatively influenced by the above and below water table mining operations. Moreover, the water level data collected from off-site private wells are generally influenced by operation of these wells. For this reason, I consider water elevation data collected from on-site observation wells more reliable than the private water supply wells for evaluation of impact on water quantity and quality on off-site receptors.

Conclusions:

There is no long-term negative or unacceptable impact on the surficial overburden aquifer due to below water table mining operations. The on-site and off-site groundwater quantity and quality does not appear to have been influenced by aggregate mining operations. The groundwater level and quality monitoring should continue at all on-site wells. The removal of off-site private wells from the current monitoring program is acceptable.

I trust that the above comments will be of benefit. If you have any questions, I can be reached at 905-521-7817 or abdul.quyum@ontario.ca

Statement of Limitations:

The purpose of the preceding review is to provide advice to the Ministry of the Environment regarding subsurface conditions based on a review of the information provided in the above referenced document and data gathered in the investigation undertaken by the ministry. The conclusions, opinions and recommendations of the reviewer are based on information provided by others. The Ministry cannot guarantee that the information that has been provided by others is accurate or complete. A lack of specific comment by the reviewer is not to be construed as endorsing the content or views expressed in the reviewed material.

Abdul

Abdul Quyum, M.A.Sc., P.Eng., P.Geo. (ab)
Hydrogeologist

TOWNSHIP OF PUSLINCH
PROGRESSING TOGETHER

Township of Puslinch
7404 Wellington Road #34
Guelph, ON, N1H 6H9
T: (519) 763 – 1226
F: (519) 763 – 5846
www.puslinch.ca

February 6th 2015

Sent Via Regular Mail

Attention Mr. Ron. Van Ooteghem
Dufferin Aggregates
125 Brock Road South
Aberfoyle, ON, N1H 6H9

Dear Mr. Van Ooteghem:

Re: Dufferin Aggregates Aberfoyle Pit No.2
Township of Puslinch
2013 Monitoring Report Review
File No: E13/DUF

Enclosed please find a copy of correspondence from Harden Environmental Services Inc. dated December 18th, 2014 with respect to the above matter.

The Township respectfully requests that the removal of each private well be agreed to by the individual resident.

If you have any questions regarding the above, please contact Karen Landry, Clerk/CAO klandry@puslinch.ca (519) 763-1226 ext.214.

Yours truly,

Karen Landry
Clerk/CAO

KL/nl

HARDEN

4622 Nassagaweya-Puslinch Townline R.R. 1 Moffat Ontario Canada L0P 1J0
Phone: 519.826.0099 fax: 519.826.9099 www.hardenv.com

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

Our File: 0132

December 18, 2014

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

CLERK'S DEPARTMENT
RV GP LA (MNR) AM (MNR)
Public Hearing
For Your Information
Council Agenda Feb / 15

Attention: Karen Landry,
CAO - Clerk

Dear Ms. Landry:

Re: Aberfoyle Pit #2
2013 Monitoring Report Review

We have reviewed the 2013 Aberfoyle Pit #2 report prepared by Conestoga Rovers and Associates prepared on behalf of Dufferin Aggregates. There has been no aggregate extraction at this site between 2009 and 2013. Based on the data presented we make the following comments.

The monitoring of stations SW1-90, SW2-91, SW3-91 and SW4-91 resumed in February 2012. These stations represent water levels in the wetland adjacent to Pit # 2. Water levels in the wetland measured at SW2-91 have shifted lower in comparison to pre-below-water-table extraction. The shift is in the range of twenty to thirty centimeters as observed from the seasonal low water elevations (see attached figure). When below-water-table extraction commences, there will likely be additional water level change in the wetland.

The 2013 Monitoring report again recommends the removal of the Van Horsigh, Behmann, Hohenadel and Cox private wells from the monitoring program. We concur that on-site monitoring wells can adequately address changes in the groundwater flow system. The removal of the each private well should, however, be agreed to by the individual resident.

The Tikal Pond is located between the Dufferin Pit No. 2 extraction area and the Cox well. It is our opinion that continued monitoring of this well is not necessary since it is unlikely that activities on the Dufferin Pit No. 2 site could impact either the quantity or quality of groundwater in the Cox well.

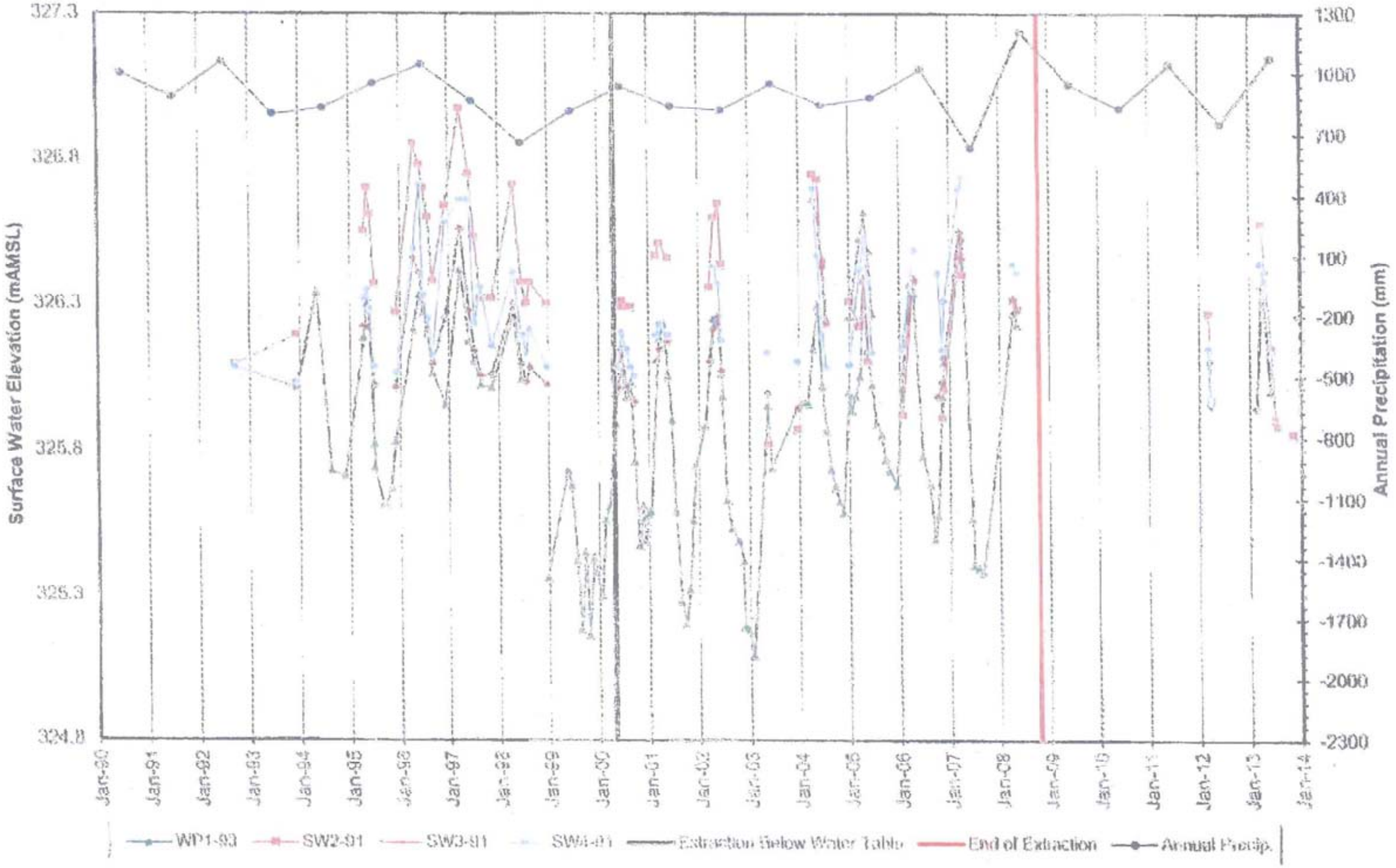
There are no significant changes in on-site water groundwater levels since the cessation of extraction in 2009.

There have been no significant changes in water quality from the extractive operations, based on a review of the water quality data obtained in 2013.

Sincerely
Harden Environmental Services Ltd.

Stan Denhoed

Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist



Note:
Data gaps indicate frozen or "dry" (water level below bottom of t-bar) conditions;
SW2-91 t-bar was not in place between July to December 2002; therefore no water level taken.
WP1-93 not monitored Jun. 2008 to Jan. 2012 at request of owner, blocked since Feb. 2012
SW2, SW3 and SW4 not monitored Jun. 2008 to Jan. 2012 at request of owner.

figure 3.5

SURFACE WATER ELEVATIONS (1)

ABERFOYLE PIT No. 2

Dufferin Aggregates

-----Original Message-----
From: Richardson, Seana (MNRF) [mailto:Seana.Richardson@ontario.ca]
Sent: Wednesday, April 12, 2017 11:33 AM
To: Armour, Lynnette (MOECC) <Lynnette.Armour@ontario.ca>; Pucovsky, Greg <Greg.Pucovsky@ghd.com>
Subject: RE: 2016 Annual Monitoring Report, Aberfoyle Pit No. 2, Township of Puslinch ~COR-001644~

Hi Greg,

Our MNRF hydrogeologist, Oleg Ivanov, has reviewed this request and has no concerns with the proposed modifications.

Have a great rest of your day,

Seana

Seana Richardson
Aggregate Technical Specialist
Ministry of Natural Resources and Forestry, Guelph District
1 Stone Road West
Guelph ON, N1G 4Y2
(P) 519-826-4927
(E) Seana.Richardson@ontario.ca

-----Original Message-----
From: Armour, Lynnette (MOECC)
Sent: March 21, 2017 11:23 AM
To: Pucovsky, Greg
Cc: Richardson, Seana (MNRF)
Subject: RE: 2016 Annual Monitoring Report, Aberfoyle Pit No. 2, Township of Puslinch ~COR-001644~

Hi Greg

I have requested a review of the annual report and proposed changes. I will let you know when the review is complete.

Thanks,

Lynnette Armour
Provincial Officer
Ministry of the Environment and Climate Change West Central Region, Guelph District Office
Tel: 519-826-4759 or 1-800-265-8658
Fax: 519-826-4286

-----Original Message-----
From: Pucovsky, Greg [mailto:Greg.Pucovsky@ghd.com]
Sent: March 21, 2017 10:03 AM
To: Armour, Lynnette (MOECC); Richardson, Seana (MNRF); klandry@puslinch.ca
Cc: Fleming, Chris; Topalovic, Maria R; Project Email Filing
Subject: 2016 Annual Monitoring Report, Aberfoyle Pit No. 2, Township of Puslinch ~COR-001644~

Attached please find the 2016 Annual Monitoring Report for Aberfoyle Pit No. 2, Township of Puslinch. A separate letter outlines a request for modification of the monitoring program.

Greg
Greg M. Pucovsky, M.Sc., P. Geo.
Senior Hydrogeologist

GHD
T: (519) 884-0510 | M: (519) 404-6277 | E: greg.pucovsky@ghd.com
Mailing Address: 651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2 Office Address: 40 Bathurst Drive, Waterloo, Ontario|
www.ghd.com WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION
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Appendix B
Stratigraphic and Instrumentation Logs

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

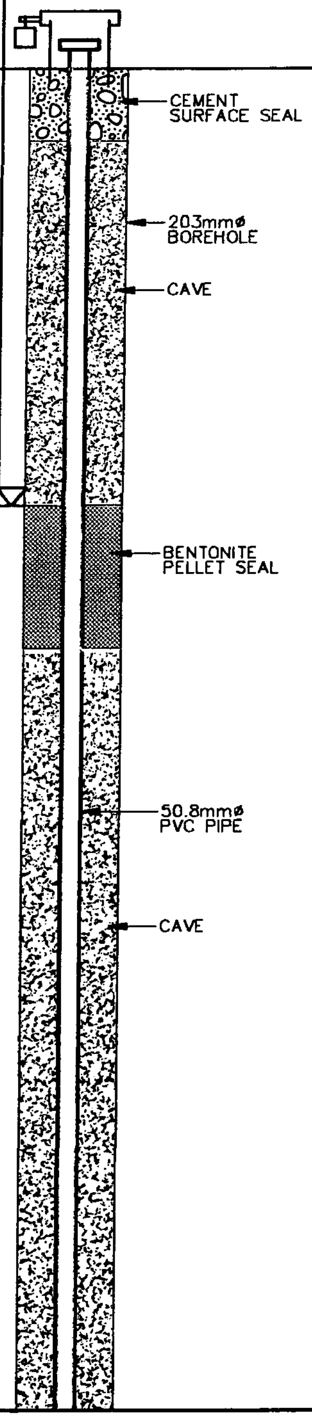
(L-01)

PROJECT NAME: ABERFOYLE PIT #2
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW1A-90 (Page 1 of 2)
DATE COMPLETED: MAY 2, 1990
DRILLING METHOD: 3 3/4" HSA
CRA SUPERVISOR: B. PARKER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser)	*330.674*			
	GROUND SURFACE	*329.89*			
	SW-GW(SAND/GRAVEL), little to some silt, dense, fine to medium grained, well graded, brown, moist, cobbles				
1.0					
2.0			1SS	☒	39
3.0	Some silt, very dense				
			2SS	☒	>50
4.0					
	Dense 2.5cm seam SP, medium to coarse sand, trace silt and clay, medium to coarse grained, wet	*325.32* ▽			
5.0			3SS	☒	44
	SM(SAND), and silt, trace gravel, medium dense, fine to medium grained, poorly graded, brown, wet	*324.40*			
6.0					
	SW(SAND), little to some silt, little gravel, very dense, very fine to medium grained, well graded, brown-grey, wet	*323.33*	4SS	☒	23
7.0			5SS	☒	50
8.0			6SS	☒	39
9.0	Medium dense				
			7SS	☒	28
10.0					
	Dense				
11.0			8SS	☒	31
12.0					
			9SS	☒	31
13.0					

MONITOR INSTALLATION



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

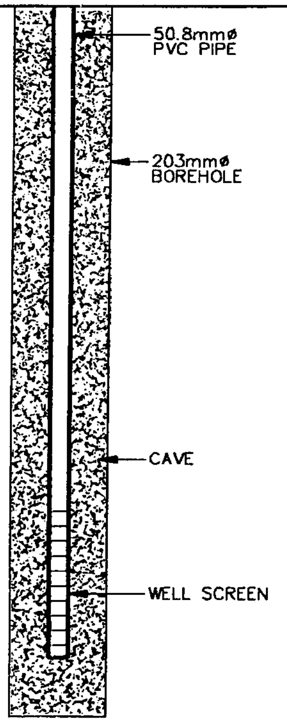
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-01)

PROJECT NAME: ABERFOYLE PIT #2
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW1A-90 (Page 2 of 2)
DATE COMPLETED: MAY 2, 1990
DRILLING METHOD: 3 3/4" HSA
CRA SUPERVISOR: B. PARKER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
						
14.0				10SS	☒	33
15.0	Medium dense					
				11SS	☒	11
16.0	Harder drilling	313.73				
	SW-GW(SAND/GRAVEL), medium dense, medium to coarse grained, well graded, grey, wet, cobbles					
17.0				12SS	☒	14
	Dense					
18.0	Very dense			13SS	☒	32
				14SS	☒	>50
19.0						
20.0	ML(SILT)TILL, little clay, trace sand and gravel, hard, low plasticity, massive, grey-brown, moist	309.92		15SS	☒	<50
	END OF HOLE @ 20.42 m BGS.	309.46				
21.0			SCREEN DETAILS: Screened Interval: 18.29m to 19.81m BGS Length −1.52m Diameter −50.8mm Slot # 10 Material − PVC Sand pack interval: 6.1m to 20.42m BGS Material − Natural			
22.0						
23.0						
24.0						
25.0						
26.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

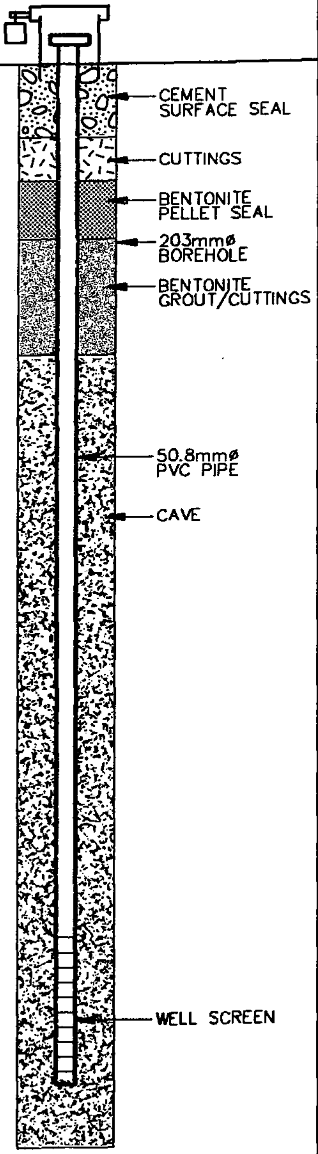
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-02)

PROJECT NAME: ABERFOYLE PIT #2
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW1B-90
DATE COMPLETED: MAY 2, 1990
DRILLING METHOD: 3 3/4" HSA
CRA SUPERVISOR: B. PARKER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser)	330.834				
	GROUND SURFACE	329.92				
	Stratigraphy as per OW1A-90					
1.0						
2.0						
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
	END OF HOLE @ 11.28 m BGS.	318.64				
12.0						
13.0						



SCREEN DETAILS:
Screened Interval:
9.14m to 10.67m BGS
Length – 1.52m
Diameter – 50.8mm
Slot # 10
Material – PVC
Sand pack interval:
6.10m to 11.28m BGS
Material – Silica/Natural

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

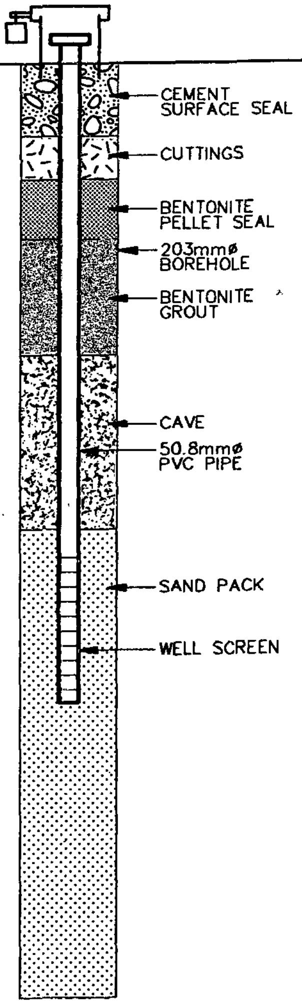
(L-03)

PROJECT NAME: ABERFOYLE PIT #2
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW2-90 (Page 1 of 3)
DATE COMPLETED: MAY 2, 1990
DRILLING METHOD: 3 3/4" HSA
CRA SUPERVISOR: B. PARKER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser)	326.837			
	GROUND SURFACE	325.83			
	ML(SILT), some sand and gravel, brown, moist cobbles				
	SM-GM(SAND/GRAVEL), and silt, very dense, fine to medium grained, well graded, brown, moist, cobbles	325.22			
1.0					
			1SS	☒	>50
2.0					
3.0	Little silt, medium dense, fine to coarse grained, grey-brown, wet		2SS	☒	27
4.0					
			3SS	☒	31
5.0					
6.0			4SS	☒	15
		318.97			
7.0	ML(SILT)TILL, little to some clay, trace sand and gravel, very stiff, medium plasticity, nuggetty, grey, very moist				
			5SS	☒	28
8.0					
9.0	Little very fine sand, hard		6SS	☒	>50
		316.08			
10.0	END OF HOLE @ 9.75 m BGS.				
11.0					
12.0					
13.0					

MONITOR INSTALLATION



SCREEN DETAILS:
Screened Interval:
5.18m to 6.71m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
3.05m to 9.75m BGS
Material -Silica/Natural

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-04)

PROJECT NAME: ABERFOYLE PIT #2

PROJECT NO.: 1644

CLIENT: DUFFERIN AGGREGATES

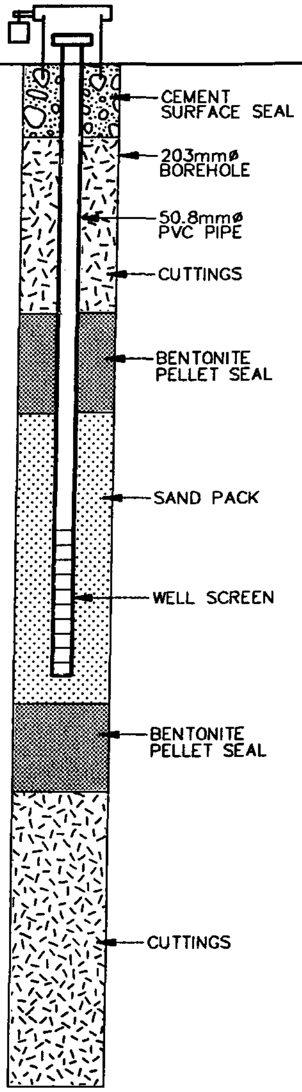
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW3-90

DATE COMPLETED: MAY 3, 1990

DRILLING METHOD: 3 3/4" HSA

CRA SUPERVISOR: B. PARKER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	334.854 334.01				
	ML(SILT)FILL, some sand and gravel, little clay, medium plasticity, brown, slightly moist, cobbles					
1.0						
2.0						
3.0				1SS	☒	48
4.0	SM-GM(SAND/GRAVEL), some silt, dense, fine to medium grained, well graded, brown, slightly moist, cobbles	329.89		2SS	☒	>50
5.0				3SS	☒	42
6.0	Very dense, very moist Three inch seam, very fine sand, wet			4SS	☒	>50
7.0	ML(SILT)TILL, some sand and gravel, trace clay, hard, low plasticity, nuggetty, grey-brown, moist, sand and gravel very fine to coarse grained	326.84				
8.0				5SS	☒	50
9.0						
10.0				6SS	☒	>50
	Refusal END OF HOLE @ 10.67 m BGS.	323.34		7G		
11.0						
12.0						
13.0						

SCREEN DETAILS:
Screened Interval:
4.88m to 6.40m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material - PVC
Sand pack interval:
3.66m to 6.70m BGS
Material - Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

(CRA #OW3R-05)

BOREHOLE NO. BH05-1

PAGE 1 OF 1

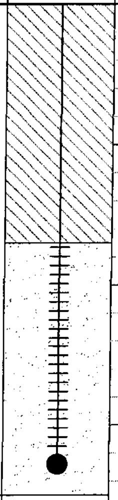
PROJECT NAME: ABERFOYLE PIT #2 **PROJECT NO.:** 051773.00

CLIENT: DUFFERIN AGGREGATES **DATE:** SEPTEMBER 28, 2005

BOREHOLE TYPE: BECKER HAMMER DRILL (168 mm) **SUPERVISOR:** JMM

GROUND ELEVATION: 324 m ASL (estimated) 324.27 (surveyed), **REVIEWER:** AJC

TOP OF RISER : 325.21 (surveyed)

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION "N" VALUE 10 20 30 SHEAR STRENGTH	WATER CONTENT % 10 20 30 WP WL	REMARKS
				TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)			
0 2	SAND AND GRAVEL: FINE TO COARSE SAND, FINE TO COARSE GRAVEL, TRACE SILT, TRACE COBBLE, MOIST TO 2.4 m.			GS1							UTM COORDINATES 17T 6570608 4814893 LOCATED IN SOUTHWEST CORNER OF PIT ON FLOOR. INCLUDED AS MOE WELL RECORD A014804.
4	- GRAVEL CONTENT WITH DEPTH > 60% - SATURATED BELOW 2.4 m.			GS2							
6 7.0				GS3							BOREHOLE COMPLETED WITH GROUND WATER STANDPIPE. BOREHOLE ANNULUS CONTAINS COLAPSED NATIVE MATERIALS AND UPPER ± 1.5 m SEALED WITH BENTONITE.
8	SILTY CLAY: SILTY CLAY, OCCASIONAL GRAVEL OR COBBLE, WTPL TO APL.			GS4							-TILL LIKE.
10 10.7				GS5	A AND	B					
12 13.4	SILTY SAND: FINE TO COARSE SAND, SOME SILT TO SILTY, SOME FINE TO COARSE GRAVEL, TRACE COBBLE, SATURATED.			GS6							- POSSIBLE BOULDER RECOVERED ROCK PARTICLES. - DRILL REFUSAL
14 16 18 20	BOREHOLE TERMINATED AT 13.4 m ON ROCK.										

Revision 2/ Aug 2003

JAGGER HIMS LIMITED

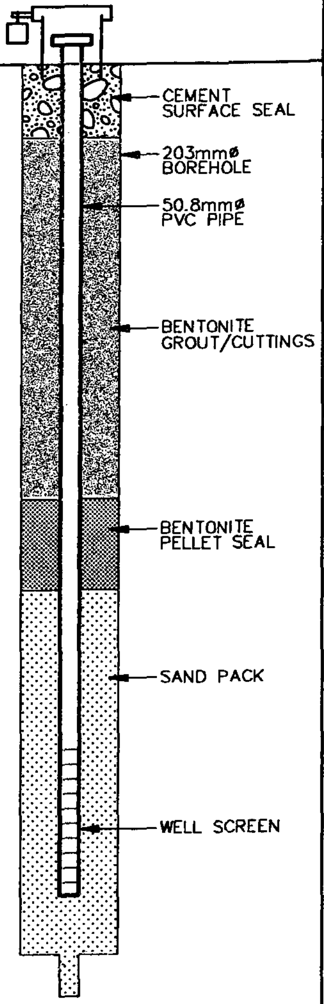
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-05)

PROJECT NAME: ABERFOYLE PIT #2
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW4-90
DATE COMPLETED: MAY 3, 1990
DRILLING METHOD: 3 3/4" HSA
CRA SUPERVISOR: B. PARKER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	335.783 334.94				
	SW-GW(SAND/GRAVEL), little to some silt, very dense, very fine to coarse grained, well graded, brown, moist, cobbles					
1.0						
2.0				1SS	☒	>50
	ML(SILT)TILL, some sand, little gravel, hard, low plasticity, very fine to medium grained sands, nuggetty, brown, moist	332.65				
3.0	Very moist			2SS	☒	>50
4.0	Some gravel					
5.0						
6.0						
7.0						
	Harder drilling					
8.0				5SS	☒	>50
9.0						
				6SS	☒	>50
	END OF HOLE @ 9.30 m BGS.	325.64				
10.0						
11.0						
12.0						
13.0						



SCREEN DETAILS:
Screened Interval:
7.16m to 8.69m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
5.49m to 9.30m BGS
Material -Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

(CRA # OW4R-05)

BOREHOLE NO. BH05-3

PAGE 1 OF 2

PROJECT NAME: ABERFOYLE PIT #2 **PROJECT NO.:** 051773.00

CLIENT: DUFFERIN AGGREGATES **DATE:** SEPTEMBER 28, 2005

BOREHOLE TYPE: BECKER HAMMER DRILL (168 mm) **SUPERVISOR:** JMM

GROUND ELEVATION: 336 m ASL (estimated) ; 339.51 (surveyed) **REVIEWER:** AJC

Top of Riser : 340.38 (surveyed)

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 Wp WL	REMARKS
0	SAND: FINE TO COARSE SAND, WITH SOME TO TRACE FINE TO COARSE GRAVEL, TRACE COBBLE, TRACE SILT, MOIST.			GS1							UTM COORDINATES 17T 6570605 4814830 LOCATED SOUTHWEST CORNER OF PROPERTY ON TOP LIFT. MOE WELL RECORD A014804.
2				GS2							
4				GS3							
6	– CLAYEY SILT LAYER AT 6.1 m APPROXIMATELY 15 cm.										
7.0	SAND: FINE TO COARSE SAND, WITH SOME SILT, TRACE FINE TO COARSE GRAVEL, TRACE COBBLE, MOIST.			GS4							BOREHOLE COMPLETED WITH GROUND WATER STANDPIPE. BOREHOLE ANNULUS CONTAINS COLAPSED NATIVE MATERIALS AND UPPER ± 1.5 m SEALED WITH BENTONITE.
10				GS5							
12				GS6							
14.3	SAND AND GRAVEL: FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, TRACE COBBLE, MOIST TO 18.9 m. – SILT CONTENT VARIABLE 0 – 25%.			GS7							
18				GS8							
	– SATURATED BELOW 18.9 m.										
20				GS9							

Revision 2/ Aug 2003

JAGGER HIMS LIMITED

(CRA # OW4R-05)

BOREHOLE NO. BH05-3

PAGE 2 OF 2

PROJECT NAME: ABERFOYLE PIT #2

PROJECT NO.: 051773.00

CLIENT: DUFFERIN AGGREGATES

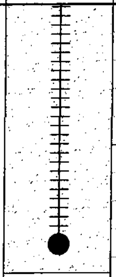
DATE: SEPTEMBER 28, 2005

BOREHOLE TYPE: BECKER HAMMER DRILL (168 mm)

SUPERVISOR: JMM

GROUND ELEVATION: ~~336 m ASL (estimated)~~

REVIEWER: AJC

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 SHEAR STRENGTH	WATER CONTENT % 10 20 30 Wp WL	REMARKS
20	SAND AND GRAVEL: Continued.			GS10							
22				GS11							
24				GS12							
26											– DRILL REFUSAL
26.8	BOREHOLE TERMINATED AT 26.8 m IN SAND AND GRAVEL.										
28											
30											
32											
34											
36											
38											
40											

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

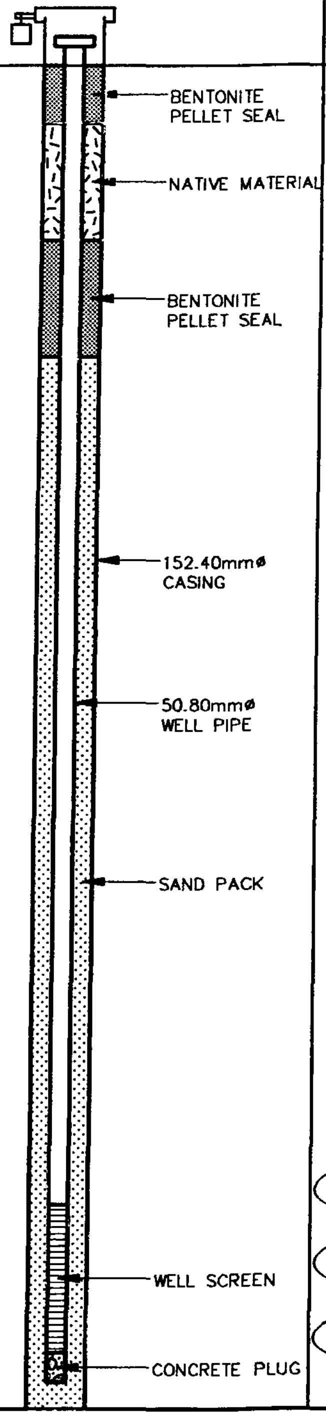
(L-07)

PROJECT NAME: ABERFOYLE PIT
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW5-90 (Page 1 of 2)
DATE COMPLETED: JUNE 21, 1990
DRILLING METHOD: CABLE TOOL
CRA SUPERVISOR: L. LAVALLEE

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Casing) GROUND SURFACE	326.571 325.53			
1.0	SM(SAND), some silt, medium grained, poorly graded, cobbles, grey, moist		1CT	☒	
2.0 3.0	SW(SAND), some gravel, little silt, medium to coarse grained, well graded, grey, saturated	324.01	2CT	☒	
4.0	SM(SAND), some silt, trace gravel, medium grained, poorly graded, grey, saturated	322.48	3CT	☒	
5.0 6.0	SM-GM(SAND/GRAVEL), some silt, coarse grained, poorly graded, grey, saturated	320.96	4CT	☒	
7.0 8.0 9.0 10.0 11.0	SM(SAND), some silt, fine to medium grained, well graded, grey, saturated – little clay – little clay, trace gravel	319.43	5CT 6CT 7CT 8CT 9CT	☒ ☒ ☒ ☒ ☒	
12.0 13.0	SW(SAND), trace silt and clay, trace gravel, fine grained, poorly graded, grey-black, saturated – trace to little gravel, no silt, more coarse, fine to medium grained, well graded – trace gravel, trace silt and clay, fine to coarse grained	314.25	10CT 11CT 12CT	☒ ☒ ☒	

MONITOR INSTALLATION



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

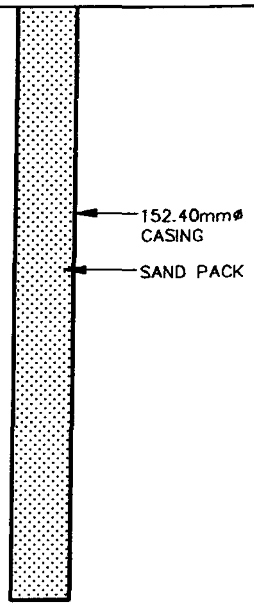
(L-07)

PROJECT NAME: ABERFOYLE PIT
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW5-90 (Page 2 of 2)
DATE COMPLETED: JUNE 21, 1990
DRILLING METHOD: CABLE TOOL
CRA SUPERVISOR: L. LAVALLEE

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
		311.81			
14.0	SM(SAND), trace to little silt, trace clay fine grained, poorly graded, grey–black,saturated		13CT	☒	
15.0	– trace silt and clay, more coarse, poorly graded		14CT	☒	
	– trace clay, medium to coarse grained, well graded		15CT	☒	
16.0	– little gravel, medium grained, poorly graded		16CT	☒	
		309.07			
	ML(SILT), little sand, trace gravel, medium grained sand, grey, saturated		17GR	☒	
17.0		308.46			
	SP(SAND), trace silt, trace fine grained gravel, medium grained, poorly graded, grey–black, saturated		18GR	☒	
18.0	– little to trace silt, no gravel				
	– trace silt, brown		19GR	☒	
19.0			20GR	☒	
		306.33			
	END OF HOLE @ 19.20 m BGS.				
20.0					
21.0					
22.0					
23.0					
24.0					
25.0					
26.0					

MONITOR INSTALLATION



SCREEN DETAILS:
Screened Interval:
11.9 to 13.4m BGS
Length –1.5m
Diameter –50.80mm
Slot # 10
Material –Stainless Steel
Sand pack interval:
3.0 to 19.2m BGS
Material –Natural

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

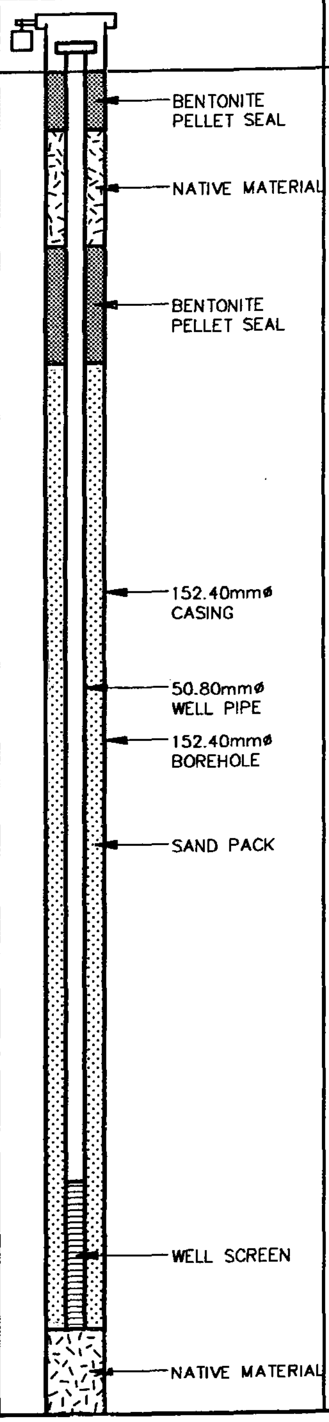
(L-08)

PROJECT NAME: ABERFOYLE PIT
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW6-90 (Page 1 of 2)
DATE COMPLETED: JUNE 21, 1990
DRILLING METHOD: CABLE TOOL
CRA SUPERVISOR: L. LAVALLEE

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Casing)	326.464			
	GROUND SURFACE	325.49			
	Stratigraphy for 0.0 to 9.14 as per OW5-90				
1.0					
2.0					
3.0					
4.0					
5.0					
6.0					
7.0					
8.0					
9.0		316.35			
	SM(SAND), some silt, little fine grained gravel, medium to coarse grained, well graded, grey, saturated - dense clay layer		1CT	☒	
10.0		315.43	2CT	☒	
	SM(SAND), little silt, trace fine grained gravel, fine to medium grained, well graded, grey-brown, saturated				
11.0	- some silt, no gravel, fine grained, poorly graded		3CT	☒	
	- fine to medium grained, well graded		4CT	☒	
12.0	- trace fine grained gravel, medium to coarse grained - no gravel, fine to medium grained, grey		5CT	☒	
13.0	- more fine - trace clay, medium to coarse grained				

MONITOR INSTALLATION



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

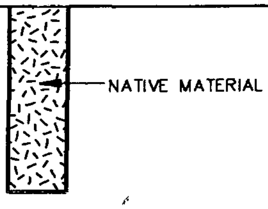
GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-08)

PROJECT NAME: ABERFOYLE PIT
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW6-90 (Page 2 of 2)
DATE COMPLETED: JUNE 21, 1990
DRILLING METHOD: CABLE TOOL
CRA SUPERVISOR: L. LAVALLEE

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	'N' VALUE
	– trace clay, medium to coarse grained					
14.0						
	ML(SILT), some coarse grained gravel, little fine to coarse grained sand, little clay, well graded, grey, saturated	311.16				
15.0	END OF HOLE @ 14.94 m BGS.	310.55	SCREEN DETAILS: Screened Interval: 11.58 to 13.11m BGS Length –1.52m Diameter –50.8mm Slot # 10 Material –PVC Sand pack interval: 3.05 to 13.11m BGS Material –Natural			
16.0						
17.0						
18.0						
19.0						
20.0						
21.0						
22.0						
23.0						
24.0						
25.0						
26.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

(CRA # OW7-05)

BOREHOLE NO. BH05-2

PAGE 1 OF 2

PROJECT NAME: ABERFOYLE PIT #2

PROJECT NO.: 051773.00

CLIENT: DUFFERIN AGGREGATES

DATE: SEPTEMBER 28, 2005

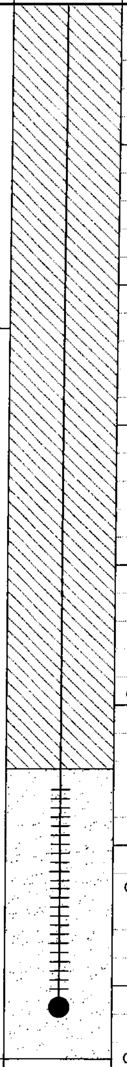
BOREHOLE TYPE: BECKER HAMMER DRILL (168 mm)

SUPERVISOR: JMM

GROUND ELEVATION: 334 m ASL (estimated) , 333.41 (surveyed)

Top of Riser : 334.38 (surveyed)

REVIEWER: AJC



DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 Wp WL	REMARKS
0	SAND: FINE TO COARSE SAND, WITH SOME FINE TO COARSE GRAVEL, TRACE COBBLE, TRACE SILT, MOIST.			GS1							UTM COORDINATES 17T 0571455 4815165 LOCATED ON THE EASTERN CORNER OF THE PIT. – FOLLOW ROADWAY AROUND POND TO THE MEETING OF THE TWO BERMS. INCLUDED AS MOE WELL RECORD A014804.
2				GS2							
4.6	GRAVELLY SAND: FINE TO COARSE SAND, FINE TO COARSE GRAVEL, TRACE COBBLE, TRACE SILT, MOIST TO 10.0 m.			GS3							BOREHOLE COMPLETED WITH GROUND WATER STANDPIPE. BOREHOLE ANNULUS CONTAINS COLAPSED NATIVE MATERIALS AND UPPER ± 1.5 m SEALED WITH BENTONITE.
8				GS4							
10	– SATURATED BELOW 10.0 m.			GS5							
12				GS6							
15.0	GRAVELLY SAND: GRAVELLY FINE TO COARSE SAND, TRACE COBBLES, SATURATED.			GS7							
18				GS8							
20				GS9							

Revision 2/ Aug 2003

JAGGER HIMS LIMITED

(CRA # OW7-05)

BOREHOLE NO. BH05-2

PAGE 2 OF 2

PROJECT NAME: ABERFOYLE PIT #2
PROJECT NO.: 051773.00
CLIENT: DUFFERIN AGGREGATES
DATE: SEPTEMBER 28, 2005
BOREHOLE TYPE: BECKER HAMMER DRILL (168 mm)
SUPERVISOR: JMM
GROUND ELEVATION: ~~334 m ASL (estimated)~~
REVIEWER: AJC

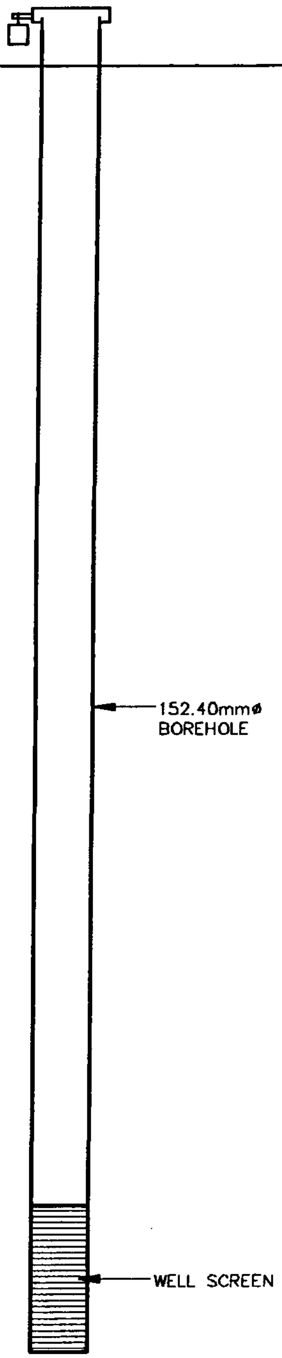
DEPTH (m)		STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION "N" VALUE 10 20 30 SHEAR STRENGTH	WATER CONTENT % 10 20 30 Wp WL	REMARKS
					TYPE	'N' VALUE	% WATER	% RECOVERY	RQD (%)			
20		GRAVELLY SAND: Continued.			GS10							
22	21.6	CLAYEY SILT: SILTY CLAY TO CLAYEY SILT, WITH SOME FINE TO MEDIUM GRAVEL, TRACE MEDIUM TO COARSE SAND, WTPL.										– DRILL REFUSAL
24	23.8	BOREHOLE TERMINATED AT 23.8 m IN CLAYEY SILT.										
26												
28												
30												
32												
34												
36												
38												
40												

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-06)

PROJECT NAME: ABERFOYLE PIT
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: PW1-90
Page 1 of 2
DATE COMPLETED: JUNE 21, 1990
DRILLING METHOD: CABLE TOOL
CRA SUPERVISOR: L. LAVALLEE

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	'N' VALUE
	REFERENCE POINT (Top of Casing) GROUND SURFACE	326.517 325.47				
1.0	SM(SAND), some silt, medium grained, poorly graded, cobbles, grey, moist					
2.0 3.0	SW(SAND), some gravel, little silt, medium to coarse grained, well graded, grey, saturated	333.95				
4.0	SM(SAND), some silt, trace gravel, medium grained, poorly graded, grey, saturated	322.42				
5.0 6.0	SM-GM(SAND/GRAVEL), some silt, coarse grained, poorly graded, grey, saturated	320.90				
7.0 8.0 9.0	SM(SAND), some silt, fine to medium grained, well graded, grey, saturated – little clay	319.37				
10.0 11.0	SM(SAND), some silt, medium grained, poorly graded, grey, saturated – trace clay, fine to medium grained, well graded	316.33		1CT 2CT 3CT	☒ ☒ ☒	
12.0	SW(SAND), trace fine grained gravel, trace silt, medium to coarse grained, well graded, brown-black, saturated	314.04		4CT	☒	
	SM(SAND), some silt, fine to medium grained, well graded, grey-black, saturated	313.28		5CT	☒	
13.0	SW(SAND), little to trace silt, trace gravel, medium to coarse grained, well graded, grey-black, saturated	312.52		6CT	☒	
	END OF HOLE @ 13.41 m BGS.	312.06				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-06)

PROJECT NAME: ABERFOYLE PIT
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: PW1-90
Page 2 of 2
DATE COMPLETED: JUNE 21, 1990
DRILLING METHOD: CABLE TOOL
CRA SUPERVISOR: L. LAVALLEE

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
			SCREEN DETAILS: Screened Interval: 11.9 to 13.4m BGS Length -1.5m Diameter -152.40mm Slot # 25 Material -Stainless Steel			
1.0						
2.0						
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

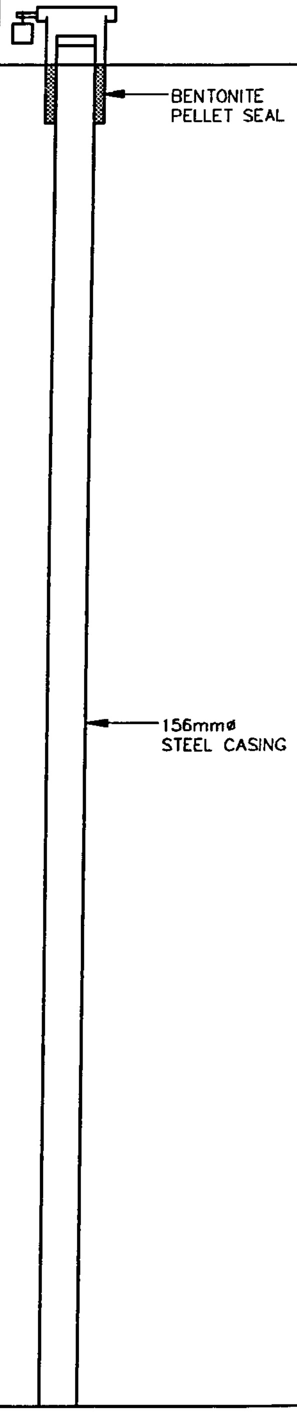
GRAIN SIZE ANALYSIS ◯ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-09)

PROJECT NAME: ABERFOYLE PIT 2
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: F. GAUTHIER PROPERTY

HOLE DESIGNATION: GAUTHIER (Page 1 of 2)
DATE COMPLETED: JULY 11, 1990
DRILLING METHOD: CABLE TOOL
CRA SUPERVISOR: B. PARKER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	Topsoil	*-0.15*				
	GM-SM(GRAVEL/SAND), little silt, brown, cobbles					
1.0						
2.0						
3.0				1G	☒	
4.0						
5.0	- less cobbles, easier drilling					
6.0				2G	☒	
7.0						
8.0						
9.0				3G	☒	
10.0	ML-CL(SILT/CLAY), trace sand and gravel, reddish brown	*-9.80*				
11.0						
12.0				4G	☒	
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

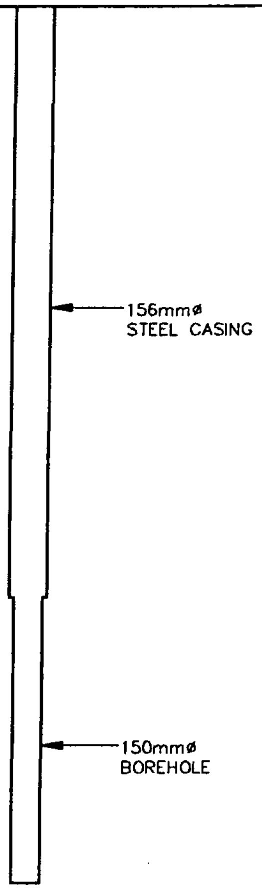
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-09)

PROJECT NAME: ABERFOYLE PIT 2
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: F. GAUTHIER PROPERTY

HOLE DESIGNATION: GAUTHIER (Page 2 of 2)
DATE COMPLETED: JULY 11, 1990
DRILLING METHOD: CABLE TOOL
CRA SUPERVISOR: B. PARKER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE		
				NUMBER	STATE	'N' VALUE
14.0	– trace to little sand and gravel, harder drilling					
15.0	– trace sand and gravel			5G	☒	
16.0				6G	☒	
17.0						
18.0				7G	☒	
19.0		−19.20		8G	☒	
20.0	BEDROCK, Limestone					
21.0						
22.0	END OF HOLE @ 22.16 m BGS.	−22.16				
23.0						
24.0						
25.0						
26.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

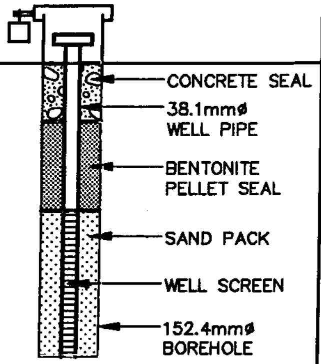
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(L-01)

PROJECT NAME: DUFFERIN AGGREGATES
PROJECT NO.: 1644
CLIENT: DUFFERIN AGGREGATES
LOCATION: AS PER PLAN

HOLE DESIGNATION: WP1-93
DATE COMPLETED: AUGUST 11, 1993
DRILLING METHOD: POWER AUGER
CRA SUPERVISOR: J. DUDA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m BGS	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
	SM-SAND, some silt, little clay, medium dense, brown, saturated, organics — no organics						
0.5							
1.0							
1.5	Auger refusal (@ 1.52m BGS) END OF HOLE @ 1.52 m BGS.	-1.52					
2.0							
2.5							
3.0							
3.5							
4.0							
4.5							
5.0							
5.5							
6.0							
6.5							



SCREEN DETAILS:
Screened Interval:
0.76 to 1.52m BGS
Length -0.76m
Diameter -38.1mm
Slot # 10
Material -PVC
Sand pack interval:
0.76 to 1.52m BGS
Material -# 2 Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○ WATER FOUND ▽ STATIC WATER LEVEL ▼

Appendix C
Laboratory Analyses

GHD Limited (Waterloo)
ATTN: LAURA ERMETA
455 PHILLIP STREET
WATERLOO ON N2L 3X2

Date Received: 21-SEP-18
Report Date: 05-OCT-18 09:50 (MT)
Version: FINAL

Client Phone: 519-884-0510

Certificate of Analysis

Lab Work Order #: L2169067
Project P.O. #: 73504734-2
Job Reference: 1644
C of C Numbers:
Legal Site Desc:

Rick Hawthorne

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2169067-1 GW-1644-0921-18-RC-001 OW4R-05 Sampled By: RC on 21-SEP-18 @ 12:55 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	14.6		0.50	mg/L		26-SEP-18	R4246009
Nitrate (as N)	0.346		0.020	mg/L		26-SEP-18	R4246009
Nitrite (as N)	<0.010		0.010	mg/L		26-SEP-18	R4246009
Phosphorus, Total	0.0398		0.0030	mg/L	27-SEP-18	28-SEP-18	R4249325
Sulfate (SO4)	29.9		0.30	mg/L		26-SEP-18	R4246009
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4236754
Calcium (Ca)-Dissolved	46.6		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	24-SEP-18	25-SEP-18	R4241707
Magnesium (Mg)-Dissolved	21.8		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Potassium (K)-Dissolved	1.12		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Sodium (Na)-Dissolved	5.83		0.50	mg/L	24-SEP-18	25-SEP-18	R4241707
L2169067-2 GW-1644-0921-18-RC-002 OW4R-05 (DUP.) Sampled By: RC on 21-SEP-18 @ 12:57 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	14.7		0.50	mg/L		26-SEP-18	R4246009
Nitrate (as N)	0.347		0.020	mg/L		26-SEP-18	R4246009
Nitrite (as N)	<0.010		0.010	mg/L		26-SEP-18	R4246009
Phosphorus, Total	0.0393		0.0030	mg/L	27-SEP-18	28-SEP-18	R4249325
Sulfate (SO4)	30.1		0.30	mg/L		26-SEP-18	R4246009
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4236754
Calcium (Ca)-Dissolved	47.4		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	24-SEP-18	25-SEP-18	R4241707
Magnesium (Mg)-Dissolved	21.6		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Potassium (K)-Dissolved	1.13		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Sodium (Na)-Dissolved	5.82		0.50	mg/L	24-SEP-18	25-SEP-18	R4241707
L2169067-3 GW-1644-0921-18-RC-003 OW1A-90 Sampled By: RC on 21-SEP-18 @ 14:10 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	21.2		0.50	mg/L		26-SEP-18	R4246009
Nitrate (as N)	<0.020		0.020	mg/L		26-SEP-18	R4246009
Nitrite (as N)	<0.010		0.010	mg/L		26-SEP-18	R4246009
Phosphorus, Total	0.0397		0.0030	mg/L	27-SEP-18	28-SEP-18	R4249325
Sulfate (SO4)	21.6		0.30	mg/L		26-SEP-18	R4246009
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4236754
Calcium (Ca)-Dissolved	64.6		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Iron (Fe)-Dissolved	1.00		0.010	mg/L	24-SEP-18	25-SEP-18	R4241707
Magnesium (Mg)-Dissolved	33.1		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2169067-3 GW-1644-0921-18-RC-003 Sampled By: RC on 21-SEP-18 @ 14:10 Matrix: WATER							
Dissolved Metals							
Potassium (K)-Dissolved	1.06		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Sodium (Na)-Dissolved	7.25		0.50	mg/L	24-SEP-18	25-SEP-18	R4241707
L2169067-4 GW-1644-0921-18-RC-004 OW1B-90 Sampled By: RC on 21-SEP-18 @ 14:20 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	60.9		0.50	mg/L		26-SEP-18	R4246009
Nitrate (as N)	<0.020		0.020	mg/L		26-SEP-18	R4246009
Nitrite (as N)	<0.010		0.010	mg/L		26-SEP-18	R4246009
Phosphorus, Total	0.0359		0.0030	mg/L	27-SEP-18	28-SEP-18	R4249325
Sulfate (SO4)	7.68		0.30	mg/L		26-SEP-18	R4246009
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4236754
Calcium (Ca)-Dissolved	65.7		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Iron (Fe)-Dissolved	0.841		0.010	mg/L	24-SEP-18	25-SEP-18	R4241707
Magnesium (Mg)-Dissolved	21.8		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Potassium (K)-Dissolved	1.64		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Sodium (Na)-Dissolved	25.7		0.50	mg/L	24-SEP-18	25-SEP-18	R4241707
Aggregate Organics							
Heavy Oil (C24-C50)	<2.0		2.0	mg/L	02-OCT-18	03-OCT-18	R4258027
Hydrocarbons							
TPH (C5-C10)	<0.10		0.10	mg/L		28-SEP-18	R4247693
TPH (C10-C24)	<100		100	ug/L	26-SEP-18	29-SEP-18	R4246609
TPH Total (C5-C24)	<100		100	ug/L		05-OCT-18	
Surrogate: 2-Bromobenzotrifluoride	90.7		50-150	%	26-SEP-18	29-SEP-18	R4246609
L2169067-5 GW-1644-0921-18-RC-005 OW2-90 Sampled By: RC on 21-SEP-18 @ 14:50 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	16.4		0.50	mg/L		26-SEP-18	R4246009
Nitrate (as N)	<0.020		0.020	mg/L		26-SEP-18	R4246009
Nitrite (as N)	<0.010		0.010	mg/L		26-SEP-18	R4246009
Phosphorus, Total	0.0065		0.0030	mg/L	27-SEP-18	28-SEP-18	R4249325
Sulfate (SO4)	13.6		0.30	mg/L		26-SEP-18	R4246009
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4236754
Calcium (Ca)-Dissolved	72.4		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	24-SEP-18	25-SEP-18	R4241707
Magnesium (Mg)-Dissolved	22.8		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Potassium (K)-Dissolved	2.88		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Sodium (Na)-Dissolved	5.61		0.50	mg/L	24-SEP-18	25-SEP-18	R4241707
Aggregate Organics							
Heavy Oil (C24-C50)	<2.0		2.0	mg/L	02-OCT-18	03-OCT-18	R4258027

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2169067-5 GW-1644-0921-18-RC-005 Sampled By: RC on 21-SEP-18 @ 14:50 Matrix: WATER							
Aggregate Organics							
Hydrocarbons							
TPH (C5-C10)	<0.10		0.10	mg/L		28-SEP-18	R4247693
TPH (C10-C24)	<100		100	ug/L	26-SEP-18	29-SEP-18	R4246609
TPH Total (C5-C24)	<100		100	ug/L		05-OCT-18	
Surrogate: 2-Bromobenzotrifluoride	94.1		50-150	%	26-SEP-18	29-SEP-18	R4246609
L2169067-6 GW-1644-0921-18-RC-006 OW3R-05 Sampled By: RC on 21-SEP-18 @ 15:10 Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	16.8		0.50	mg/L		26-SEP-18	R4246009
Nitrate (as N)	0.100		0.020	mg/L		26-SEP-18	R4246009
Nitrite (as N)	<0.010		0.010	mg/L		26-SEP-18	R4246009
Phosphorus, Total	0.0808		0.0030	mg/L	27-SEP-18	28-SEP-18	R4249325
Sulfate (SO4)	31.0		0.30	mg/L		26-SEP-18	R4246009
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					24-SEP-18	R4236754
Calcium (Ca)-Dissolved	51.1		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	24-SEP-18	25-SEP-18	R4241707
Magnesium (Mg)-Dissolved	22.7		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Potassium (K)-Dissolved	1.17		0.050	mg/L	24-SEP-18	25-SEP-18	R4241707
Sodium (Na)-Dissolved	5.70		0.50	mg/L	24-SEP-18	25-SEP-18	R4241707
Aggregate Organics							
Heavy Oil (C24-C50)	<2.0		2.0	mg/L	02-OCT-18	03-OCT-18	R4258027
Hydrocarbons							
TPH (C5-C10)	<0.10		0.10	mg/L		28-SEP-18	R4247693
TPH (C10-C24)	<100		100	ug/L	26-SEP-18	29-SEP-18	R4246609
TPH Total (C5-C24)	<100		100	ug/L		05-OCT-18	
Surrogate: 2-Bromobenzotrifluoride	88.5		50-150	%	26-SEP-18	29-SEP-18	R4246609
L2169067-7 SW-1644-0921-18-RC-001 MP1-93 Sampled By: RC on 21-SEP-18 @ 13:35 Matrix: WATER							
Anions and Nutrients							
Phosphorus, Total	1.39	DLHC	0.0060	mg/L	27-SEP-18	28-SEP-18	R4249325

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2169067-1, -2, -3, -4, -5, -6
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2169067-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2169067-1, -2, -3, -4, -5, -6
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2169067-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2169067-1, -2, -3, -4, -5, -6

Sample Parameter Qualifier key listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

<table>
<tr><th>ALS Test Code</th><th>Matrix</th><th>Test Description</th><th>Method Reference**</th></tr>
<tr><td>CL-IC-N-WT</td><td>Water</td><td>Chloride by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>ETL-TPH-ONT-WT</td><td>Water</td><td>Total Petroleum Hydrocarbons (C5-C24)</td><td>Calculation</td></tr>
<tr><td>MET-D-CCMS-WT</td><td>Water</td><td>Dissolved Metals in Water by CRC ICPMS</td><td>APHA 3030B/6020A (mod)</td></tr>
<tr><td colspan="4">Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).</td></tr>
<tr><td>NO2-IC-WT</td><td>Water</td><td>Nitrite in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>NO3-IC-WT</td><td>Water</td><td>Nitrate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>OGG-HYDR-WT</td><td>Water</td><td>Heavy Oil (C24-C50)</td><td>APHA 5520 F</td></tr>
<tr><td colspan="4">Water samples requiring heavy oil analysis are solvent extracted with hexane and cleaned up using silica gel, the extract is then weighed to determine the concentration gravimetrically</td></tr>
<tr><td>P-T-COL-WT</td><td>Water</td><td>Total P in Water by Colour</td><td>APHA 4500-P PHOSPHORUS</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.</td></tr>
<tr><td>SO4-IC-N-WT</td><td>Water</td><td>Sulfate in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>TEH-ON-WT</td><td>Water</td><td>TPH (C10-C24)</td><td>Contam. Sites</td></tr>
<tr><td colspan="4">The petroleum hydrocarbons are extracted from the aqueous samples using solvent partition. The extracts are treated with silica gel to remove polar contaminants. The final concentrated extract is analyzed by gas chromatography (GC) using flame ionization detection (FID) and a 100% polydimethylsiloxane column.</td></tr>
<tr><td>TVH-WT</td><td>Water</td><td>TPH (C5-C10)</td><td>Contam. Sites</td></tr>
</table>

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Quality Control Report

Workorder: L2169067 Report Date: 05-OCT-18

Client: GHD Limited (Waterloo)
455 PHILLIP STREET
WATERLOO ON N2L 3X2
Contact: LAURA ERMETA

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-WT	Water							
Batch R4246009								
WG2887269-4 DUP		**WG2887269-3**						
Chloride (Cl)		12.8	12.8		mg/L	0.3	20	26-SEP-18
WG2887269-2 LCS								
Chloride (Cl)			101.6		%		90-110	26-SEP-18
WG2887269-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	26-SEP-18
WG2887269-5 MS		**WG2887269-3**						
Chloride (Cl)			101.6		%		75-125	26-SEP-18
MET-D-CCMS-WT	Water							
Batch R4241707								
WG2885249-4 DUP		**WG2885249-3**						
Calcium (Ca)-Dissolved		109	112		mg/L	3.3	20	25-SEP-18
Iron (Fe)-Dissolved		2.88	2.84		mg/L	1.5	20	25-SEP-18
Magnesium (Mg)-Dissolved		122	122		mg/L	0.6	20	25-SEP-18
Potassium (K)-Dissolved		4.83	4.91		mg/L	1.8	20	25-SEP-18
Sodium (Na)-Dissolved		74.4	74.6		mg/L	0.2	20	25-SEP-18
WG2885249-2 LCS								
Calcium (Ca)-Dissolved			96.6		%		80-120	25-SEP-18
Iron (Fe)-Dissolved			96.2		%		80-120	25-SEP-18
Magnesium (Mg)-Dissolved			98.3		%		80-120	25-SEP-18
Potassium (K)-Dissolved			96.8		%		80-120	25-SEP-18
Sodium (Na)-Dissolved			97.5		%		80-120	25-SEP-18
WG2885249-1 MB								
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	25-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	25-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	25-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	25-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	25-SEP-18
WG2885249-5 MS		**WG2885249-6**						
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	25-SEP-18
Iron (Fe)-Dissolved			N/A	MS-B	%		-	25-SEP-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	25-SEP-18
Potassium (K)-Dissolved			N/A	MS-B	%		-	25-SEP-18
Sodium (Na)-Dissolved			N/A	MS-B	%		-	25-SEP-18
NO2-IC-WT	Water							

Quality Control Report

Workorder: L2169067 Report Date: 05-OCT-18

Client: GHD Limited (Waterloo)
455 PHILLIP STREET
WATERLOO ON N2L 3X2
Contact: LAURA ERMETA

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-WT	Water							
Batch R4246009								
WG2887269-4 DUP		**WG2887269-3**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	26-SEP-18
WG2887269-2 LCS								
Nitrite (as N)			102.0		%		70-130	26-SEP-18
WG2887269-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	26-SEP-18
WG2887269-5 MS		**WG2887269-3**						
Nitrite (as N)			96.0		%		70-130	26-SEP-18
NO3-IC-WT	Water							
Batch R4246009								
WG2887269-4 DUP		**WG2887269-3**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	26-SEP-18
WG2887269-2 LCS								
Nitrate (as N)			100.6		%		70-130	26-SEP-18
WG2887269-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	26-SEP-18
WG2887269-5 MS		**WG2887269-3**						
Nitrate (as N)			99.9		%		70-130	26-SEP-18
OGG-HYDR-WT	Water							
Batch R4258027								
WG2892431-2 LCS								
Heavy Oil (C24-C50)			89.4		%		60-120	03-OCT-18
WG2892431-3 LCSD		**WG2892431-2**						
Heavy Oil (C24-C50)		89.4	85.5		%	4.5	50	03-OCT-18
WG2892431-1 MB								
Heavy Oil (C24-C50)			<2.0		mg/L		2	03-OCT-18
P-T-COL-WT	Water							
Batch R4249325								
WG2888961-3 DUP		**L2169067-2**						
Phosphorus, Total		0.0393	0.0403		mg/L	2.7	20	28-SEP-18
WG2888961-2 LCS								
Phosphorus, Total			93.1		%		80-120	28-SEP-18
WG2888961-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	28-SEP-18
WG2888961-4 MS		**L2169067-2**						
Phosphorus, Total			94.3		%		70-130	28-SEP-18
SO4-IC-N-WT	Water							

Quality Control Report

Workorder: L2169067 Report Date: 05-OCT-18

Client: GHD Limited (Waterloo)
455 PHILLIP STREET
WATERLOO ON N2L 3X2
Contact: LAURA ERMETA

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	Water							
Batch **R4246009**								
WG2887269-4 **DUP**		**WG2887269-3**						
Sulfate (SO4)		<0.30	<0.30	RPD-NA	mg/L	N/A	20	26-SEP-18
WG2887269-2 **LCS**								
Sulfate (SO4)			102.1		%		90-110	26-SEP-18
WG2887269-1 **MB**								
Sulfate (SO4)			<0.30		mg/L		0.3	26-SEP-18
WG2887269-5 **MS**		**WG2887269-3**						
Sulfate (SO4)			102.3		%		75-125	26-SEP-18
TEH-ON-WT	Water							
Batch **R4246609**								
WG2887610-2 **LCS**								
TPH (C10-C24)			107.6		%		50-120	27-SEP-18
WG2887610-3 **LCSD**		**WG2887610-2**						
TPH (C10-C24)		107.6	96.6		%	11	45	27-SEP-18
WG2887610-1 **MB**								
TPH (C10-C24)			<100		ug/L		100	27-SEP-18
Surrogate: 2-Bromobenzotrifluoride			89.1		%		50-150	27-SEP-18
TVH-WT	Water							
Batch **R4247693**								
WG2882773-4 **DUP**		**WG2882773-3**						
TPH (C5-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	28-SEP-18
WG2882773-1 **LCS**								
TPH (C5-C10)			82.3		%		50-150	28-SEP-18
WG2882773-2 **MB**								
TPH (C5-C10)			<0.10		mg/L		0.1	28-SEP-18

Quality Control Report

Workorder: L2169067 Report Date: 05-OCT-18

Client: GHD Limited (Waterloo)
455 PHILLIP STREET
WATERLOO ON N2L 3X2
Contact: LAURA ERMETA

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

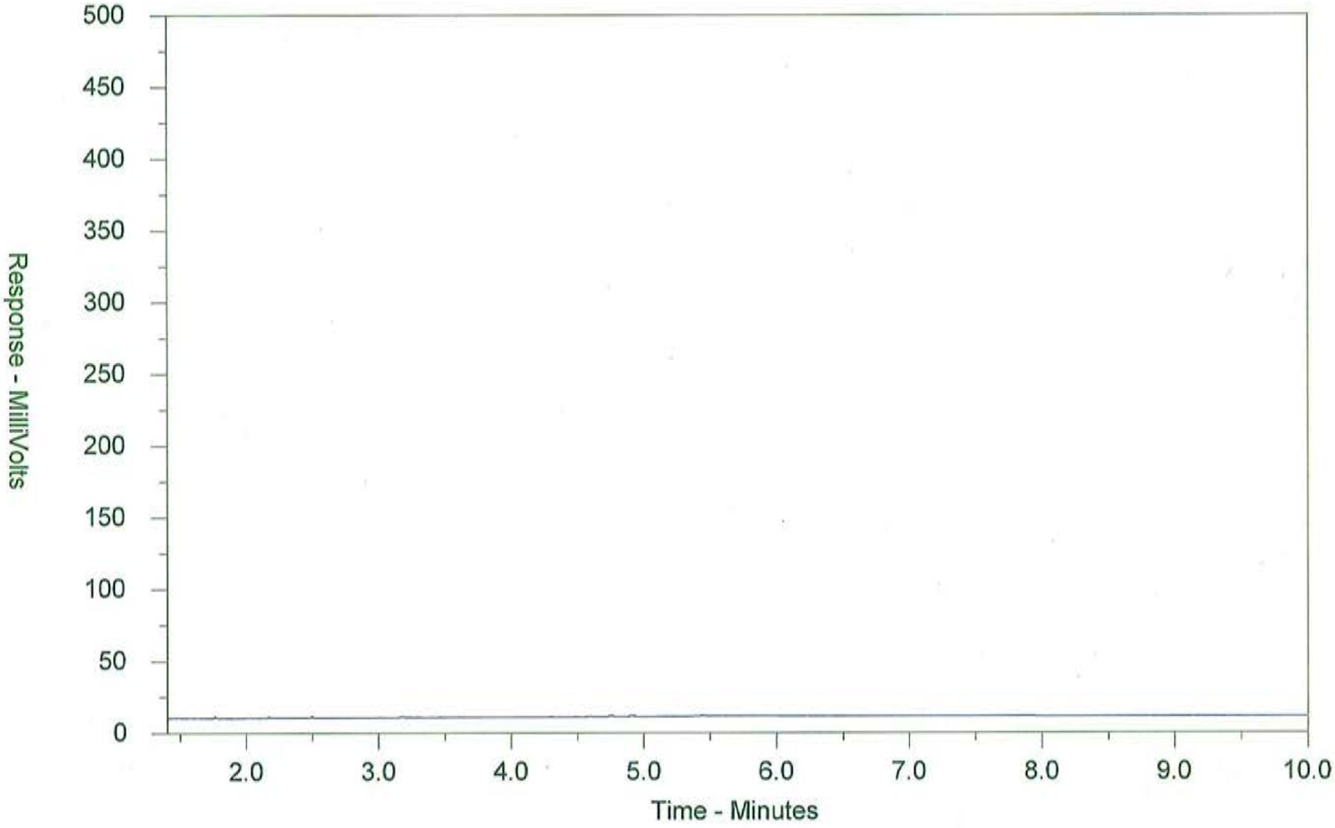
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2169067-4
Client Sample ID: GW-1644-0921-18-RC-004



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

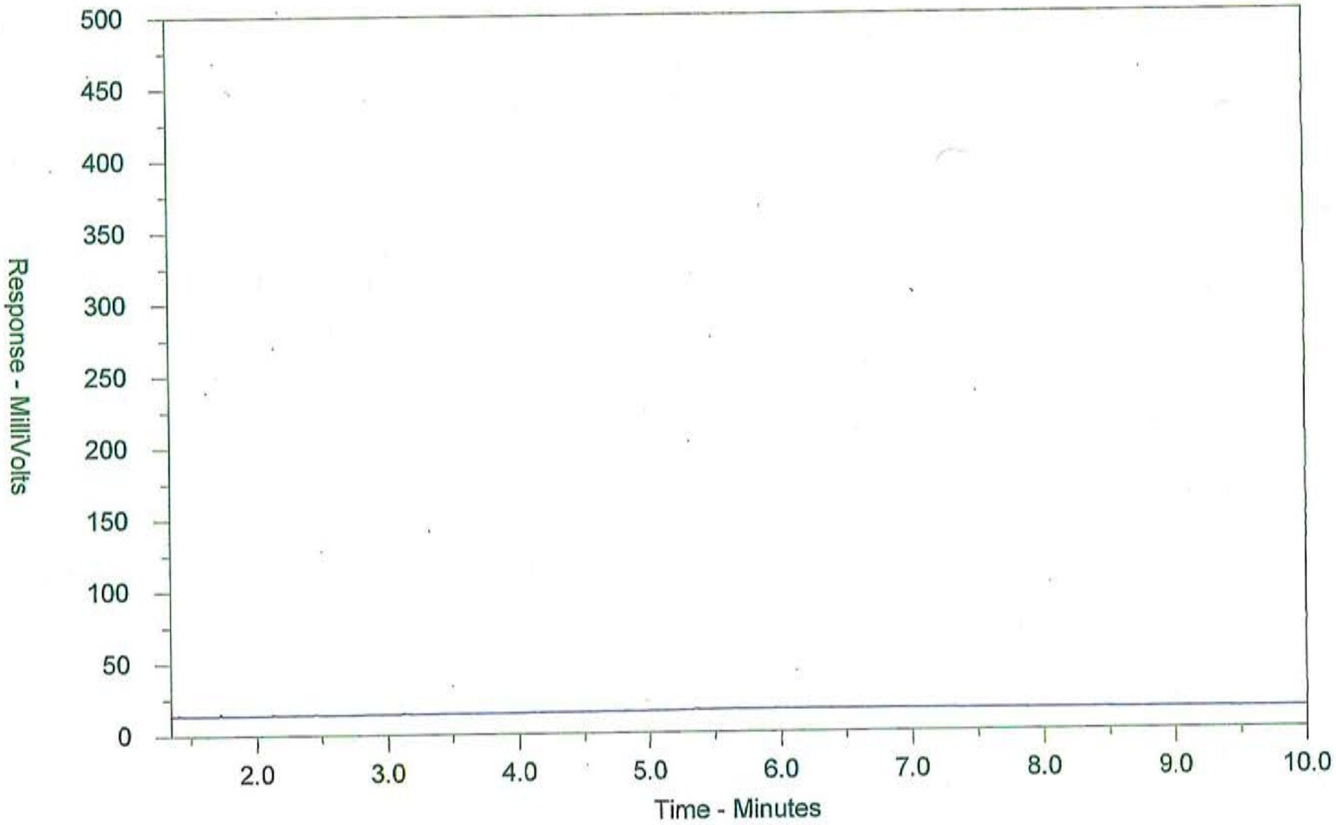
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2169067-5
Client Sample ID: GW-1644-0921-18-RC-005



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

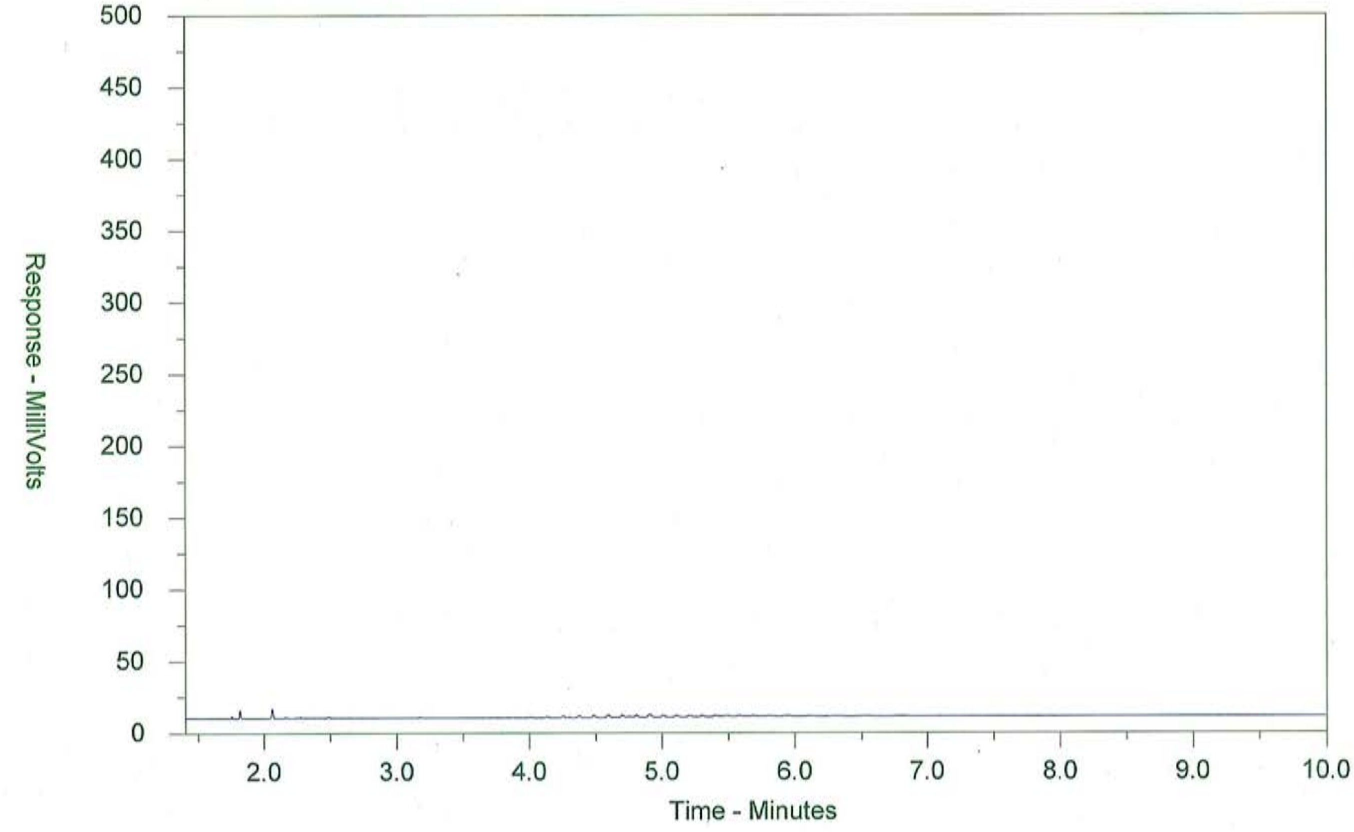
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2169067-6
Client Sample ID: GW-1644-0921-18-RC-006



←F2→	←F3→		←F4→
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2169067-COFC

COC Number: 15 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report	
Company:	GHD LIMITED	Acct# 13791
Contact:	Laura Ermeta	
Phone:	519 884 0510	
	Company address below will appear on the final report	
Street:	455 Phillip St	
City/Province:	Waterloo / Ontario	
Postal Code:	N2L 3X2	
Invoice To	Same as Report To ☑ YES ☐ NO	
	Copy of Invoice with Report ☐ YES ☑ NO	
Company:	GHD LIMITED	
Contact:	Laura Ermeta	

Project Information

ALS Account # / Quote #:

Job #: 1644

PO / AFE: 73504734-2

LSD:

ALS Lab Work Order # (lab use only) L2169067

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax Laura.Ermeta@ghd.com

Email 2 See PO

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax Laura.Ermeta@ghd.com

Email 2

Oil and Gas Required Fields (client use)

AFE/Cost Center:

PO#

Major/Minor Code:

Routing Code:

Requisitioner:

Location:

ALS Contact: Rick H

Sampler: R. Cadfield

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
4 day [P4] ☐
3 day [P3] ☐
2 day [P2] ☐

EMERGENCY
1 Business day [E1] ☐
Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	ANIONS (CL,NO2,NO3,SO4)	MET-D-CCMS-WT(Select Dis Metals)	P-T-COL-WT	TPH,HO-P-WT										Number of Containers
	GW-1644- 0921 -18-RC-001	21-Sept-18	12:55	Water	R	R	R											3
	GW-1644- -18-RC-002		13:57 ~~13:53~~	Water	R	R	R											3
	GW-1644- -18-RC-003		14:10	Water	R	R	R											3
	GW-1644- -18-RC-004		14:20	Water	R	R	R	R										9
	GW-1644- -18-RC-005		14:50	Water	R	R	R	R										9
	GW-1644- -18-RC-006		15:10	Water	R	R	R	R										9
	~~GW-1644- -18-RC-007~~			~~Water~~				R										
	~~GW-1644- -18-RC-008~~			~~Water~~				R										
	~~GW-1644- -18-RC-009~~			~~Water~~				R										
	SW-1644- 0921 -18-RC-001		13:35	Water			R											1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Dissolved Metals (Ca, Fe, Mg, K, Na – field filtered)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C 3-6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: Sept 21/18	Time: 16:15	Received by:	Date:	Time:	Received by: RK	Date: Sept 21 @	Time: 16:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

[1] If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Greg Pucovsky
Greg.Pucovsky@ghd.com
519.340.4239

www.ghd.com

HARDEN

Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline Road
R.R. 1, Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

Our File: 0132

April 10, 2019

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

Attention: Karen Landry,
CAO - Clerk

Dear Ms. Landry:

Re: Aberfoyle Pit #2
2018 Monitoring Report Review

We have reviewed the 2018 Aberfoyle Pit #2 report prepared by GHD Limited prepared on behalf of Dufferin Aggregates. We have also reviewed the March 21, 2019 letter written by GHD to the MNRF and the MOECC.

There was no aggregate extraction at this site between 2009 and 2015. There was sporadic below water table extraction 2016 through to 2018.

Based on the data presented we make the following comments.

Water levels upgradient (OW1B-90 and OW7-05) and downgradient (OW2-90 and OW4-05) have stabilized and appear to be responding to natural seasonal variations. There are 29 years of monitoring data presented and it is evident that the development of the pit pond has decreased the hydraulic potential difference across the site. That is, the water levels upgradient of the pond (east side) are somewhat lower and the water levels downgradient of the pond are somewhat higher. The lower water levels along the eastern side of the site could have an effect on water levels in the adjacent wetland.

The monitoring of stations SW1-90, SW2-91, SW3-91 and SW4-91 resumed in February 2012. These stations represent water levels in the wetland adjacent to Pit # 2. These monitors show that wetland water levels in 2018 are within the historical range. The exception to this is SW2-91 where, since below water table extraction began in 2000, late season water levels regularly fall below pre-development water levels. 2018 was no exception to this. The data from SW2-91 is not very good as there are many dry months and inconsistent readings.

There are no significant changes in on-site water groundwater levels since the cessation of extraction in 2009 or with the limited below water table extraction in 2016 through to 2018.

There have been no significant changes in water quality caused by the extractive operations, based on a review of the water quality data obtained in 2018. As noted by GHD, the chloride concentration in water obtained from monitor OW1B-90 continues to increase. The background chloride concentration is approximately 15 mg/L and the concentration at OW1B-90 in 2018 is 60.9 mg/L. There has been a gradual increase since 1990. It is likely that this is related to road salt activities as the sodium concentration has also been increasing.

Monitoring Recommendations

We have reviewed the request from Dufferin Aggregates to reduce the monitoring requirements. Specifically, SW1-90, SW3-91 and SW4-91 are requested for removal. These stations are all located on the adjacent property and obtain water levels in the wetland. The data is not useful as these monitors are often dry and the remaining monitors WP1-93, Pond 2 and SW2-91 will be able to provide a better record of water level changes. That said, SW2-91 should be improved or replaced to provide a consistent seasonal record of water levels. A replacement monitor(SW2-91R) should be installed adjacent to it, approximately one metre deeper and recorded for a one-year period along with SW2-91(old) to develop a correlation between the readings.

We concur with the removal of Pond 1 from the monitoring program. Pond 1 is located on the north side of County Road 34 with the Tikal Pit pond in between.

We concur with the removal of OW5-90, OW6-90 and PW1-90 from the monitoring program. These are internal monitors adjacent to the existing pit pond. There are monitors around the site periphery that provide adequate water table data.

Sincerely
Harden Environmental Services Ltd.

Stan Denhoed

Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist

Groundwater
Science Corp.

Unit 2, 465 Kingscourt Drive,
Waterloo, ON N2K 3R5
Phone: (519) 746-6916
groundwaterscience.ca

March 15, 2019

Colin Evans
St. Marys Cement Inc. (Canada)
CBM Aggregates - Aberfoyle
55 Industrial Street
Toronto, ON
M4G 3W9

Dear Mr. Evans:

RE: 2018 Groundwater Monitoring Summary,
CBM Neubauer Pit, Licence No. 625284
Part Lot 27, Concession 1, Puslinch Township

This letter is a summary of the results of the 2018 groundwater monitoring program completed for the above reference property. The pit Licence was issued in December 2011. Site details and monitoring well locations are shown on **Figure 1** (attached).

1.0 Monitoring Program Requirements

The Licence conditions as listed on the Site Plan are summarized as follows:

The following monitoring, mitigation and contingency plan is recommended for the site:

1. *No subaqueous placement of fine grained material (i.e. silt or clay) shall occur on-site without additional hydrogeological investigation, as outlined in the Mitigation and Contingency Plan.*
2. *Prior to below water table extraction at the site two new water table monitoring wells shall be installed, one at the east property boundary and one at the south property boundary (BH4 and BH5 respectively).*
3. *The water level monitoring program shall consist of monthly measurements at BH1, BH2 (until destroyed). BH3 (until destroyed), BH4, BH5, the McNally East monitor "East 1", the Puslinch Pit monitor "MP7", and, the Neubauer Pond monitor (after installation) as accessible. If any of the perimeter monitors are destroyed or damaged they shall be replaced or repaired.*
4. *During the first year of below water table extraction water level monitoring at perimeter wells shall be completed every two weeks during the extraction period.*
5. *Monthly monitoring of temperature profiles at the perimeter monitoring wells shall occur for two years prior to below water extraction, with measurements taken at 1 m depth intervals. Once below water table extraction has begun quarterly monitoring of temperature profiles (temperatures obtained at 1 m intervals) in the perimeter monitoring wells shall be completed.*

6. *The monitoring results, and any Mitigation or Contingency Plan measures undertaken during each operational year, shall be summarized in an annual report provided to the Township of Puslinch, GRCA and MNR.*

7. *Trigger Levels, considering existing cross-site hydraulic gradients, shall be developed to the satisfaction of MNR, in consultation with GRCA and the Township of Puslinch as needed, prior to below water table extraction.*

8. *The following Mitigation and Contingency Plan shall be adopted:*

   - ***Initial Trigger Level** exceeded – the Township, GRCA and MNR shall be notified immediately and daily monitoring shall be undertaken.*
   - ***Intermediate Trigger Level** exceeded for seven (7) consecutive days – the Township, GRCA and MNR shall be notified immediately and extraction below the water table shall be reduced 50% until the Neubauer Pond surface water elevation is greater than the **Intermediate Trigger Level** for seven (7) consecutive days.*
   - ***Final Trigger Level** exceeded – the Township, GRCA and MNR shall be notified immediately and extraction below the water table shall cease until the Neubauer Pond surface water elevation is greater than the **Intermediate Trigger Level** for seven (7) consecutive days.*
   - *Additional mitigation measures, such as below water placement of fine-grained material (silt or clay) along the perimeter of the pond, will be evaluated as needed in response to threshold exceedances. No mitigation measures (beyond ceasing below water table extraction) shall be undertaken prior to approval from MNR, in consultation with GRCA and The Township of Puslinch as needed.*

Trigger Levels have recently been developed to the satisfaction of MNRF, GRCA and the Township of Puslinch. Confirmation of the acceptance of the Trigger Levels is expected in the near future. Ongoing monitoring results, during below water extraction operations, will be compared to the trigger levels.

2.0 Trigger Levels

The following Trigger Levels (Thresholds) have been developed for the site:

Monitor	Water Level Trigger Threshold Elevations (mASL)		
	Initial	Intermediate	Final
Pond	305.7	305.6	305.2
BH1	305.5	305.4	305.0
BH4	305.7	305.6	305.2

In addition, the following general threshold applies:

Should groundwater elevations in BH1 exceed those measured in BH5, the owner will undertake an evaluation to estimate the magnitude of groundwater flux between Mill Creek Subwatershed and Fletcher Creek Subwatershed. Mitigation of the groundwater flux may be necessary should the Ministry of Natural Resources and Forestry or the Grand River Conservation Authority deem the volume of flux to be significant.

mASL = metres above sea level

3.0 Site Operations and Monitoring Completed

Above water table extraction in the northwest corner of the site and along the boundary with the adjacent Puslinch Pit began in 2017. No below water extraction has occurred at the site to date.

Monitors BH4 and BH5 were installed in July, 2012 and borehole logs were provided with the 2013 annual report. Existing monitor installation details are provided in **Table 1**. Note that McNally East monitor "East 1" is also referenced as "HH1" by CBM.

Monitor	Elevations (mASL)			
	Ground	Top of Well	Top of Screen	Bottom of Well
BH1	322.29	323.30	300.92	299.40
BH2	327.60	328.71	301.54	300.02
BH3	328.75	329.84	296.17	294.65
BH4	320.03	320.74	308.80	304.23
BH5	317.90	318.69	306.67	302.10
East 1 / HH1	309.96	310.76	306.25	303.25
mASL = metres above mean sea level				

Table 1: Monitor Installation Details

Water level data has been collected at the site since 2001. In the last number of years, including 2018, most water level measurements have been obtained by CBM personnel. Due to operations and safety considerations locations are occasionally inaccessible. Water level data is also obtained by Groundwater Science Corp as temperature profiles are completed.

Occasional anomalous readings are noted in the 2018 data set, inconsistent with both historical data, measurements obtained by Groundwater Science Corp on similar dates, and measurements obtained at adjacent sites (e.g. Puslinch Pit and McNally East Pit). This is particularly evident in the BH1. To illustrate the anomalies a comparison plot is attached showing data obtained on-site and at the adjacent McNally East HH1 monitor. The reason for the anomalous reading is unknown, but could include malfunctioning water level tape, errors in reading the water level tape, condensation on the PVC pipe, etc. The primary anomalous readings (in October and December 2018) were removed from the data set for the remaining hydrographs. The remaining data may also contain discrepancies, however can be used to assess general trends.

In March 2019 Groundwater Science Corp. assumed monitoring duties at the Puslinch Pit and Neubauer Pit in order to collect a more complete data set for the sites moving forward. As part of that work water level dataloggers were installed in all of the Neubauer monitors, and HH1, and programed to obtain measurements four times daily. Going forward, this information will provide a much more detailed data set to examine potential groundwater level changes on-site as related to below water extraction.

The water level monitoring data collected at the site in 2018, and as available from adjacent sites, is presented in **Table 2** (attached). Hydrographs of the water level data, showing historical trends since 2001, and the 2017/2018 monitoring results, are also included with this letter.

In addition, monthly temperature profile measurements were completed in 2018 at perimeter monitoring wells BH1, BH4 and HH1 when accessible. Starting in March 2018 continuous temperature data will be available at the datalogger depths. Going forward, this information will provide a much more detailed data set to examine potential groundwater temperature changes at the site as related to below water extraction.

The profile measurements consist of temperature measurements obtained within the water column at 1 m intervals below the top of casing. The profile measurements obtained to date are summarized in **Table 3** (attached).

4.0 Discussion of Monitoring Results

Based on the considerable monitoring record available, baseline conditions are well established for the site. As noted for other monitoring programs in the area, the water table at the site fluctuates in response to seasonal and annual recharge patterns related to climate variation.

No below water table extraction has occurred at the site to date, potential changes related to groundwater to date would consist of a slight increase in potential recharge related to above water table extraction.

5.0 Recommendations

The monitoring program as listed on the Site Plan should continue in 2019. Once below water table extraction is started a pond monitor should be installed as soon as safely possible.

If you have any questions or require further assistance please do not hesitate to contact me.

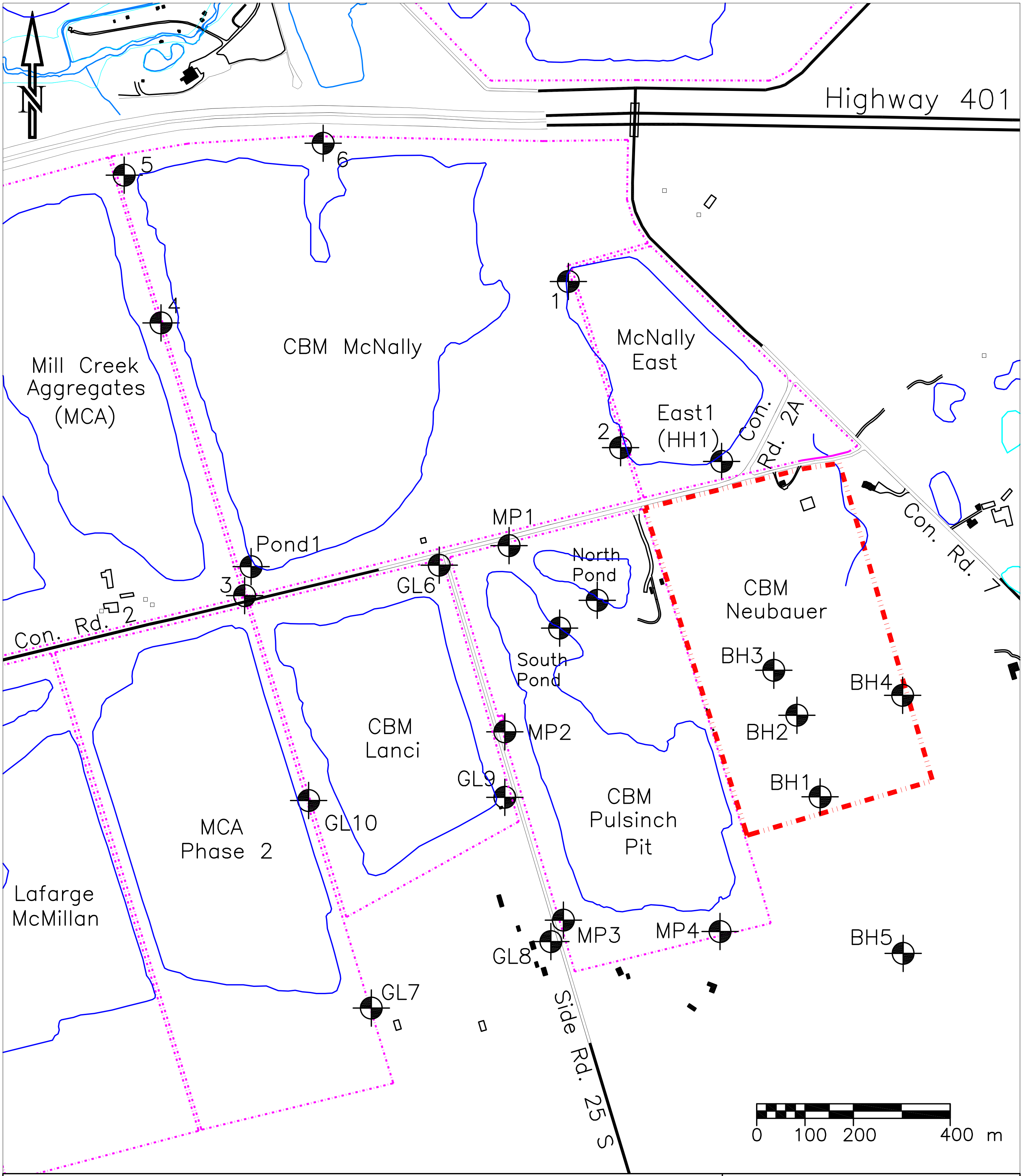
Sincerely,

Andrew Pentney, P.Geo.
Hydrogeologist

PROFESSIONAL GEOSCIENTIST
ANDREW H, PENTNEY
PRACTISING MEMBER
0652
ONTARIO

Cc: Bernie Janssen, Harrington McAvan Ltd.
MNR, GRCA, Township of Puslinch

Attached: Figure 1 Monitoring Locations
Table 2: Water Level Elevations Annual Summary
Table 3: Temperature Profile Annual Summary
Comparison Hydrograph
Hydrograph – Historical Data
Hydrograph – 2017 and 2018 Data



CBM Neubauer Pit Licence Boundary (approximate)

existing Licence boundaries (approximate)

surface water: pond (approximate), creek or swale

wetland (OBM mapping)

modified from :
1) OBM mapping UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO

2) Site Plans, Harrington McAvan Ltd.

3) 2018 Air Photo, Google Earth

Figure 1: Local Monitoring Locations

CBM Neubauer Pit
Groundwater Monitoring Program
Annual Report

Goundwater
Science Corp.

Scale: as shown
Date: March 2019

Date	Water Level Elevations (mAMSL*)						
	Neubauer Pit					McNally East	
	BH1	BH2	BH3	BH4	BH5	Date	HH1
24-Jan-18	305.93	306.19	306.32	306.34	306.00	2-Apr-18	307.22
30-Jan-18	305.84	314.16	#N/A	306.27	#N/A	9-Apr-18	307.19
20-Feb-18	305.92	306.19	306.35	306.32	306.00	16-Apr-18	307.18
21-Feb-18	305.88	#N/A	#N/A	306.30	#N/A	23-Apr-18	307.17
21-Mar-18	305.94	306.21	306.36	306.34	306.02	30-Apr-18	307.20
26-Mar-18	306.02	#N/A	#N/A	306.49	#N/A	7-May-18	307.24
25-Apr-18	305.95	306.23	306.36	306.35	306.03	14-May-18	307.27
23-May-18	305.97	306.25	306.37	306.38	306.06	14-May-18	307.31
28-May-18	306.37	#N/A	#N/A	306.84	#N/A	22-May-18	307.31
20-Jun-18	305.98	306.28	306.39	306.40	306.08	28-May-18	307.29
12-Jul-18	306.22	#N/A	#N/A	306.68	#N/A	4-Jun-18	307.28
25-Jul-18	306.00	306.30	306.42	306.43	306.11	11-Jun-18	307.26
22-Aug-18	306.02	306.33	306.44	306.46	306.15	18-Jun-18	307.24
19-Sep-18	306.04	306.35	306.47	306.49	306.17	25-Jun-18	307.23
20-Sep-18	305.92	#N/A	#N/A	306.39	#N/A	2-Jul-18	307.21
24-Oct-18	305.80	#N/A	#N/A	306.26	#N/A	9-Jul-18	307.21
13-Dec-18	305.75	#N/A	#N/A	306.19	#N/A	16-Jul-18	307.19
04-Jan-19	305.76	306.12	306.23	#N/A	#N/A	23-Jul-18	307.17
01-Feb-19	305.77	306.14	306.25	#N/A	#N/A	30-Jul-18	307.16
01-Mar-19	305.92	306.23	306.31	#N/A	#N/A	7-Aug-18	307.14
08-Mar-19	305.95	306.26	306.36	#N/A	306.06	13-Aug-18	307.12
11-Mar-19	#N/A	#N/A	#N/A	306.38	#N/A	20-Aug-18	307.11
						27-Aug-18	307.11
						4-Sep-18	307.08
						10-Sep-18	307.06
						17-Sep-18	307.04
						24-Sep-18	307.02
						1-Oct-18	306.96
						9-Oct-18	306.88
						15-Oct-18	306.81
						22-Oct-18	306.73
						29-Oct-18	306.70
						5-Nov-18	306.76
						12-Nov-18	306.77
						19-Nov-18	306.78
						26-Nov-18	306.75
						3-Dec-18	306.73
						10-Dec-18	306.71
						17-Dec-18	306.71
						11-Mar-19	306.91

Notes:
* Elevations are geodetic, as per Van Harten Surveying Inc. July 2007 or July 2012

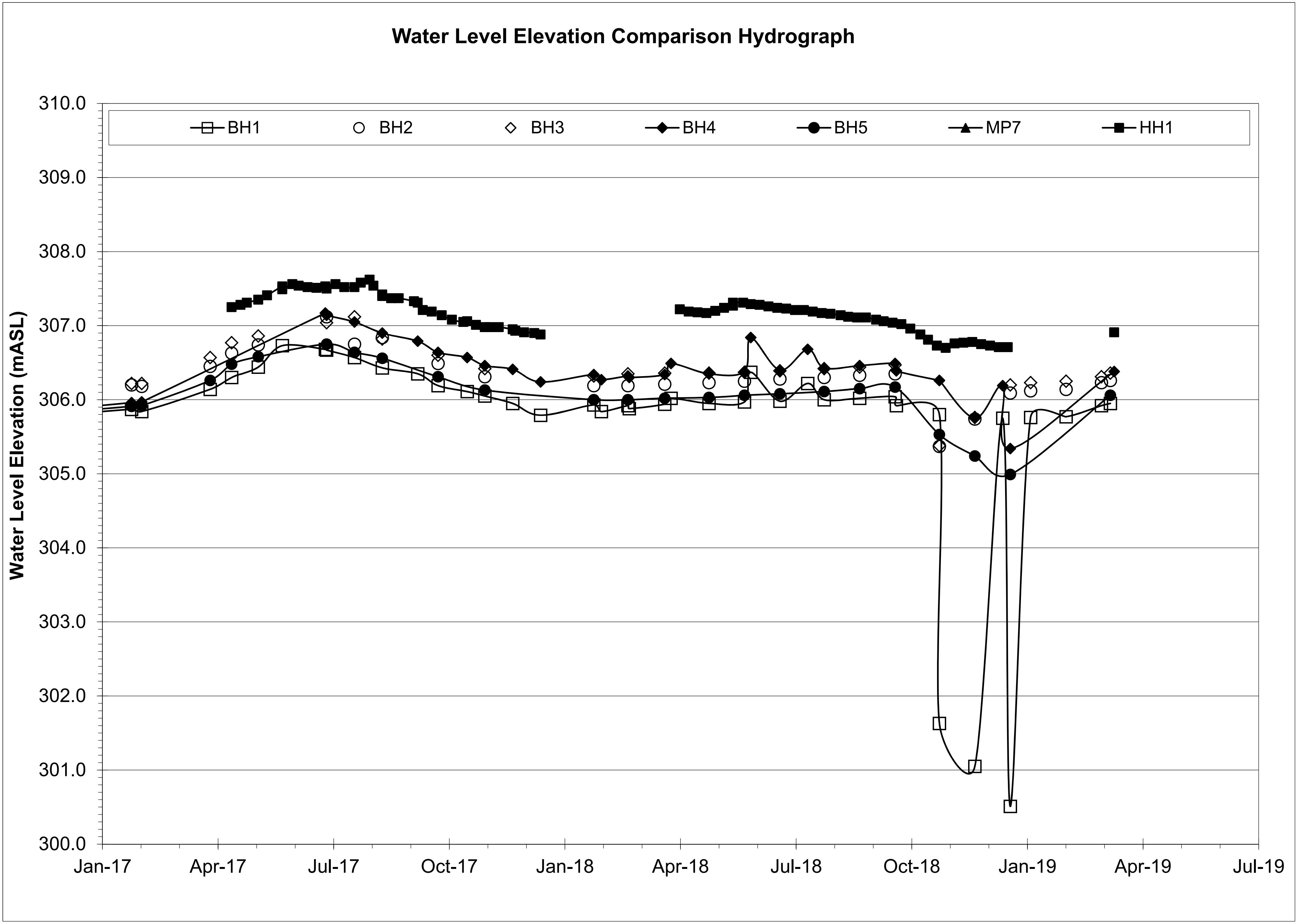
Table 2: Water Level Elevations
Annual Summary

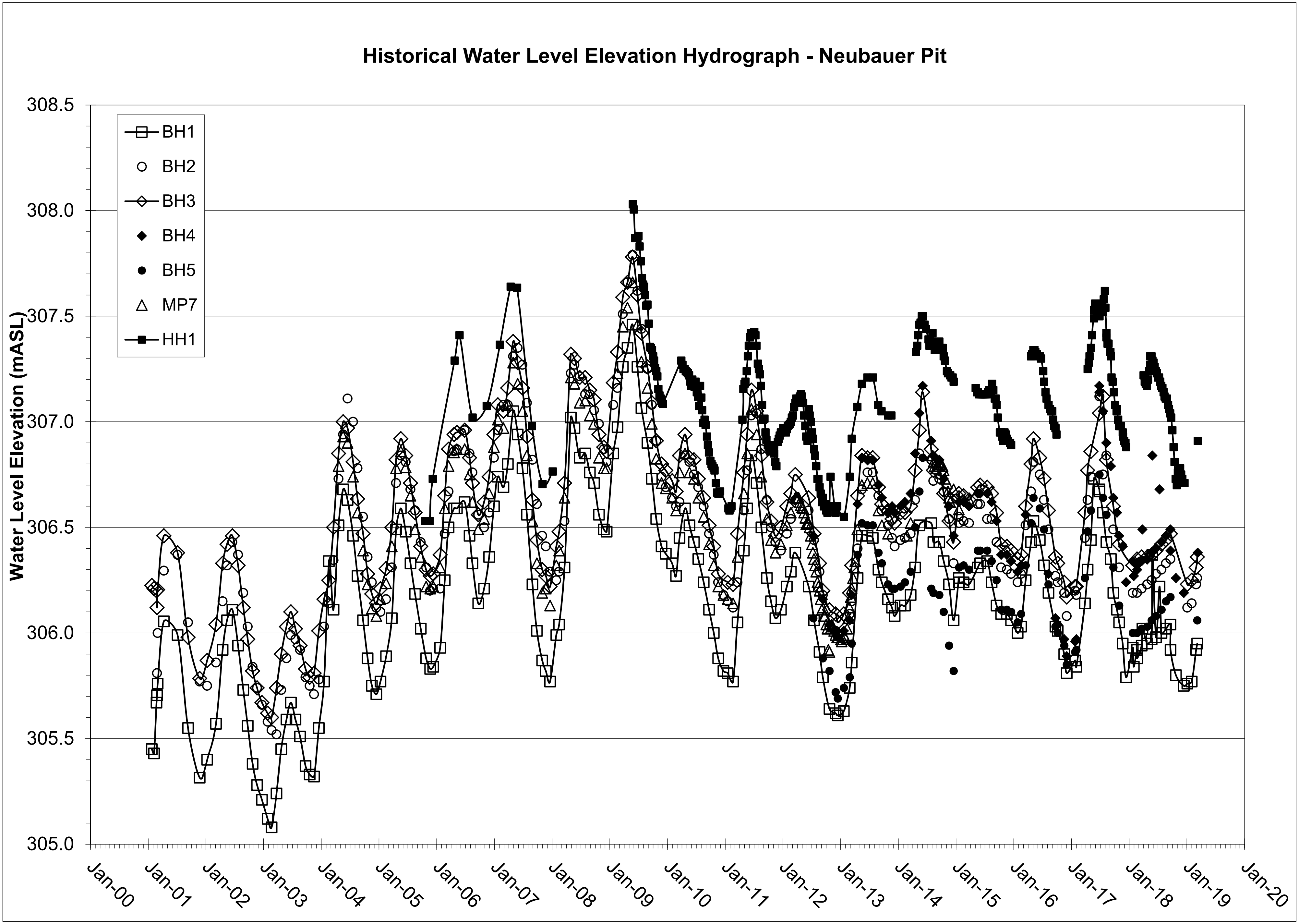
Monitor:	BH1	Temperature (C) at **Depth (mBGS)**								
Date	Air	**16.0**	**17.0**	**18.0**	**19.0**	**20.0**	**21.0**	**22.0**	**23.0**	**24.0**
30-Jan-18	-12.0	4.8	9.1	9.7	9.9	10.0	10.4	12.1	12.2	11.7
21-Feb-18	2.5	7.6	10.0	10.5	10.6	10.7	10.8	10.7	10.6	10.6
26-Mar-18	10.2	8.9	11.2	11.5	11.3	11.0	10.9	10.6	10.5	10.5
26-Apr-18	5.6	no access due to operations								
28-May-18	-	11.4	11.6	11.1	11.2	11.4	11.4	16.5	15.6	15.4
12-Jul-18	20.8	17.0	14.3	13.5	13.4	13.7	15.4	19.3	18.4	17.9
20-Sep-18	19.4	12.3	9.6	9.1	9.0	8.9	8.9	8.8	8.8	8.8
24-Oct-18	5.1	8.1	8.6	8.7	8.8	8.8	8.8	8.8	8.8	8.8
13-Dec-18	-	no access due to conditions								

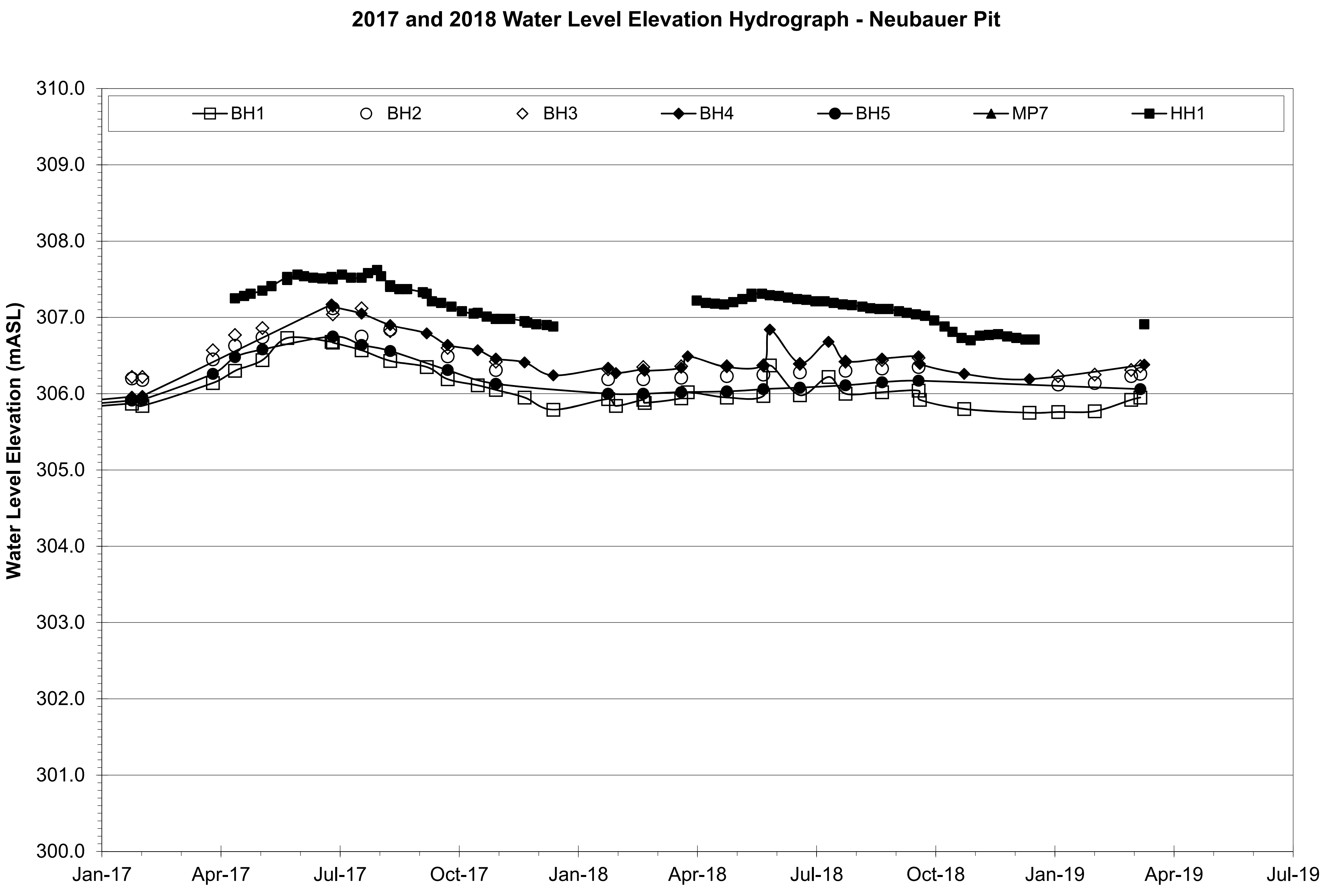
Monitor:	BH4	Temperature (C) at **Depth (mBGS)**		
Date	Air	**13.0**	**14.0**	**15.0**
30-Jan-18	-12	6.1	8.4	11.9
21-Feb-18	2.5	8.8	10.5	10.9
26-Mar-18	10.2	10.6	14.9	14.0
26-Apr-18	5.6	no access due to operations		
28-May-18	-		19.0	17.1
12-Jul-18	20.8	16.2	16.6	20.9
20-Sep-18	19.4	17.2	11.3	10.0
24-Oct-18	5.1	8.7	8.9	8.9
13-Dec-18	-	no access due to conditions		

Monitor:	HH1	Temperature (C) at **Depth (mBGS)**			
Date	Air	**3.0**	**4.0**	**5.0**	**6.0**
30-Jan-18	-12.1	4.7	12.2	13.4	14.3
21-Feb-18	2.5	6.2	12.8	13.9	14.7
26-Mar-18	10.2	6.6	13.0	14.0	14.3
26-Apr-18	5.6	7.8	13.3	16.2	16.4
28-May-18	-	17.1	29.3	14.3	12.5
12-Jul-18	20.8	17.5	19.0	16.2	14.9
20-Sep-18	19.4	16.3	17.1	14.4	13.2
24-Oct-18	5.1	9.0	12.2	12.3	12.2
13-Dec-18	-	no access due to conditions			

Table 3: Temperature Profile
Annual Summary


Water Level Elevation Comparison Hydrograph
BH1
BH2
BH3
BH4
BH5
MP7
HH1
Water Level Elevation (mASL)
310.0
309.0
308.0
307.0
306.0
305.0
304.0
303.0
302.0
301.0
300.0
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19


Historical Water Level Elevation Hydrograph - Neubauer Pit
Water Level Elevation (mASL)
308.5
308.0
307.5
307.0
306.5
306.0
305.5
305.0
BH1
BH2
BH3
BH4
BH5
MP7
HH1
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20


2017 and 2018 Water Level Elevation Hydrograph - Neubauer Pit
Water Level Elevation (mASL)
310.0
309.0
308.0
307.0
306.0
305.0
304.0
303.0
302.0
301.0
300.0
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
BH1
BH2
BH3
BH4
BH5
MP7
HH1

HARDEN

Harden Environmental Services Ltd.
4622 Nassagaweya Puslinch Townline Road
Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

File: 0929

April 10, 2019

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

Attention: Karen Landry,
CAO- Clerk

Re: Neubauer Pit – 2018 Monitoring Report (File E13/ ST)

We have reviewed the documentation received regarding the 2018 groundwater monitoring at the Neubauer Pit. The report is prepared by Groundwater Science Corp. on behalf of CBM Aggregates. Below water table extraction has not commenced at the site, however in 2018 there was above water table extraction.

Groundwater monitoring data show that water levels are consistent with seasonal and annual recharge patterns. We visually compared the Neubauer Pit data to that of Puslinch Monitoring Network Wells and find similar patterns and magnitude of water level change.

We have attached the temperature data collected for both 2017 and 2018. The temperature values and profiles with depth are very different with anomalous readings in 2018 as high as 29.3 °C in HH1. The report does not provide an explanation for the change in temperature or the anomalous readings. We understand that data loggers have been installed to provide consistent water level and temperature readings.

An explanation for the anomalous temperature readings and difference between 2017 and 2018 data should be presented to the Township of Puslinch.

Sincerely,
Harden Environmental Services Ltd.

Stan Denhoed

Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist

Monitor:	BH1	Temperature (C) at **Depth (mBGS)**								
Date	Air	**16.0**	**17.0**	**18.0**	**19.0**	**20.0**	**21.0**	**22.0**	**23.0**	**24.0**
23-May-17	25.8		10.3	9.3	9.0	8.8	8.7	8.6	8.6	8.5
26-Jun-17	21.5		9.1	8.8	8.7	8.6	8.6	8.5	8.5	8.5
19-Jul-17	19.1	9.7	9.1	9.0	8.9	8.8	8.9	8.9	8.9	8.8
10-Aug-17	16.3	10.0	9.3	8.9	8.8	8.7	8.7	8.7	8.7	8.7
07-Sep-17	14.6	9.8	9.1	8.9	8.7	8.7	8.7	8.7	8.6	8.6
16-Oct-17	7.4	9.0	8.8	8.7	8.7	8.6	8.6	8.6	8.6	8.6
21-Nov-17	6.4	8.7	9.2	9.2	9.2	9.2	9.3	9.7	9.7	9.7
13-Dec-17	-11.5	8.1	8.5	8.9	9.0	9.0	9.1	9.5	9.5	9.5

Monitor:	BH1	Temperature (C) at **Depth (mBGS)**								
Date	Air	**16.0**	**17.0**	**18.0**	**19.0**	**20.0**	**21.0**	**22.0**	**23.0**	**24.0**
30-Jan-18	-12.0	4.8	9.1	9.7	9.9	10.0	10.4	12.1	12.2	11.7
21-Feb-18	2.5	7.6	10.0	10.5	10.6	10.7	10.8	10.7	10.6	10.6
26-Mar-18	10.2	8.9	11.2	11.5	11.3	11.0	10.9	10.6	10.5	10.5
26-Apr-18	5.6	no access due to operations								
28-May-18	-	11.4	11.6	11.1	11.2	11.4	11.4	16.5	15.6	15.4
12-Jul-18	20.8	17.0	14.3	13.5	13.4	13.7	15.4	19.3	18.4	17.9
20-Sep-18	19.4	12.3	9.6	9.1	9.0	8.9	8.9	8.8	8.8	8.8
24-Oct-18	5.1	8.1	8.6	8.7	8.8	8.8	8.8	8.8	8.8	8.8
13-Dec-18	-	no access due to conditions								

Monitor:	BH4	Temperature (C) at **Depth (mBGS)**		
Date	Air	**13.0**	**14.0**	**15.0**
23-May-17	25.8	-	-	-
26-Jun-17	21.5	9.9	9.1	8.8
19-Jul-17	19.1	10.1	9.5	9.2
10-Aug-17	16.3	14.3	9.6	9.1
07-Sep-17	14.6	13.0	9.9	9.3
16-Oct-17	7.4	13.5	9.9	9.2
21-Nov-17	6.4	8.8	9.8	9.8
13-Dec-17	-11.5	7.9	9.7	9.7

Monitor:	HH1	Temperature (C) at **Depth (mBGS)**			
Date	Air	**3.0**	**4.0**	**5.0**	**6.0**
23-May-17	25.8	9.9	8.7	8.4	8.3
26-Jun-17	21.5	10.9	9.7	8.9	8.5
19-Jul-17	19.1	13.5	11.3	10.5	9.7
10-Aug-17	16.3	16.2	12.7	11.2	10.2
07-Sep-17	14.6	14.3	12.7	11.9	11.0
16-Oct-17	7.4	10.9	12.3	12.2	11.9
21-Nov-17	6.4	9.7	13.1	13.4	13.7
13-Dec-17	-11.5	5.3	11.3	14.4	15.1

Monitor:	BH4	Temperature (C) at **Depth (mBGS)**		
Date	Air	**13.0**	**14.0**	**15.0**
30-Jan-18	-12	6.1	8.4	11.9
21-Feb-18	2.5	8.8	10.5	10.9
26-Mar-18	10.2	10.6	14.9	14.0
26-Apr-18	5.6	no access due to operations		
28-May-18	-		19.0	17.1
12-Jul-18	20.8	16.2	16.6	20.9
20-Sep-18	19.4	17.2	11.3	10.0
24-Oct-18	5.1	8.7	8.9	8.9
13-Dec-18	-	no access due to conditions		

Monitor:	HH1	Temperature (C) at **Depth (mBGS)**			
Date	Air	**3.0**	**4.0**	**5.0**	**6.0**
30-Jan-18	-12.1	4.7	12.2	13.4	14.3
21-Feb-18	2.5	6.2	12.8	13.9	14.7
26-Mar-18	10.2	6.6	13.0	14.0	14.3
26-Apr-18	5.6	7.8	13.3	16.2	16.4
28-May-18	-	17.1	29.3	14.3	12.5
12-Jul-18	20.8	17.5	19.0	16.2	14.9
20-Sep-18	19.4	16.3	17.1	14.4	13.2
24-Oct-18	5.1	9.0	12.2	12.3	12.2
13-Dec-18	-	no access due to conditions			

CAPITAL PAVING INC.

Quality Construction by Quality People
P.O Box 815 Guelph, Ontario N1H 6L8

March 26, 2019

Ontario Ministry of Natural Resources and Forestry
Guelph District
1 Stone Rd. West
Guelph ON N1H 4Y2

Attention: **Ms. Seanna Richardson**

RE: **2018 Groundwater Monitoring Report**
Capital Paving Inc., Wellington Pit, Licence No. 20085
Part Lots 7 and 8, Concession 3, Township of Puslinch

Dear Ms. Richardson,

Please find enclosed with this letter, as per Site Plan requirements, a copy of the 2018 Groundwater Monitoring Annual Report for Capital Paving's Wellington Pit, prepared by Groundwater Science Corp.

A copy has also been submitted to the Townhip of Puslinch and the Ministry of Environment, Conservation and Parks.

Should you have any questions, please do not hesitate to contact me at (519) 822-4511 or glourenco@capitalpaving.on.ca

Sincerely,

George Lourenco, P.Eng
Resources Manager

C.C. Karen Landry, Township of Puslinch

(enclosures)

Groundwater
Science Corp.

Unit 2, 465 Kingscourt Drive,
Waterloo, ON N2K 3R5
Phone: (519) 746-6916
groundwaterscience.ca

March 26, 2019

George Lourenco
Resource Manager,
Capital Paving Inc.
P.O. Box 815
Guelph, ON
N1H 6L8

Dear Mr. Lourenco:

**RE: 2018 Groundwater Monitoring Summary,
Wellington Pit, Licence No. 20085
Part Lots 7 and 8, Concession 3, Township of Puslinch**

This letter is a summary of the results of the 2018 groundwater monitoring program completed for the above reference property. The site location is shown on **Figure 1** (attached).

1.0 Monitoring Program Requirements

The Licence conditions as listed on the Site Plan are summarized as follows:

- *Quarterly (seasonal) groundwater level measurements at locations BH204, BH205, BH213, BH214, BH219, A3, A4, A5, A8, A10, and TP319 for the life of the pit;*
- *Annual reporting of the monitoring data. The report shall include a review of the monitoring program and recommendations regarding future monitoring frequency. It will also include a determination of the "normal" seasonal groundwater tale variations that will trigger mitigation measures;*
- *Should groundwater levels at any time be measured above or below the "normal" seasonal groundwater table variations, all below groundwater table extraction will cease immediately and the operator will inform the Ministry of Natural Resources (MNR), Ministry of the Environment (MOE) and the Township of Puslinch.*

2.0 Monitoring Completed

Water level monitoring at the site during the period 1997 to 2010 was completed by Stantec Consulting Ltd. Annual reporting was prepared by Stantec during years of site operation up until 2010 summarizing operational activities and monitoring results. Please refer to those previous reports for specific information. Based on recommendations made by Stantec in the March 30, 2010 report, monitoring was discontinued at that time. The historical data (April 1997 to January 2010) available for the site is incorporated into this (2018) report.

Groundwater Science Corp. was retained in November 2012 to reinstate the monitoring program. As part of that work the monitors were located, or reinstalled, and ongoing measurements obtained. Annual monitoring reports have been provided previously for the years 2012 to 2017.

The monitoring locations are shown on **Figure 1**. Monitor installation details are shown in **Table 1**.

Monitor	Elevations (mAMSL)			
	Ground	Top of Well	Top of Screen	Bottom of Well
BH204	318.71	319.63	305.51	304.01
BH205	315.52	316.57	301.12	299.62
BH213	324.79	325.56	304.69	303.19
BH214	324.30	325.17	316.00	314.50
BH219	330.21	331.21	315.21	313.71
TP319	319.0*	319.9*	317.9*	316.4*
A3	315.6*	316.4*	314.5*	314.2*
A4	316.7*	317.6*	315.6*	315.3*
A5	313.9*	314.8*	312.9*	312.6*
A8	317.0*	317.9*	316.6*	316.3*
A10	315.4*	316.3*	313.7*	313.4*

mAMSL = metres above mean sea level
monitor elevations as per Stantec Consulting Ltd. report March 30, 2010
A3 and A5 elevations revised as per installation notes January 29, 2013
* elevations estimated from Site Plan topographic mapping

Table 1: Monitor Installation Details

Summaries of the water level data available for the site are attached to this letter report, in both tabular and hydrograph formats.

3.0 Discussion of Monitoring Results

For comparison to the hydrographs, a plot of the monthly precipitation and current 30-year monthly precipitation normal (1981-2010) reported by Environment Canada for the weather station location closest to the site (at the Region of Waterloo International Airport) for the years 2001 to 2018 is attached to this report. The data is provided by Golder Associates as part of a coordinated approach to monthly and annual precipitation analysis for the Township of Puslinch, and to our knowledge as of the date of this report, is consistent with other annual monitoring assessments for the area (e.g. Nestlé Waters Canada).

The graph indicates seasonal and annual variation, and a comparison to "average" values as represented by the Environment Canada reported 30-year Climate Normal. As indicated, on an annual basis the reported total precipitation in 2018 of 807.1 mm was below "average" (916.5 mm). Relatively "dry" conditions occurred in "winter" 2017/2018, "normal" conditions occurred during "spring" and "summer", and relatively "dry" conditions occurred again later in "fall" 2018.

The water level data gathered to date indicates that groundwater elevations during extraction periods at the site have been maintained within in similar range under varying climate conditions since prior to extraction (1997). As shown on the hydrographs, water levels in 2018 also remain within the historical range of water levels observed. The relatively "dry" precipitation conditions in 2018 are reflected at drive-point piezometer A5. However given fact that water levels at the adjacent monitoring well BH219 remain within the historical range, this indicates that lower water levels at A5 are a result of reduced surface water (precipitation and runoff) inputs to the wetland (i.e. not related to groundwater conditions between the pit operations and the wetland). The overall annual pattern of groundwater level variation in 2018 is consistent with precipitation patterns.

There are no evident long-term trends that indicate significant or measurable groundwater level impacts (e.g. declines). Therefore both historical and current water level elevations are interpreted to be within the range of "natural" seasonal conditions for the site and immediate area. This is consistent with monitoring results at other nearby sites over the same period.

Theoretically the reduction in runoff associated with the extraction to date has likely led to additional recharge as compared to the original site condition. This effect would tend to slightly increase local seasonal water table fluctuation and average annual groundwater levels. As illustrated by the hydrographs however, it is likely that the on-going seasonal and annual variation in recharge has a larger influence on local water table elevations, and masks any potential small-scale effect related to the extraction.

The maximum and minimum elevations measured in the period 1997 to 2018 are shown on the data tables and likely represents the "natural" range in fluctuation at the site. No mitigation measures response is recommended as a result of the monitoring data.

4.0 Recommendations

The monitoring program as listed on the Site Plan should continue in 2019.

If you have any questions or require further assistance please do not hesitate to contact us.

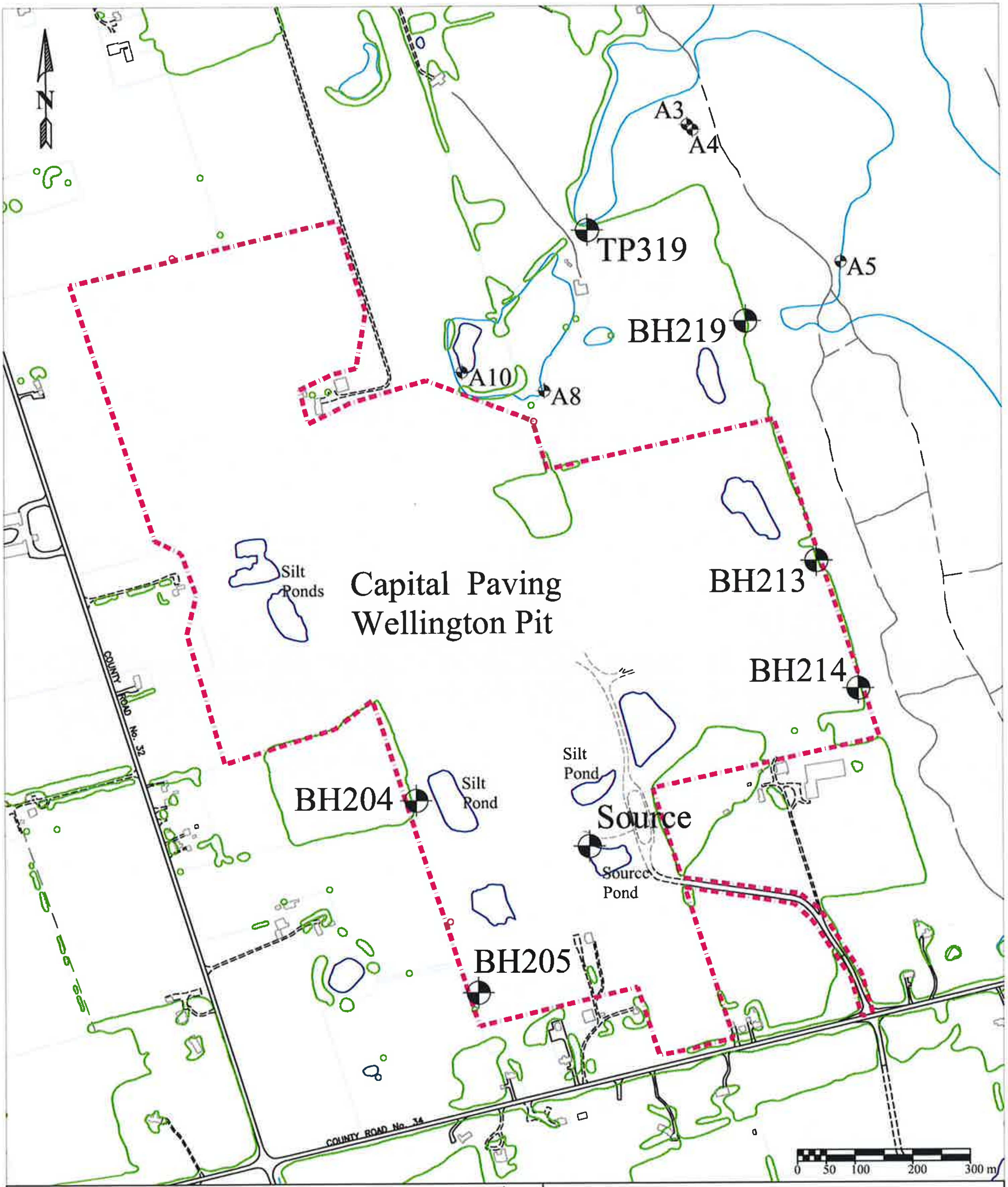
Sincerely,

PROFESSIONAL GEOSCIENTISTS
ANDREW H. PENTNEY
PRACTISING MEMBER
0652
ONTARIO

Dave Nahrgang, P.Geo.
Project Hydrogeologist.

Andrew Pentney, P.Geo
Senior Hydrogeologist

Attached:	Figure 1 Monitoring Locations
	Water Level Monitoring Data Summary Table
	Hydrograph – Monitoring Well Water Level Data
	Hydrograph – Drive-Point Piezometer Water Level Data
	Puslinch Area Precipitation Summary



monitoring location

Licenced boundary (approx.)

surface water (pond, creek)

mapped wetlands

scale : as shown
March 2017

modified from: 1,10,000 OBM Mapping
UNDER LICENSE, WITHOUT PREJUDICE OR
ENDORSEMENT FROM THE QUEEN'S PRINTER OF ONTARIO

Figure 1: Monitoring Locations

Annual Monitoring Report

Capital Paving Inc. Wellington Pit
Lot 7, Con. 3, Township of Puslinch, County of Wellington

Date	Water Level Elevation (mAMSL)														
	BH204	BH205	BH213	BH214	BH219	TP319	A3 GW	A3 SW	A4 GW	A5 GW	A5 SW	A8 GW	A8 SW	A10 GW	A10 SW
15-Apr-97	307.68	307.47	315.79	315.85	316.55	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26-May-97	307.64	307.46	315.50	315.53	316.34	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
11-Jun-97	307.58	307.42	315.37	315.49	316.29	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
25-Jun-97	307.68	307.45	315.44	315.51	316.35	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9-Jul-97	307.73	307.48	315.46	315.54	316.46	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
22-Jul-97	307.27	307.15	314.98	315.16	316.13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
23-Jul-97	n/a	n/a	n/a	n/a	n/a	n/a	n/a	315.62	315.55	n/a	313.78	317.27	317.09	314.80	315.50
30-Jul-97	307.21	307.09	314.87	315.11	316.11	n/a	314.75	315.59	315.51	313.72	313.76	317.28	317.07	315.43	315.45
15-Sep-97	306.83	306.84	314.27	314.82	315.87	n/a	315.53	n/a	315.43	313.81	313.84	317.18	317.00	315.19	n/a
15-Oct-97	306.47	306.59	313.83	314.55	315.46	n/a	315.58	n/a	315.39	313.94	313.88	317.08	n/a	315.04	n/a
17-Nov-97	306.37	306.56	313.69	dry	315.52	n/a	315.58	315.59	315.46	313.98	313.96	317.05	n/a	315.00	n/a
17-Dec-97	306.18	306.46	313.53	dry	315.42	n/a	315.00	315.61	315.47	313.97	313.97	316.98	n/a	314.89	n/a
21-Jan-98	306.11	306.50	313.59	314.85	315.48	n/a	n/a	n/a	315.62	fr	n/a	fr	n/a	314.70	n/a
10-Jun-98	306.62	306.68	313.52	315.15	316.07	n/a	315.60	315.60	315.54	313.76	n/a	317.26	317.07	315.18	n/a
23-Oct-98	305.66	305.88	313.26	314.45	315.35	n/a	314.99	dry	dry	313.32	dry	316.60	dry	dry	n/a
24-Dec-98	305.25	305.64	312.89	314.43	315.06	n/a	315.08	dry	dry	313.72	dry	316.45	dry	dry	n/a
6-Apr-99	305.37	305.90	313.12	314.90	315.10	316.85	315.66	fr	315.59	314.15	313.94	317.11	dry	314.79	dry
18-Jun-99	305.33	305.65	313.22	314.70	315.27	316.53	315.51	dry	315.39	313.72	dry	316.76	dry	314.13	dry
22-Sep-99	305.02	305.10	312.68	dry	314.94	316.44	dry	dry	dry	dry	dry	316.16	dry	dry	dry
19-Nov-99	304.94	305.28	312.59	314.56	314.81	316.45	316.15	dry	dry	313.84	dry	316.13	dry	dry	dry
5-Apr-00	305.05	305.43	312.92	dry	314.96	316.80	315.53	dry	315.44	313.90	313.87	316.82	dry	dry	dry
16-Jun-00	305.48	305.99	313.85	315.30	315.64	316.93	315.82	315.79	316.71	313.96	313.91	317.24	317.02	dry	dry
19-Sep-00	305.64	305.94	313.75	314.97	315.74	316.58	315.54	dry	315.43	313.68	dry	317.11	dry	314.65	dry
7-Dec-00	305.43	305.80	313.27	dry	315.37	316.50	315.34	dry	dry	fr	fr	316.86	dry	314.24	dry
19-Mar-01	n/a	305.99	313.60	315.47	315.43	316.89	dry	n/a	315.63	314.13	n/a	317.02	dry	315.12	dry
14-Jun-01	305.93	306.25	314.20	315.29	315.95	316.85	315.70	315.69	315.61	313.86	313.85	317.22	dry	n/a	dry
1-Oct-01	306.12	305.67	315.25	314.59	315.19	316.45	315.05	dry	dry	313.27	dry	n/a	dry	313.71	dry
15-Dec-01	305.47	305.81	313.18	314.56	315.23	316.83	315.56	315.61	315.46	313.88	313.83	317.08	dry	314.48	dry
1-Apr-02	305.63	306.12	313.91	315.66	315.69	316.89	315.73	fr	315.64	313.86	313.94	316.96	dry	315.16	dry
4-Jul-02	306.23	306.45	314.68	315.99	316.12	316.86	315.72	315.71	315.66	313.80	313.79	317.27	317.06	n/a	dry
30-Sep-02	305.87	305.96	313.70	315.31	315.49	316.45	315.21	dry	dry	313.31	dry	316.94	dry	314.12	dry
10-Dec-02	305.56	305.73	313.02	314.46	315.28	316.48	315.09	dry	dry	313.51	dry	316.74	dry	313.87	dry
8-Apr-03	305.30	305.77	313.33	314.71	315.26	316.91	315.57	fr	315.53	fr	fr	317.00	fr	315.03	dry
15-Jul-03	305.75	306.03	313.80	315.61	315.74	316.69	315.63	dry	315.54	313.62	dry	317.03	dry	314.90	dry
20-Oct-03	305.63	305.85	313.93	314.60	315.67	316.74	315.55	315.60	315.48	313.77	313.74	316.94	dry	314.33	dry

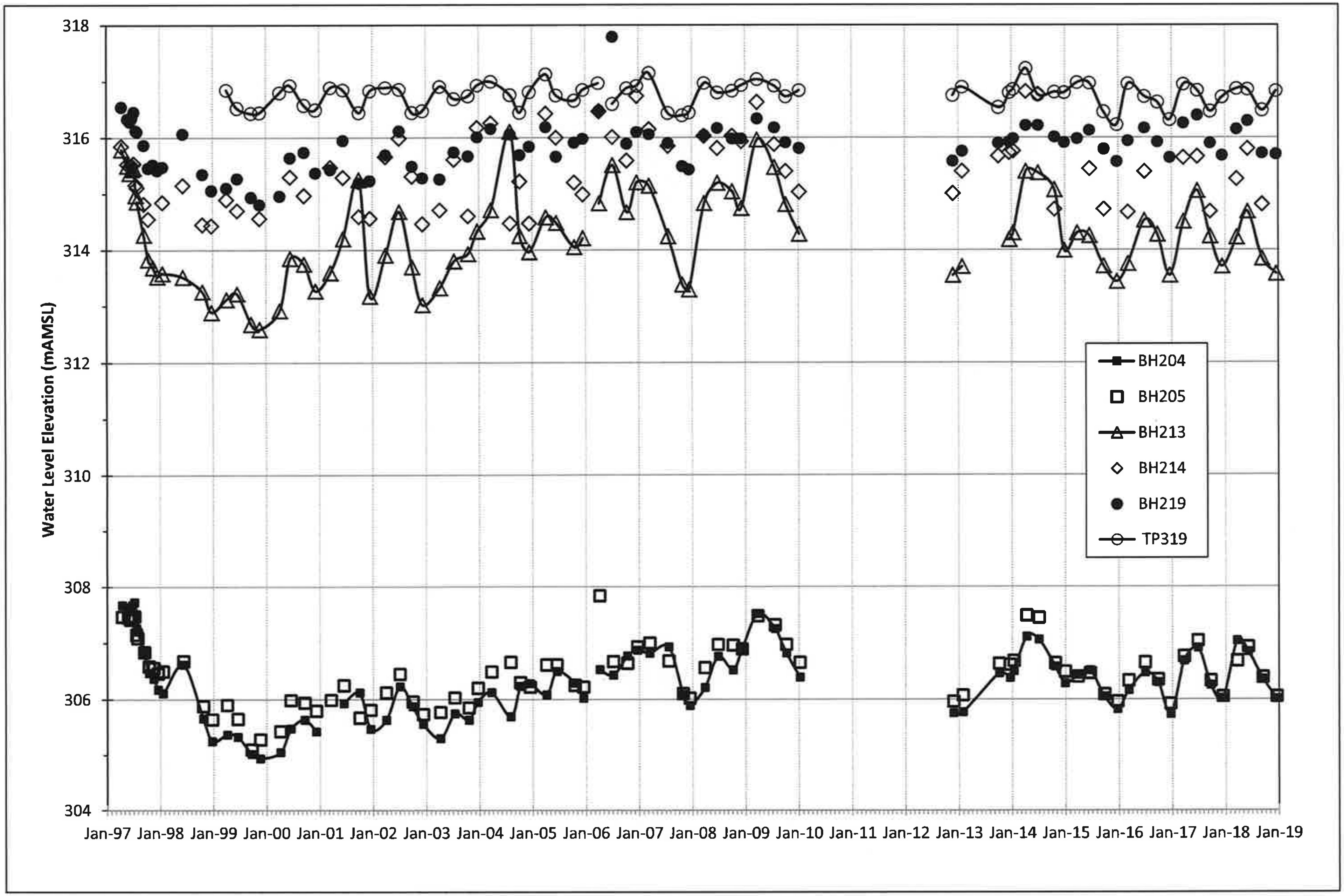
	Water Level Elevation (mAMSL)														
Date	BH204	BH205	BH213	BH214	BH219	TP319	A3 GW	A3 SW	A4 GW	A5 GW	A5 SW	A8 GW	A8 SW	A10 GW	A10 SW
21-Dec-03	305.95	306.20	314.33	316.18	316.01	316.93	fr	fr	315.65	fr	fr	317.04	dry	315.11	dry
24-Mar-04	306.13	306.49	314.71	316.26	316.16	317.00	fr	fr	315.68	fr	fr	317.05	dry	315.43	
3-Aug-04	305.69	306.66	316.11	314.47	316.06	316.76	315.63	315.62	315.58	313.68	dry	317.25	dry	315.41	315.40
8-Oct-04	306.24	306.30	314.25	315.22	315.69	316.45	315.32	dry	dry	313.32	dry	316.90	dry	314.77	dry
13-Dec-04	306.28	306.22	313.96	314.47	315.84	316.81	315.58	315.64	315.50	fr	fr	316.98	dry	314.83	dry
5-Apr-05	306.08	306.61	314.58	316.43	316.19	317.13	fr	fr	315.78	313.92	313.87	317.09	317.08	315.48	315.48
15-Jun-05	306.50	306.61	314.48	316.00	315.66	316.75	315.61	315.62	315.58	313.68	313.70	317.20	317.07	315.28	dry
17-Oct-05	306.29	306.25	314.05	315.20	315.91	316.66	315.49	dry	315.45	313.60	dry	316.92	dry	314.38	dry
15-Dec-05	306.02	306.22	314.21	314.99	315.98	316.85	315.61	fr	315.60	313.82	fr	317.17	dry	314.84	dry
31-Mar-06	n/a	n/a	n/a	n/a	n/a	316.97	315.73	315.69	315.75	313.79	313.78	n/a	n/a	n/a	n/a
6-Apr-06	306.53	307.84	314.83	316.47	316.48	n/a	n/a	n/a	n/a	n/a	n/a	317.35	317.30	315.69	315.69
7-Jul-06	306.43	306.67	315.51	316.01	317.79	316.60	315.50	315.48	316.75	313.68	313.69	n/a	n/a	315.21	dry
13-Oct-06	306.77	306.64	314.67	315.59	315.89	316.88	314.49	315.64	315.61	313.75	313.76	317.18	dry	315.13	dry
20-Dec-06	306.87	306.93	315.20	316.74	316.10	316.92	fr	fr	fr	fr	fr	fr	fr	fr	fr
15-Mar-07	306.82	307.00	315.14	316.15	316.06	317.15	fr	316.40	316.96	313.88	314.50	317.24	dry	315.75	dry
23-Jul-07	306.93	306.68	314.24	315.85	315.90	316.44	dry	dry	316.69	dry	dry	316.79	dry	315.65	dry
29-Oct-07	306.09	306.10	313.38	dry	315.49	316.40	314.98	dry	dry	313.17	dry	317.11	dry	dry	dry
14-Dec-07	305.89	306.02	313.29	dry	315.43	316.45	315.14	n/a	315.52	313.56	n/a	316.97	n/a	dry	n/a
27-Mar-08	306.21	306.56	314.83	316.03	316.04	316.97	fr	fr	315.66	fr	fr	fr	fr	fr	fr
26-Jun-08	306.76	306.97	315.19	315.81	316.17	316.80	315.66	315.66	315.67	313.61	313.61	317.67	317.47	315.59	315.57
6-Oct-08	306.52	306.96	315.04	316.03	315.98	316.83	315.66	315.70	315.69	313.65	313.64	317.64	317.37	315.48	315.48
7-Dec-08	306.89	306.89	314.74	315.93	315.98	316.93	fr	fr	315.64	fr	fr	fr	fr	fr	fr
25-Mar-09	307.52	307.48	315.96	316.63	316.34	317.04	fr	fr	315.76	fr	fr	fr	fr	316.06	316.06
22-Jul-09	307.25	307.32	315.47	315.88	316.18	316.92	315.59	315.60	315.67	313.59	dry	317.77	317.67	315.79	315.79
7-Oct-09	306.82	306.97	314.81	315.40	315.91	316.73	315.49	315.54	315.56	313.63	313.63	317.81	317.29	315.43	315.40
8-Jan-10	306.39	306.65	314.28	315.03	315.81	316.84	315.58	fr	315.53	313.76	fr	317.06	fr	315.14	fr
26-Nov-12	305.75	305.96	313.55	315.00	315.58	316.75	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
29-Jan-13	305.77	306.07	313.70	315.40	315.76	316.90	n/a	315.79	315.58	n/a	313.61	316.98	dry	314.38	dry
4-Oct-13	306.46	306.63	n/a	315.67	315.90	316.54	315.68	315.69	315.48	n/a	n/a	n/a	n/a	n/a	n/a
17-Dec-13	306.38	306.61	314.18	315.73	315.92	316.80	fr	fr	315.58	fr	fr	fr	dry	315.02	dry
13-Jan-14	306.50	306.68	314.30	315.76	315.98	316.86	fr	fr	315.64	fr	fr	fr	fr	315.10	dry
10-Apr-14	307.11	307.49	315.40	316.82	316.22	317.23	315.98	fr	fr	313.83	313.67	317.31	317.12	315.58	fr
3-Jul-14	307.06	307.45	315.37	316.77	316.22	316.76	315.93	315.98	n/a	313.80	313.69	317.25	dry	315.37	dry
23-Oct-14	306.58	306.64	315.07	314.72	316.01	316.81	315.78	315.78	315.60	313.75	313.66	317.57	dry	314.80	dry
29-Dec-14	306.28	306.49	313.99	dry	315.91	316.80	315.82	315.80	315.63	313.47	313.53	fr	dry	fr	dry

	Water Level Elevation (mAMSL)														
Date	BH204	BH205	BH213	BH214	BH219	TP319	A3 GW	A3 SW	A4 GW	A5 GW	A5 SW	A8 GW	A8 SW	A10 GW	A10 SW
27-Mar-15	306.43	306.40	314.30	dry	315.98	316.98	fr	fr	fr	fr	fr	fr	fr	fr	fr
19-Jun-15	306.51	306.46	314.25	315.44	316.13	316.97	315.79	315.78	315.66	313.51	313.45	317.46	dry	315.09	dry
24-Sep-15	306.05	306.09	313.71	314.72	315.79	316.46	315.52	dry	315.45	313.24	dry	dry	dry	dry	dry
23-Dec-15	305.82	305.96	313.43	dry.	315.57	316.23	315.49	dry	dry	313.18	dry	dry	dry	dry	dry
8-Mar-16	306.16	306.33	313.75	314.67	315.94	316.96	fr	fr	dry	fr	fr	fr	dry	fr	fr
29-Jun-16	306.47	306.65	314.52	315.39	316.17	316.73	315.65	315.64	dry	313.23	dry	dry	dry	dry	dry
26-Sep-16	306.30	306.35	314.27	dry	315.92	316.63	315.81	315.80	315.64	313.49	313.54	317.23	dry	dry	dry
20-Dec-16	305.73	305.92	313.54	dry	315.64	316.32	fr	fr	dry	fr	fr	fr/dry	dry	fr	fr
23-Mar-17	306.68	306.76	314.50	315.64	316.26	316.95	fr	fr	315.72	fr	fr	dry	dry	fr	fr
26-Jun-17	306.91	307.04	315.05	315.66	316.40	316.84	315.79	315.80	315.70	313.48	313.46	317.67	317.13	314.81	dry
22-Sep-17	306.25	306.33	314.24	314.68	315.90	316.47	315.82	315.80	315.69	313.51	313.46	317.49	317.09	315.11	dry
13-Dec-17	306.02	306.05	313.70	dry	315.68	316.72	fr	fr	dry	fr	fr	fr/dry	dry	fr	fr/dry
22-Mar-18	307.04	306.68	314.22	315.26	316.15	316.87	fr	fr	315.72	fr	fr	fr	dry	315.29	dry
6-Jun-18	306.84	306.93	314.68	315.80	316.30	316.86	315.74	315.74	315.72	313.44	313.39	317.42	dry	315.08	dry
14-Sep-18	306.36	306.39	313.84	314.81	315.72	316.49	315.48	dry	dry	313.05	dry	dry	dry	dry	dry
18-Dec-18	306.01	306.05	313.57	dry	315.70	316.83	fr	fr	dry	fr	fr	fr	dry	fr	dry

Note: GW = groundwater, SW = surface water n/a = not available fr = frozen

1997 to 2010 data as reported by Stantec subsequent data as measured by Groundwater Science Corp.

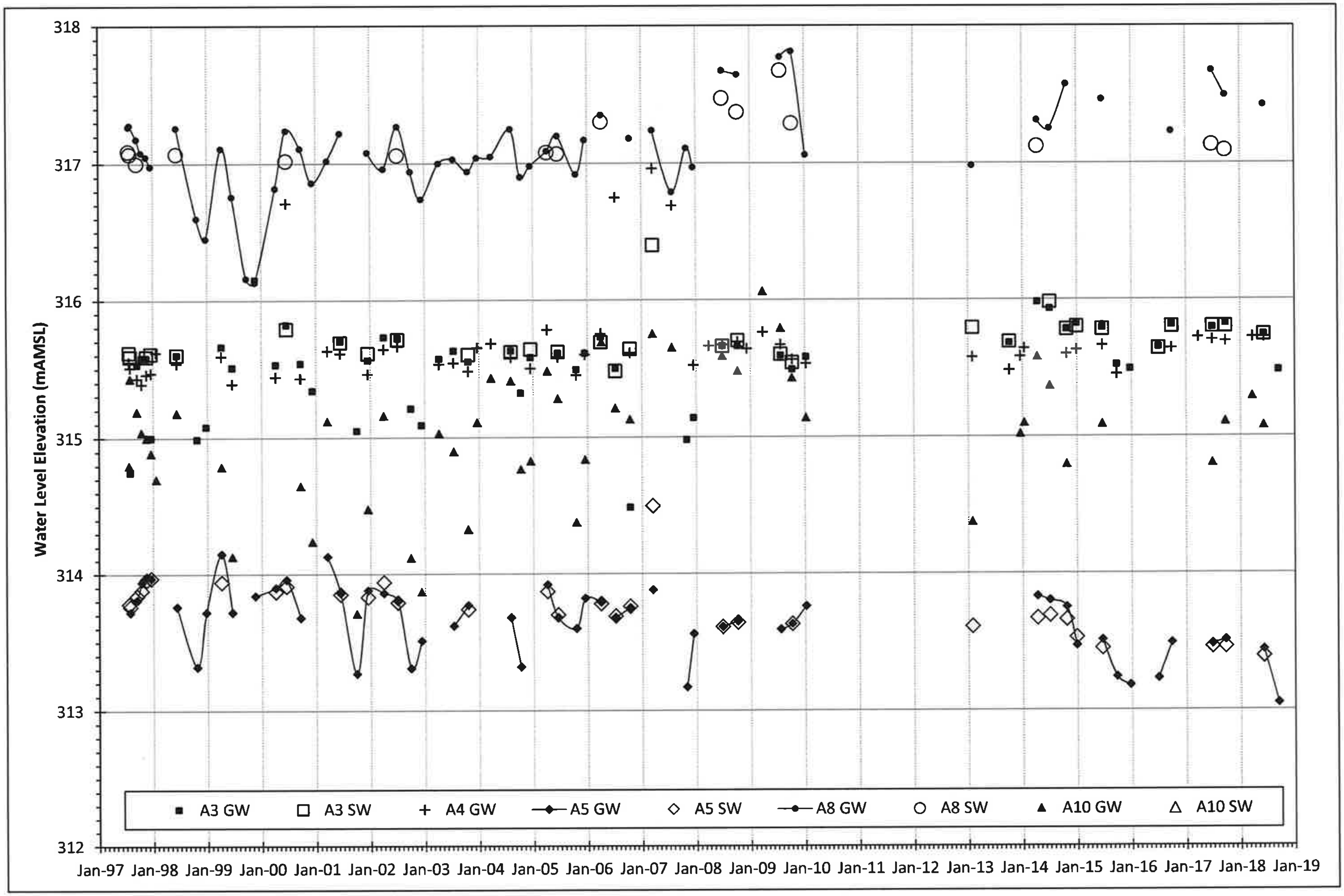
1997 to 2018 Maximum and Minimum Elevations (mAMSL)															
max	307.73	307.84	316.11	316.82	317.79	317.23	316.15	316.40	316.96	314.15	314.50	317.81	317.67	316.06	316.06
min	304.94	305.10	312.59	314.43	314.81	316.23	314.49	315.48	315.39	313.05	313.39	316.13	317.00	313.71	315.40



Capital Paving Inc.
Wellington Pit

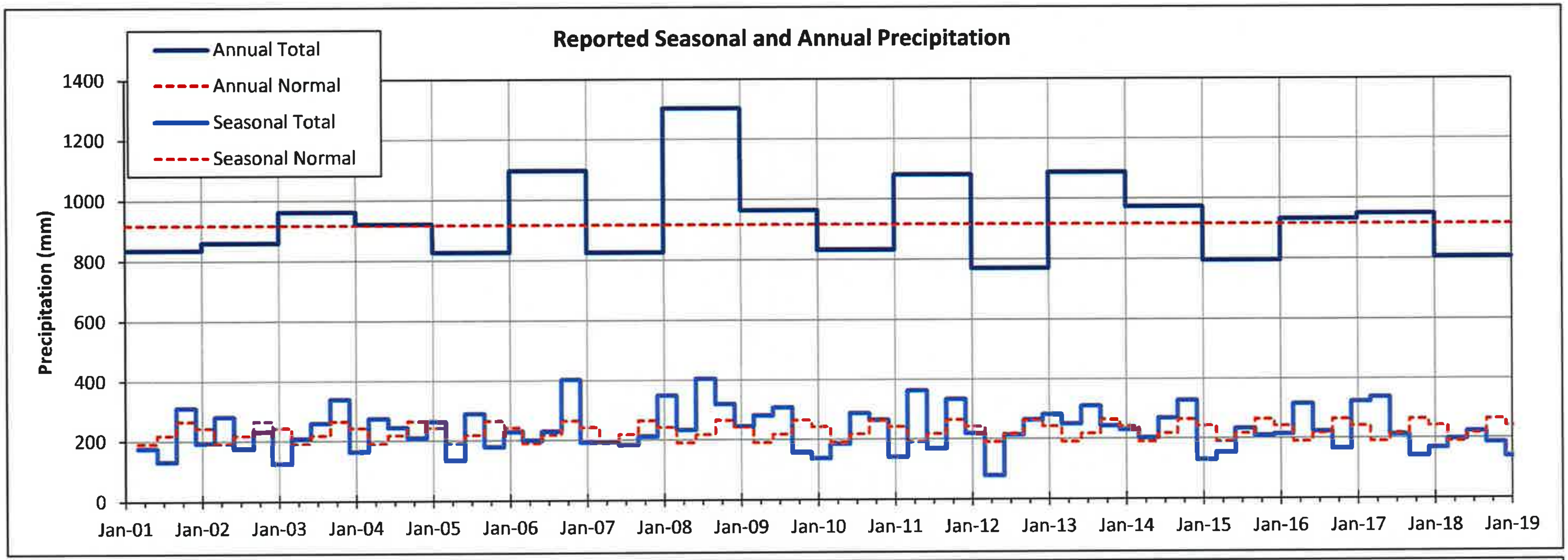
Monitoring Well Water Level Data

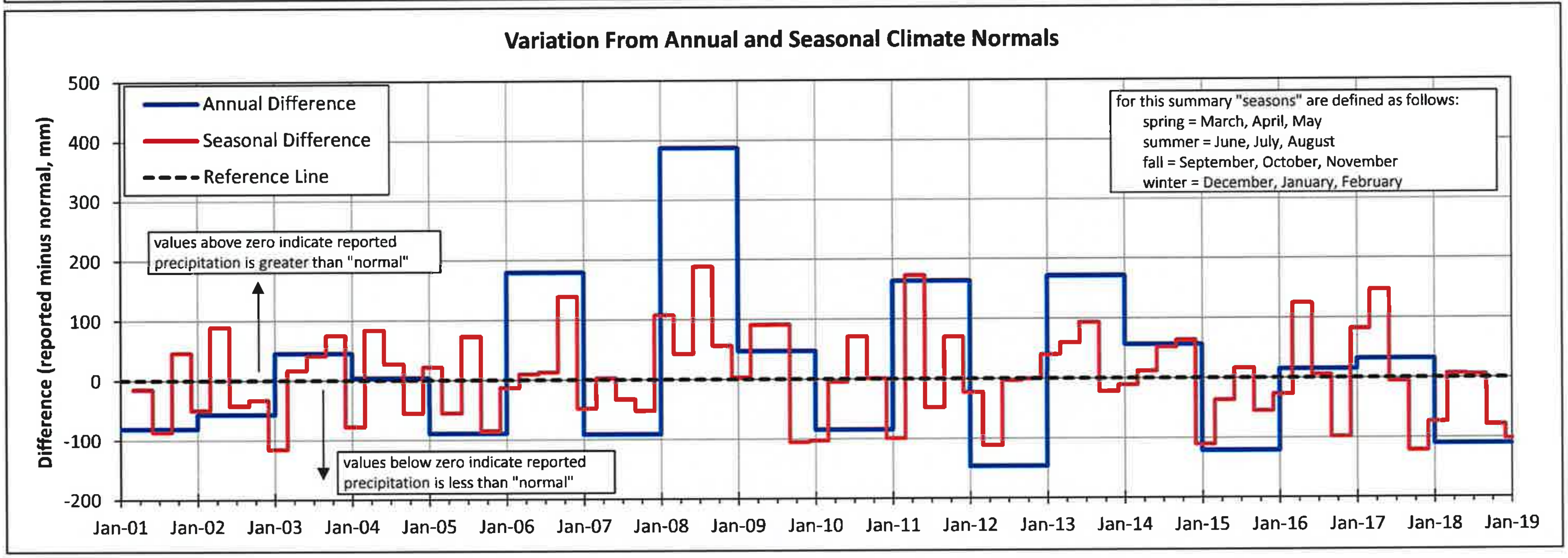
Annual Monitoring Report
Groundwater Science Corp.



Capital Paving Inc.
Wellington Pit

Drive-Point Piezometer Water Level Data


Reported Seasonal and Annual Precipitation


Variation From Annual and Seasonal Climate Normals

for this summary "seasons" are defined as follows:
spring = March, April, May
summer = June, July, August
fall = September, October, November
winter = December, January, February

values above zero indicate reported precipitation is greater than "normal"

values below zero indicate reported precipitation is less than "normal"

HARDEN

Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline Road
R.R. 1, Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modeling
Groundwater Mapping
Permits to Take Water
Environmental Compliance Approvals

Our File: 9711

April 9, 2019

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

Attention: Ms. Karen Landry
CAO

Dear Ms. Landry;

Re: Capital Paving Inc., Wellington Pit, License 20085
Puslinch File: E10 CAP – Wellington License: 20085

We have reviewed the 2018 Monitoring Report for the Capital Paving Inc. Wellington Pit, License 20085 prepared by Groundwater Science Corp. on March 26, 2019.

We agree with Groundwater Science Corp. that there is no indication of long term trends of declining groundwater or surface water levels for on-site monitors. Water levels are observed to vary seasonally but remain within a relatively narrow range over the historical record period. There is no indication that water levels are outside of their normal range.

The downward trend in water levels continues in off-site station A5 SW and A5 GW. There is no indication that the on-site extractive activities can be causing this water level trend. The nearest on-site monitor is BH219 and it consistently has higher water levels than the A5 series and there is no trend toward lower water levels.

There has been limited below-water-table extraction to-date, therefore any change in water levels are expected to be subtle. Based on this review we conclude that groundwater and surface water conditions adjacent to the pit are not being affected by pit activities.

Sincerely,

Harden Environmental Services Ltd.

Stan Denhoed, M.Sc., P.Eng.
Senior Hydrogeologist

ONTARIO ENERGY BOARD SUPPLEMENTAL NOTICE
TO CUSTOMERS OF ENBRIDGE GAS INC.

Enbridge Gas Inc. has applied for approval of the financial terms associated with the Open Bill Access program. The OEB will determine if the Open Bill Access program should continue.

Learn more. Have your say.

Enbridge Gas Inc. (Enbridge Gas) has applied to the Ontario Energy Board (OEB) for approval of the financial terms for 2019 and 2020 associated with the Open Bill Access program, including approval for the sharing of net revenues with ratepayers. The Open Bill Access program allows third-parties to access Enbridge Gas' bill for a fee to bill for services and provide marketing information. The program provides an annual benefit of $5.389 million in rates to Enbridge Gas customers. The OEB has determined that it will consider whether the Open Bill Access program should continue, including the use of bill inserts, and if so under what terms.

THE ONTARIO ENERGY BOARD IS HOLDING A PUBLIC HEARING

The Ontario Energy Board (OEB) will hold a public hearing to consider the application filed by Enbridge Gas. We will question Enbridge Gas on the case. We will also hear questions and arguments from individual customers, from groups that represent the customers of Enbridge Gas, and from groups that use the Open Bill Access program. **At the end of this hearing, the OEB will decide whether the Open Bill Access program should continue and, if so, under what terms.**

The OEB is an independent and impartial public agency. We make decisions that serve the public interest. Our goal is to promote a financially viable and efficient energy sector that provides you with reliable energy services at a reasonable cost.

BE INFORMED AND HAVE YOUR SAY

You have the right to information regarding this application and to be involved in the process.

- You can review the application filed by Enbridge Gas on the OEB's website now.
- You can file a letter with your comments, which will be considered during the hearing.
- You can become an active participant (called an intervenor). Apply by **April 18, 2019** or the hearing will go ahead without you and you will not receive any further notice of the proceeding.
- At the end of the process, you can review the OEB's decision and its reasons on our website.

LEARN MORE

Our file number for this case is **EB-2018-0319**. To learn more about this hearing, find instructions on how to file letters or become an intervenor, or to access any document related to this case, please enter the file number **EB-2018-0319** on the OEB website: **www.oeb.ca/participate**. You can also phone our Consumer Relations Centre at 1-877-632-2727 with any questions.

ORAL VS. WRITTEN HEARINGS

There are two types of OEB hearings – oral and written. The OEB will determine at a later date whether to proceed by way of a written or oral hearing. If you think an oral hearing is needed, you can write to the OEB to explain why by **April 18, 2019.**

PRIVACY

If you write a letter of comment, your name and the content of your letter will be put on the public record and the OEB website. However, your personal telephone number, home address and e-mail address will be removed. If you are a business, all your information will remain public. If you apply to become an intervenor, all information will be public.

This hearing will be held under section 36 of the Ontario Energy Board Act, S.O. 1998 c.15 (Schedule B).

Ontario

Ontario Energy Board Commission de l'énergie de l'Ontario

From: Karen Landry
To: Nina Lecic
Subject: FW: 2018 Natural Gas Consumption Reports
Date: Tuesday, April 2, 2019 1:36:02 PM
Attachments: TS27 - Township of Puslinch.pdf

From: Fernanda Lazzaro <FLazzaro@amo.on.ca>
Sent: Tuesday, April 2, 2019 9:03 AM
To: Karen Landry <KLandry@puslinch.ca>
Subject: 2018 Natural Gas Consumption Reports

Dear Karen,

The LAS Natural Gas Procurement Program has been providing Ontario municipalities with stable and predictable Natural Gas prices for more than 20 years. Each year LAS provides all program members with a report detailing consumption from all accounts enrolled in the LAS program. Please find attached the consumption report for your municipality for the period of January-December 2018.

This report details consumption for each account for the period and also includes a graphical summary of the annual consumption of all enrolled accounts for the period, with a comparison to the prior year. Only accounts that were enrolled during this period are included in the report.

Please contact me if you have any questions about the attached report.

Thank you for your continued participation in the LAS Natural Gas Procurement Program.

Regards,

Fernanda Lazzaro
Customer Service Representative – LAS
200 University Avenue – Suite 801
Toronto, ON, M5H 3C6
T: 416-971-9856 x 369
flazzaro@amo.on.ca

Follow us on Twitter

LAS Local Authority Services

LAS NATURAL GAS PROCUREMENT PROGRAM

TS27 - TOWNSHIP OF PUSLINCH

							ALL CONSUMPTION IS REPORTED IN m^3												
UTILITY ACCOUNT NAME	**UTILITY SERVICE ADDRESS**	**ACCOUNT NUMBER**	**UTILITY**	**RATE CLASS**	**ACCOUNT STATUS**	**DATE OF CHANGE**	**Jan-18**	**Feb-18**	**Mar-18**	**Apr-18**	**May-18**	**Jun-18**	**Jul-18**	**Aug-18**	**Sep-18**	**Oct-18**	**Nov-18**	**Dec-18**	**2018 TOTAL**
PUSLINCH TOWNSHIP ROADS DEPT	7404 WELLINGTON RD 34, UNIT 2, PUSLINCH TWP, ON, N0B2J0	24220202192333	UNION GAS - SOUTH	M1	ACTIVE		6,648	4,898	3,061	2,944	1,876	8	11	3	22	399	2,626	2,879	25,375
ABERFOYLE MUNICIPAL COMPLEX	7404 WELLINGTON RD 34, UNIT 1, PUSLINCH TWP, ON, N0B2J0	24220212192334	UNION GAS - SOUTH	M1	ACTIVE		4,691	2,325	2,562	2,431	1,240	164	67	47	72	491	1,923	2,682	18,695
PUSLINCH TWSP COMMUNITY HALL	23 BROCK RD, ABERFOYLE, ON, N1H6H9	24220322192345	UNION GAS - SOUTH	M1	ACTIVE		3,102	2,918	2,194	2,110	814	254	223	173	187	622	1,960	2,015	16,572
TOWNSHIP OF PUSLINCH	23 BROCK RD, ABERFOYLE, ON, N1H6H9	41438492716747	UNION GAS - SOUTH	M1	ACTIVE		4,916	4,185	2,983	2,872	675	235	72	-	33	960	2,528	2,903	22,362
			ACTIVE LOCATIONS		4	**TOTAL**	19,357	14,326	10,800	10,357	4,605	661	373	223	314	2,472	9,037	10,479	83,004

YEAR	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**	**ACTIVE ACCOUNTS**
2014	13,947	14,288	8,410	8,566	2,994	584	471	233	658	2,254	5,916	9,373	67,694	4
2015	14,580	15,493	16,378	8,590	2,042	771	577	769	824	2,581	5,154	7,208	74,967	4
2016	12,226	14,441	10,990	7,961	3,658	955	526	307	436	1,330	5,623	7,599	66,052	4
2017	13,126	11,471	8,153	5,961	6,962	1,586	361	296	859	1,241	6,426	9,314	65,756	4
2018	19,357	14,326	10,800	10,357	4,605	661	373	223	314	2,472	9,037	10,479	83,004	4
5 YEAR AVG	14,647	14,004	10,946	8,287	4,052	911	462	366	618	1,976	6,431	8,795	71,495	

LAS NATURAL GAS PROCUREMENT PROGRAM - HOW TO READ YOUR REPORT

C01 - CITY OF SAMPLES

ALL CONSUMPTION IS REPORTED IN m^3

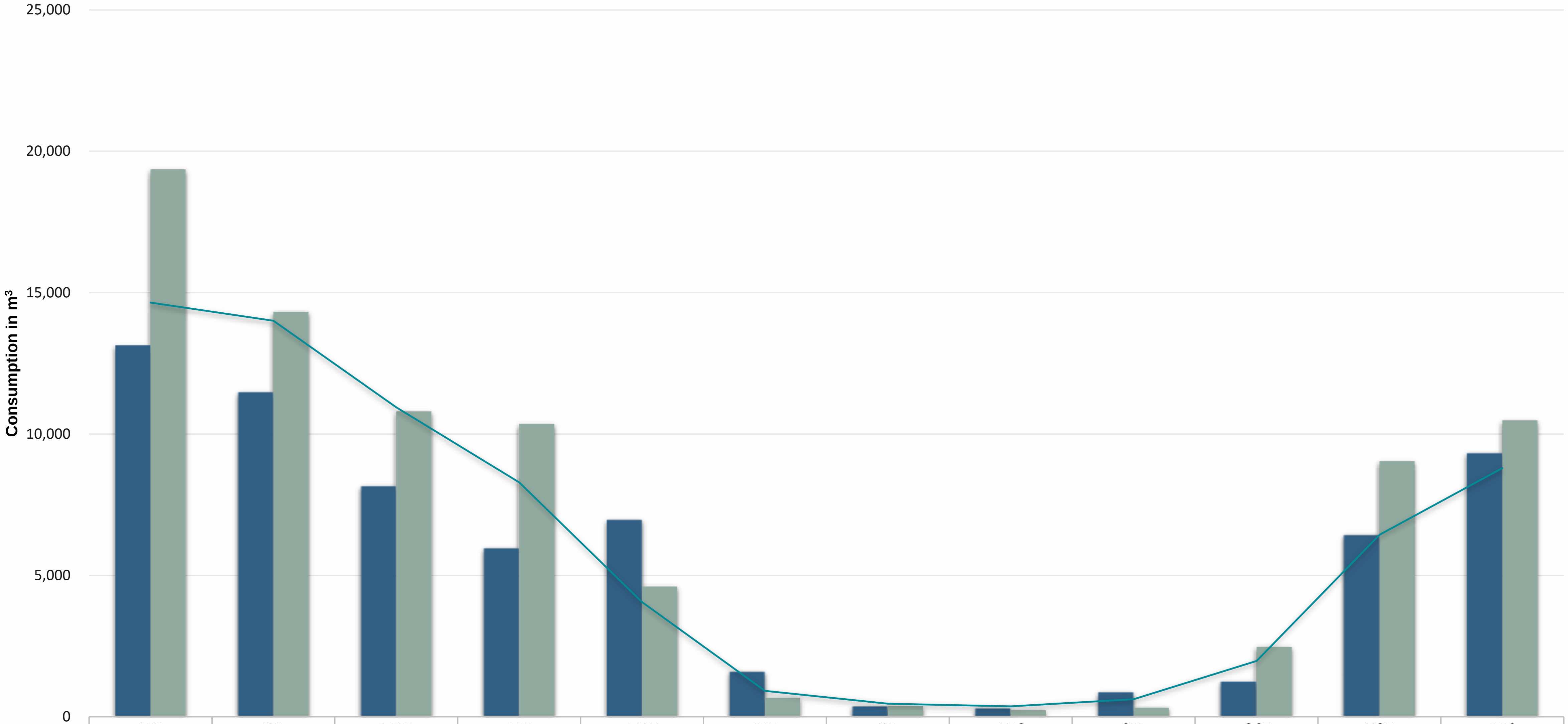
UTILITY ACCOUNT NAME	UTILITY SERVICE ADDRESS	ACCOUNT NUMBER	UTILITY	RATE CLASS	ACCOUNT STATUS	DATE OF CHANGE	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	2018 TOTAL
RECREATION CENTRE	123 MAIN ST, SAMPLES ON, X0X0X0	10446291124623	UG NORTH - EDA	1	ACTIVE	1-Jun-18	-	-	-	-	-	464	-	-	-	46	683	1,574	2,767
POLICE DEPARTMENT	321 KING ST, SAMPLES ON, X0X0X0	10479361128026	UG NORTH - EDA	1	ACTIVE		7,860	5,959	7,213	6,445	3,821	2,199	8	-	-	100	538	3,630	37,773
FIRE DEPARTMENT	432 QUEEN ST, SAMPLES ON, X0X0X0	10490392477744	UG NORTH - EDA	1	ACTIVE		2,223	1,312	1,856	1,685	743	450	26	-	-	-	-	1,665	9,960
TRANSIT SYSTEM	528 WATER ST, SAMPLES ON, X0X0X0	10510821131264	UG NORTH - EDA	1	ACTIVE		7,923	6,189	6,431	8,885	-	1,216	57	40	-	-	857	3,237	34,835
COURT HOUSE	658 BARON ST, SAMPLES ON, X0X0X0	10512991131495	UG NORTH - EDA	1	ACTIVE		7,593	8,054	8,595	7,937	3,710	1,586	410	325	316	319	1,039	6,195	46,079
CHILDRENS MUSEUM	457 MONK RD, SAMPLES ON, X0X0X0	10528781133117	UG NORTH - EDA	10	ACTIVE		5,919	7,311	7,029	7,436	3,804	2,520	999	720	239	1,173	1,663	5,207	44,020
		ACTIVE LOCATIONS			6	TOTAL	31,518	28,825	31,124	32,388	12,078	8,435	1,500	1,085	555	1,638	4,780	21,508	175,434

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	ACTIVE ACCOUNTS
2014	137,830	126,041	148,787	143,664	66,002	29,354	18,548	23,426	24,188	29,317	61,712	87,537	896,406	17
2015	111,083	134,543	132,764	79,952	47,015	20,973	20,571	20,257	20,501	35,388	51,851	61,049	735,947	16
2016	84,125	112,699	107,111	75,960	57,376	30,685	23,492	21,170	20,425	61,150	42,502	26,393	663,088	15
2017	140,631	80,056	75,365	58,800	20,596	12,378	34,756	23,317	30,999	11,761	104,330	29,741	622,730	11
2018	31,518	28,825	31,124	32,388	12,078	8,435	1,500	1,085	555	1,638	4,780	21,508	175,434	11
5 YEAR AVG	101,037	96,433	99,030	78,153	40,613	20,365	19,773	17,851	19,334	27,851	53,035	45,246	618,721	

UTILITY ACCOUNT NAME	ACCOUNT NAME ON UTILTIY BILLS	**RATE CLASS**	RATE CLASS WITH UTILITY	**MONTHS**	MONTHS REPORTED ON (CALENDAR YEAR)	**ACTIVE ACCOUNTS**	ACTIVE ACCOUNTS AT YEAR END
UTILITY SERVICE ADDRESS	SERVICE LOCATION OF UTILITY METER	**ACCOUNT STATUS**	ACCOUNT STATUS AT END OF REPORT	**YEARLY TOTAL**	ANNUAL ACCOUNT CONSUMPTION IN m3	**ACCOUNT STATUS**	YEARS CALCULATED IN AVERAGE
ACCOUNT NUMBER	UTILITY ACCOUNT NUMBER PROVIDED BY UTILITY	**DATE OF CHANGE**	DATE OF ENROLMENTS AND FINALIZATIONS	**MONTHLY TOTAL**	TOTAL MONTHLY CONSUMPTION IN m3	**5 YEAR AVERAGE**	PAST 5 YEAR MONTHLY AVERAGE
UTILITY	NATURAL GAS UTILITY AND REGION	**ACTIVE LOCATIONS**	NUMBER OF ACTIVE LOCATIONS WITH UTILTIY	**YEARLY TOTAL**	ANNUAL CONSUMPTION IN m3 FOR ENROLLED ACCOUNTS	**TOTAL AVERAGE**	PAST 5 YEAR YEARLY AVERAGE

LAS Natural Gas Procurement Program

Township of Puslinch



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■ 2017	13,126	11,471	8,153	5,961	6,962	1,586	361	296	859	1,241	6,426	9,314
■ 2018	19,357	14,326	10,800	10,357	4,605	661	373	223	314	2,472	9,037	10,479
— 5 YEAR AVG	14,647	14,004	10,946	8,287	4,052	911	462	366	618	1,976	6,431	8,795

Months

From: Don Creed
To: Nina Lecic
Cc: Karen Landry
Subject: FW: Notification of Application for Permit to Take Water
Date: Monday, April 1, 2019 9:08:50 AM

From: cynthia.doughty@ontario.ca <cynthia.doughty@ontario.ca>
Sent: Monday, April 01, 2019 8:58 AM
To: Don Creed <dcreed@puslinch.ca>; RWootton@regionofwaterloo.ca; kbelan@regionofwaterloo.ca
Cc: cynthia.doughty@ontario.ca
Subject: Notification of Application for Permit to Take Water

This E-mail message has been sent to you as a result of the requirements of Ontario's new Water Taking and Transfer Regulation (O.Reg 387/04). The regulation requires that the Ministry of the Environment and Climate Change notify municipalities and conservation authorities of applications for Permits to Take Water to withdraw water from locations within their jurisdiction.

You may examine the wording of the new Regulation online at the following web site:

http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_040387_e.htm

Notification of Application for Permit to Take Water

Ministry Reference Number:
2141-B9KLWL

Applicant:

Tri City Materials Limited
2264 Snyder's Rd E
Wilmot, Ontario
N0B 2H0

Location of Water Taking(s):
6939 Wellington Road 124
Lot 17 18 Concession Division B South of Waterloo Road
Lot 17, Concession Division B South of Waterloo
Guelph/Eramosa Township, County of Wellington

Ministry of the Environment Region:
West Central

Description:
New PTTW for Tri City Materials Limited Spencer Pit Guelph/Eramosa

This proposal is for a new Permit to Take Water for aggregate washing at an above the water table sand and gravel pit. Water will be taken from one (1) pond, and one (1) well. Details of the water taking are as follows:

Permit type – New

Source of water: Wash Pond
Purpose of taking: industrial - aggregate washing
Maximum rate per minute (Litres): 13,500
Maximum number of hours of taking per day: 12
Maximum volume per day (Litres): 9,720,000

Maximum number of days of taking per year: 240
Length of time: up to 10 years (March 1 - December 31)

Source of water: PW-1 Well
Purpose of taking: industrial - aggregate washing
Maximum rate per minute (Litres): 830
Maximum number of hours of taking per day: 24
Maximum volume per day (Litres): 1,195,200
Maximum number of days of taking per year: 240
Length of time: up to 10 years (March 1 - December 31)

Permit type:
New

Length of Taking:
10 years

Table A

Source Information and Water Taking Amount Applied For

	Source Name / Description:	Source: Type:	Taking Specific Purpose:	Taking Major Category:	Max. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	PW-1 (A219479)	Well Drilled	Aggregate Washing	Industrial	830	24	1,195,200	240	17 556671 4813618
2	Wash Pond	Pond Dugout	Aggregate Washing	Industrial	13,500	12	9,720,000	240	17 556315 4813388
						Total Taking:	10,915,200		

Comments should be directed to the following Contact Person:

Cynthia Doughty
Ministry of the Environment
12th Floor
119 King St W
Hamilton ON L8P 4Y7

This E-mail message has been sent to you as a result of the requirements of Ontario Regulation 387/04. It is the responsibility of the municipality or Conservation Authority to determine the appropriate staff person to whom this notification should be forwarded. If you wish to have subsequent notification sent to a different person within your organization, please respond to this E-mail message with an alternate E-mail address and contact name. It is the responsibility of the municipality or conservation authority to ensure that any changes to the alternate E-mail address are reported to the Ministry.

Please note that any comments, concerns, or questions must be received by the Ministry within 30 days of the date of this message.

From:	Karen Landry
To:	Nina Lecic
Cc:	Mary Hasan
Subject:	FW: Upper Grand DSB and Wellington CDSB Education Development Charge Bylaw Renewal - Stakeholder Information Update
Date:	Monday, April 8, 2019 8:02:29 AM
Attachments:	image001.png image002.png Stakeholder Notice Of Legislative Changes 2019EDC.pdf Stakeholder Session 2 UGDSB WCDSB 2019 EDC Apr 1-19.pdf NOTICE.pdf

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From: Jack Ammendolia <ammendolia@watsonecon.ca>
Sent: Thursday, April 4, 2019 10:39 AM
To: Jack Ammendolia <ammendolia@watsonecon.ca>
Cc: bteichman@overlandllp.ca; Jennifer Passy <Jennifer.Passy@ugdsb.on.ca>; Glen Regier <Glen.Regier@ugdsb.on.ca>; Tracy McLennan <tracy.mclennan@wellingtoncdsb.ca>; kerry.morrison@ugdsb.on.ca
Subject: Upper Grand DSB and Wellington CDSB Education Development Charge Bylaw Renewal - Stakeholder Information Update

Hello,

We are writing to advise area EDC stakeholders that the Ministry of Education has made a recent change to the legislation pertaining to EDC's. The attached letter explains the legislative changes and the associated impacts on the Boards' proposed EDC by-laws. The slide deck from the stakeholder presentation has been revised to include information regarding the legislative change and has also been attached to this email. Finally, official Notice of Public Meetings has also been attached. Both School Boards have updated materials on their respective websites in relation to the EDC by-law renewal process.

Please let us know if you have any comments or questions,

Sincerely,
Jack Ammendolia

Jack Ammendolia, BES, PLE
Managing Partner and Director, Education
Watson & Associates Economists Ltd.

ammendolia@watsonecon.ca
Office: 905-272-3600 ext. 230
Mobile: 416-725-5668
Fax: 905-272-3602

watsonecon.ca

UPPER GRAND DISTRICT SCHOOL BOARD
&
WELLINGTON CATHOLIC DISTRICT SCHOOL BOARD

EDUCATION DEVELOPMENT CHARGES – COUNTIES OF WELLINGTON AND DUFFERIN NOTICE OF PUBLIC MEETINGS

FIRST MEETING – POLICY REVIEW PUBLIC MEETING
SECOND MEETING – SUCCESSOR BY-LAW PUBLIC MEETING
WEDNESDAY, APRIL 24, 2019 @ 7:00 P.M. Wellington County Offices
74 Woolwich Street, Guelph

TAKE NOTICE that on April 24, 2019, the Upper Grand District School Board and the Wellington Catholic District School Board will jointly hold two public meetings pursuant to Sections 257.60 and 257.63 of the *Education Act,* at the location shown above. The purpose of the first meeting will be to review the current education development charge policies of both Boards and to solicit public input. The purpose of the second public meeting is to consider the continued imposition of education development charges and successor by-laws and to inform the public generally about the education development charge proposal of each Board.

The education development charge background study required under Section 257.61 of the Act (including the proposed EDC by-laws) together with the policy review analysis required under Section 257.60 of the Act will be available on March 26, 2019, at both Boards' administrative offices during regular office hours and on each Board's website at www.ugdsb.ca for the Upper Grand District School Board and www.wellingtoncdsb.ca for the Wellington Catholic District School Board.

THIRD PUBLIC MEETING – IN CONSIDERATION OF BY-LAW ADOPTION
MAY 15, 2019 @ 7:00 PM Wellington County Offices
74 Woolwich Street, Guelph

AND FURTHER TAKE NOTICE that on May 15, 2019, the Upper Grand District School Board and the Wellington Catholic District School Board will jointly hold a third public meeting at the location shown above.

The purpose of this meeting is to (i) allow each Board to consider the enactment of a successor EDC by-law that will apply to development in Wellington County and (ii) in the case of the Upper Grand District School Board, to also consider the enactment of a successor EDC by-law that will apply to development in Dufferin County.

Any person who attends the public meetings may make a representation to the Boards in respect of the proposals. The Boards will also consider any written submissions. All submissions received in writing and those expressed at the public meetings will be considered prior to the enactment of the education development charge by-laws.

Submissions and requests to address the Boards as a delegation should be submitted to:

Upper Grand District School Board
Attention: Jennifer Passy,
Manager of Planning
500 Victoria Road North
Guelph, ON N1E 6K2
Telephone: (519) 822-4420 Ext. 820
Email: jennifer.passy@ugdsb.on.ca

Wellington Catholic District School Board
Attention: Ms. Tracy McLennan
Superintendent, Corporate Affairs & Treasurer
75 Woolwich Street
P.O. Box 1298
Guelph, Ontario N1H 6N6
Telephone: (519) 821-4640 Ext. 229
Email:tracy.mclennan@wellingtoncdsb.ca

Martha C. Rogers
Director of Education
Upper Grand District School Board

Tamara Nugent
Director of Education
Wellington Catholic District School Board

On October 12, 2018, a change was made to the legislation that governs education development charges (“EDCs”). The Minister of Education enacted Ontario Regulation 438/18 which amended Ontario Regulation 20/98. The amendment effectively froze EDCs at the rates that were in effect on August 31, 2018. This applied to all new EDC by-laws. As a result, the Upper Grand District School Board and the Wellington Catholic District School Board would not be able to impose EDCs under the by-laws they propose to enact on May 15, 2019, that are greater than the rates the Boards currently impose under their respective 2014 by-laws. Those current rates are as follows:

1. Upper Grand District School Board - $1,567.00 per residential dwelling unit in Wellington County and $832.00 per residential dwelling unit in Dufferin County;

2. Wellington Catholic District School Board - $317.00 per residential dwelling unit in Wellington County.

However, on March 29, 2019, the Government of Ontario further amended the EDC legislation. Ontario Regulation 55/19 amended Ontario Regulation 20/98 and one of the main purposes of the amendment was to lift the aforementioned rate freeze and provide a provisional phase-in of proposed EDC rates. A school board’s existing EDC rates could now be increased by $300 or by 5% of the existing rate, whichever is greater. In addition, in the second year of the by-law and each subsequent year of the by-law, the rate could increase by a further $300 or 5% of the previous year’s EDC rate.

The proposed EDC rates in the Board’s 2019 EDC Background Study are $2,222 per residential unit for the UGDSB’s Wellington County/City of Guelph by-law and $2,734 per residential unit for the UGDSB’s Dufferin County EDC by-law. The WCDSB’s proposed residential EDC by-law is $619 per unit. The table below provides the initial proposed phase-in rates for year 1 as well as each subsequent year of the by-law.

	EXISTING EDC RATES	**Year 1 2019**	**Year 2 2020**	**Year 3 2021**	**Year 4 2022**	**Year 5 2023**	**PROPOSED EDC RATES**
WCDSB EDC By-law Rate	**$ 317**	***$ 617***	$ 619	$ 619	$ 619	$ 619	**$ 619**
UGDSB EDC By-law Rate (Wellington County/City of Guelph)	**$ 1,567**	***$ 1,867***	$ 2,167	$ 2,222	$ 2,222	$ 2,222	**$ 2,222**
UGDSB EDC By-law Rate (Dufferin County)	**$ 832**	***$ 1,132***	$ 1,432	$ 1,732	$ 2,032	$ 2,332	**$ 2,734**

The amendments to the regulation that governs EDCs do not affect the requirements that the Boards conduct two public meetings [(i) policy review and (ii) the proposed by-laws] and prepare a background study.

Watson & Associates
ECONOMISTS LTD.

Education Development Charges Stakeholder Information Session 2

(Incorporates New Information As Of April 1, 2019)

Upper Grand District School Board & Wellington Catholic District School Board
March 26, 2019 (***Revised April 1, 2019***)

Presentation Amended April 1,2019

Please note that following slides were presented at a joint Board EDC stakeholder information session on March 26, 2019. On March 29, 2019 the Minister of Education enacted a new Ontario Regulation (Ontario Regulation 55/19) that amended Ontario Regulation 20/98. The new regulation effectively lifts the existing EDC rate freeze, replacing it with a prescribed phase in of proposed EDC rates.

The amended presentation contains additional information explaining the legislative change and the impacts on the proposed rates for the UGDSB and the WCDSB.

What Are The Existing Charges & How Are They Applied?

The Upper Grand District School Board (UGDSB) and the Wellington Catholic District School Board (WCDSB) have existing EDC by-laws that cover the County of Wellington and the UGDSB also has a bylaw that covers the County of Dufferin.

- The existing UGDSB EDC is $1,567 per residential unit.
- The WCDSB residential EDC is $317 per unit in Wellington County.
- The combined EDC residential rate in Wellington County is $1,884 per residential unit.
- The UGDSB EDC residential rate in Dufferin County is $832 per unit.

The charge is allocated 100% to residential – There is no non-residential component to the charge.

The Boards propose to consider passage of new by-laws May of 2019.

A Review Of The Key Elements

Enable Recovery Of Growth-Related Land Costs Only

School Boards Must Meet An Eligibility Trigger To Qualify

Jurisdiction Wide Or Area Specific

Differentiated Or Uniform

School Boards Can Allocate Education Land Costs To Both Residential and Non-Residential Developments

What Does A School Board Have To Do?

Prepare an EDC Background Study

EDC Background Study Must Be Approved By Minister of Education

Two Public Meetings Must Be Held Prior To Passing A New EDC

EDC Study Must Be Available To Public At Least 2 Weeks Before 1st Mtg.

Notice Of Public Meetings Must Be Provided At Least 20 Days Prior To Said Meetings

Process and Methodology

- **Board Eligibility**
  - *Enrolment v. Capacity*
  - *Financial Obligations*
- **Demographic Projections**
  - Enrolment Projections
  - Growth Forecasts
- **Reserve Fund Analysis**
  - EDC expenditures and revenues
  - Existing reserve fund balance

- **Site Needs**
  - Net growth-related pupil places
  - Legislation determines site sizes
- **Net Education Land Costs**
  - Estimated site acquisition costs (appraisals)
  - Site preparation costs/Study costs
- **Determination of EDC**

Projected Enrolment

	UGDSB (Wellington County/Dufferin County)				
	Historical 2014/ 2015	Current 2018/ 2019	Year 5 2023/ 2024	Year 10 2028/ 2029	Year 15 2033/ 2034
Elementary	22,171	23,745	25,410	27,215	29,010
Secondary	11,594	11,515	12,467	13,083	13,621

	WCDSB				
	Historical 2014/ 2015	Current 2018/ 2019	Year 5 2023/ 2024	Year 10 2028/ 2029	Year 15 2033/ 2034
Elementary	5,461	5,667	6,002	6,426	6,733
Secondary	2,465	2,428	2,599	2,667	2,754

The Residential Growth Forecast – 15 Years

Wellington County (Including City of Guelph)	
Low Density	**9,460**
Medium Density	**6,533**
High Density	**7,896**
Total	**23,889**

Dufferin County	
Low Density	**5,014**
Medium Density	**1,102**
High Density	**1,805**
Total	**7,921**

Net Growth Related New Pupil Places

UGDSB (Wellington County/City of Guelph)			
ELEMENTARY		SECONDARY	
New Pupils	4,404	New Pupils	2,202
LESS: Available:	1,991	LESS: Available:	1,039
Total EDC Pupils	2,414	Total EDC Pupils	1,162
UGDSB (Dufferin County)			
ELEMENTARY		SECONDARY	
New Pupils	2,099	New Pupils	963
LESS: Available:	723	LESS: Available:	447
Total EDC Pupils	1,376	Total EDC Pupils	516

WCDSB			
ELEMENTARY		SECONDARY	
New Pupils	1,475	New Pupils	766
LESS: Available:	1,117	LESS: Available:	440
Total EDC Pupils	357	Total EDC Pupils	326

Legislated EDC Eligible Site Sizes

Elementary schools	
Number of Pupils	Maximum Area (acres)
1 to 400	4
401 to 500	5
501 to 600	6
601 to 700	7
701 or more	8

Secondary schools	
Number of Pupils	Maximum Area (acres)
1 to 1000	12
1001 to 1100	13
1101 to 1200	14
1201 to 1300	15
1301 to 1400	16
1401 to 1500	17
1501 or more	18

Appraised Land Values

Land Values Per Acre: January 1, 2019	
Guelph	**$ 1,250,000**
Centre Wellington	**$ 1,000,000**
Mapleton/Minto	**$ 400,000**
Orangeville	**$ 1,125,000**
Shelburne/Dufferin County	**$ 900,000**

Proposed Charges

UGDSB (Wellington County/City of Guelph)

Uniform Residential EDC per Dwelling Unit	**$ 2,222**

UGDSB (Dufferin County)

Uniform Residential EDC per Dwelling Unit	**$ 2,734**

WCDSB

Uniform Residential EDC per Dwelling Unit	**$ 619**

Ministry of Education Approvals - Update

- During the Provincial election/transition to a new government, the Ministry of Education temporarily suspended approvals of EDC Background Studies. This resulted in two EDC bylaws lapsing and a loss of EDC revenue for the impacted school boards.

- On October 12, 2018, the Provincial government made a change to the legislation that pertains to education development charges. Namely;

  - Ontario Regulation 438/18 amended Ontario Regulation 20/98
  - Dealt mainly with sections 7, 9 and 10 – Determining The Charge, Background Study Contents, Conditions Of Passage

Ontario Regulation Amendment Summary

- **Maintain EDC rates at the levels in existing by-laws as of August 31, 2018;**
- Limits the ability of boards to change the areas in their by-law that are subject to EDCs;
- Restricts additional boards from becoming eligible to pass a new EDC by-law;
- Streamlines some of the requirements to be included in the required background study.
- ***Limits or prevents policy changes (differentiation, res/non-res, area specific).***

MARCH 29, 2019 – EDC REGULATION AMENDMENT*

- **On March 29, 2019 the Ontario Government further amended the EDC legislation.**
- **Ontario Regulation 55/19 amended Ontario Regulation 20/98.**
- ***The most recent amendment essentially lifts the EDC rate freeze by implementing a provisional phase-in of proposed EDC rates.***
- In year 1, the existing EDC rate could be increased by $300 or 5% of the existing EDC rate, whichever is greater;
- In the second year of the by-law and in each subsequent year, the rate could be increased by another $300 or 5% of the previous year’s EDC rate, whichever is greater.

*New Slide Added April 1, 2019

Proposed Phase-In Of EDC Rates*

	EXISTING EDC RATES	**Year 1 2019**	**Year 2 2020**	**Year 3 2021**	**Year 4 2022**	**Year 5 2023**	**PROPOSED EDC RATES**
WCDSB EDC By-law Rate	**$ 317**	***$ 617***	$ 619	$ 619	$ 619	$ 619	**$ 619**
UGDSB EDC By-law Rate (Wellington County/City of Guelph)	**$ 1,567**	***$ 1,867***	$ 2,167	$ 2,222	$ 2,222	$ 2,222	**$ 2,222**
UGDSB EDC By-law Rate (Dufferin County)	**$ 832**	***$ 1,132***	$ 1,432	$ 1,732	$ 2,032	$ 2,332	**$ 2,734**

*New Slide Added April 1, 2019

Stakeholder Feedback

The Boards held an initial stakeholder meeting on October 24, 2018.

The Board will hold joint public meetings on April 24, 2019.

Notice of meetings will be provided a minimum of 20 days prior to these meetings and the EDC Background Study will be released to the public at least 2 weeks before the public meetings.

The Boards encourage all stakeholders to provide feedback on all facets of the studies.

It is important to note, however, that the Boards are limited in their ability to make major changes to the bylaws/rates/policies because of the Ministry freeze/review.

Next Steps & Important Dates

- Continued dialogue with stakeholders.
- Staff recommendations and reports.
- Examination of bylaws

Public Meeting
April 24 @ 7PM
Wellington County Council
Chambers
74 Woolwich St. Guelph

Bylaw Passage Consideration
Meeting May 15 @ 7PM
Wellington County Council
Chambers,
74 Woolwich St. Guelph

Solicitor General

Office of the Solicitor General

25 Grosvenor Street
18th Floor
Toronto ON M7A 1Y6
Tel: 416 325-0408
MCSCS.Feedback@Ontario.ca

Solliciteur général

le bureau de la solliciteure générale

25, rue Grosvenor
18e étage
Toronto ON M7A 1Y6
Tél.: 416 325-0408
MCSCS.Feedback@Ontario.ca

Ontario

132-2019-212

April 8, 2019

Dear Head of Council:

The Ontario government recognizes the importance of animal welfare. We also know that the province’s animal welfare landscape is changing.

Recently, the Superior Court of Justice provided a ruling on *Bogaerts v. Attorney General of Ontario.* This ruling affects the *Ontario Society for the Prevention of Cruelty to Animals (OSPCA) Act*, which is the province’s main legislation on animal welfare. While the Ontario government is appealing this decision, we intend to strengthen and improve animal welfare.

In addition, the OSPCA has advised me that it will withdraw from its current role of enforcing animal welfare legislation in the communities it serves, effective June 28, 2019.

The Ontario government is actively working to ensure appropriate measures are in place to provide animals with the protections they deserve and that Ontarians expect. To inform our next steps, my ministry will survey municipalities about the current landscape of animal welfare enforcement, including details of bylaws and existing partnerships.

Municipalities are important partners in developing an approach that ensures effective enforcement, is transparent and accountable, and ultimately improves the animal welfare system across Ontario.

Should you have any questions about the survey, please contact Ms. Jenna Bendayan of my office at (647) 274-9353 or Jenna.Bendayan@ontario.ca.

Sincerely,

Sylvia Jones
Solicitor General

c: Ms. Jenna Bendayan

Township of Puslinch
7404 Wellington Road 34
Puslinch, ON, N0B 2J0
T: (519) 763 – 1226
F: (519) 763 – 5846
www.puslinch.ca

Delegate Request

Meeting Date: March 20, 2019

Applicant Information

Applicant Name: Andreanne Simard

Mailing Address: 101 Brock Rd. S, puslinch ON

Email Address: andreanne.simard@waters.nestle.com

Telephone Number: 519-767-6422

Purpose of delegation (state position taken on issue, if applicable):

To present the findings of the 2018 Annual Reports by Nestlé Waters Canada.

I am submitting a formal presentation to accompany my delegation:

Yes: X No: ___

I will require the following audio-visual equipment:

PowerPoint: X

Note: delegations are permitted to speak for 10 minutes. Your form or letter must be received 24 hours before the preparation of the Council agenda. This usually means at least one week prior to the Council meeting.

Personal Information collected on this form is collected under the authority of the Municipal Act and will be used only for the purposes of sending correspondence relating to matters before Council and for creating a record that is available to the general public in a hard copy format and on the internet in an electronic format in accordance with the Municipal Freedom of Information and Protection of Privacy Act. Questions regarding the collection of this information may be directed to the Township Clerk's office.

The Township of Puslinch is committed to providing accessible formats and communication supports for people with a disability. If another format would work better for you, please contact the Township Clerk's office for assistance.

Puslinch Asset Management

Meeting Agenda

- Ontario Regulation 588/17 and Asset Management
- Public Consultation
- 2019 – 2018 Capital Plan
- Financial Plan
- Recommendations

Overview of Reg. 588/17

Strategic Asset Management Policy
(by July 1, 2019)

Requires municipalities to outline commitments to best practices and continuous improvement

Asset Management Plan: Phase 1
(by July 1, 2021)

For **core assets**:

- **Inventory of assets**
- **Current levels of service** measured by standard metrics
- **Costs to maintain levels of service**

Asset Management Plan: Phase 2
(by July 1, 2023)

Builds out the Phase 1 plan to include **all assets**

Asset Management Plan: Phase 3
(by July 1, 2024)

Builds on Phase 1 and 2 by adding:

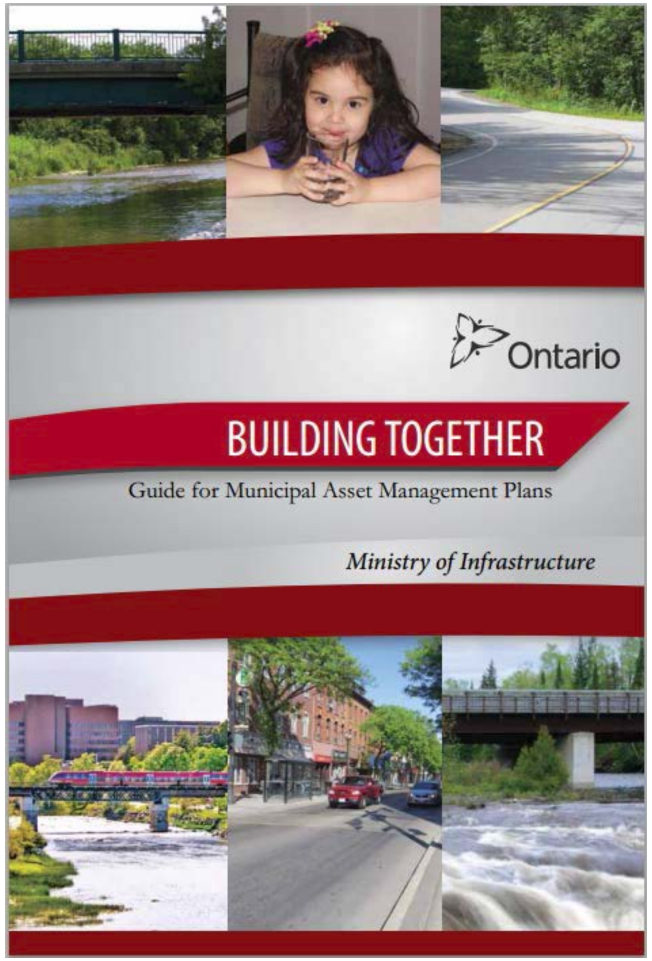
- **Proposed levels of service**
- **Lifecycle management and Financial strategy**

Additional Information

- Municipalities under 25,000 not required to discuss detailed risk analysis or growth.
- Plans would be updated every 5 years; annual progress update given to council.

Source: Build On Overview of Municipal Asset Management Planning Regulation O. Reg. 588/17

What is Asset Management ?

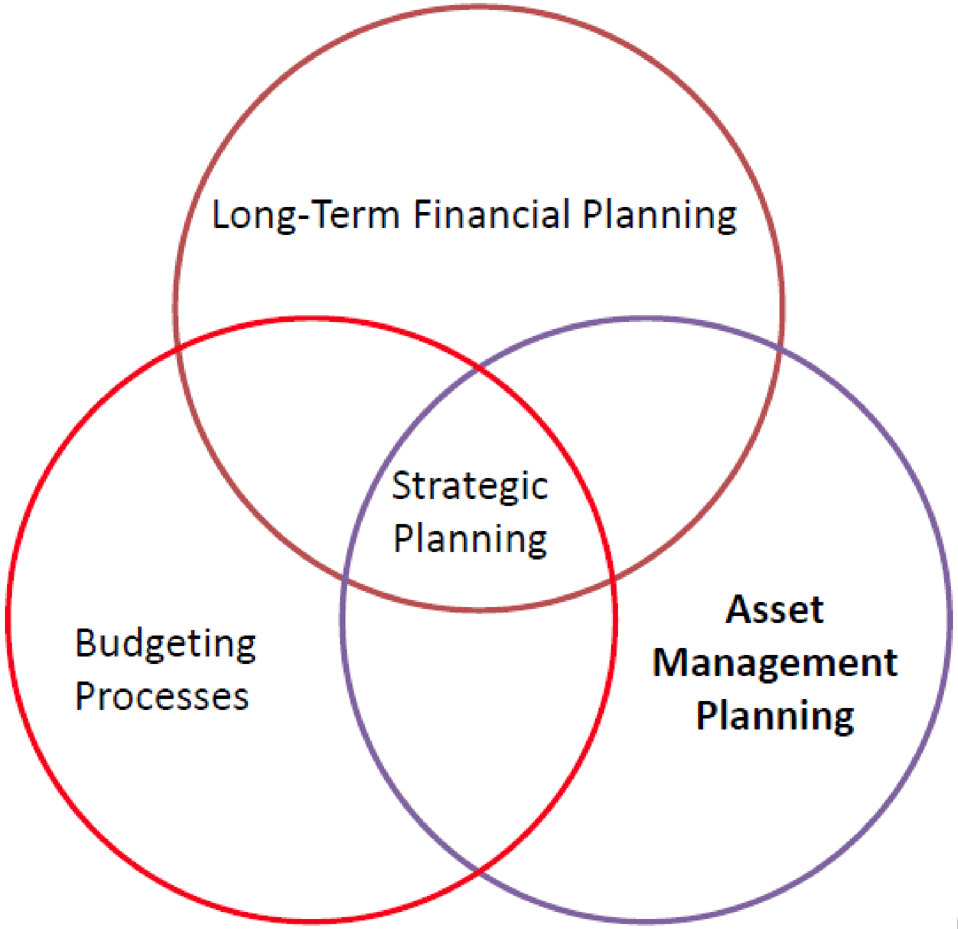


Ontario

BUILDING TOGETHER

Guide for Municipal Asset Management Plans

Ministry of Infrastructure



Long-Term Financial Planning

Strategic Planning

Budgeting Processes

Asset Management Planning

Source: Build On Overview of Municipal Asset Management Planning Regulation O. Reg. 588/17

Strategic Asset Management Policy

A strategic asset management policy formalizes the Municipality’s commitment to asset management, aligns it’s asset management actions with strategic goals and objectives, and provides direction to guide Council, management and staff in carrying out it’s business strategies, plans and activities. This policy will support the Municipality in focusing its infrastructure efforts on managing risks, addressing Priorities and meeting short and long-term needs within the bounds of possible funding.

Public Consultation

A public meeting was held on February 5, 2019 in the Council Chambers of Puslinch. The Sign-in-sheet indicated that 7 individuals attended. As of the end February 8th two emails were received by the Township.

Comments from the Public

Verbal concerns were as follows:

- There is a need to establish a process that would allow the surface treatment of gravel roads or the paving of roads on which there are homes.
- There was concern in regard to Old Morriston Park and the need for improvements that are not in the Township capital budget.

Areas of concern in the emails were as follows:

- Service Level Policy for Gravel Roads.
- Lack of Data in regard to condition of Gravel Roads.
- Change in condition of roads to poor.
- Opinion not to borrow money.
- Staff levels for Fire Department and Township as whole.

Requested clarifications were as follows:

- The methodologies used in order to quantify the condition of building components.
- The methodologies used in determining the need for upgrading gravel roads.
- The methodologies used to define level of service policies and their technical levels of service.

Responses to the Public

1. UEM in development of the service level policy for Gravel Roads did not consider the spatial significance of gravel roads as they relate to proximity to lived in homes.
2. UEM identified in the asset registry that Old Morriston Park has many assets that are in poor condition. However, the decision for remediation activities to assets at the park are subject to the policies and objectives of the Township.
3. The methodologies used to quantify the condition of buildings have been extracted from the recent Building Condition Assessment. This assessment did not use a condition index in order to assess condition but instead a visual inspection of relevant components of the building structure.
4. The methodologies used to determine the need to upgrade a gravel road have been developed through the review of reports, staff input, input from neighboring municipalities in Wellington County, Minimum Maintenance Standards Ontario Regulation 239/02, and policies of jurisdictions primarily in the United States.
5. Asset Class Level of service policies were developed using information sourced from relevant provincial policies, regulations, internal expert opinion, and the recommendations of staff.

Responses to the Public

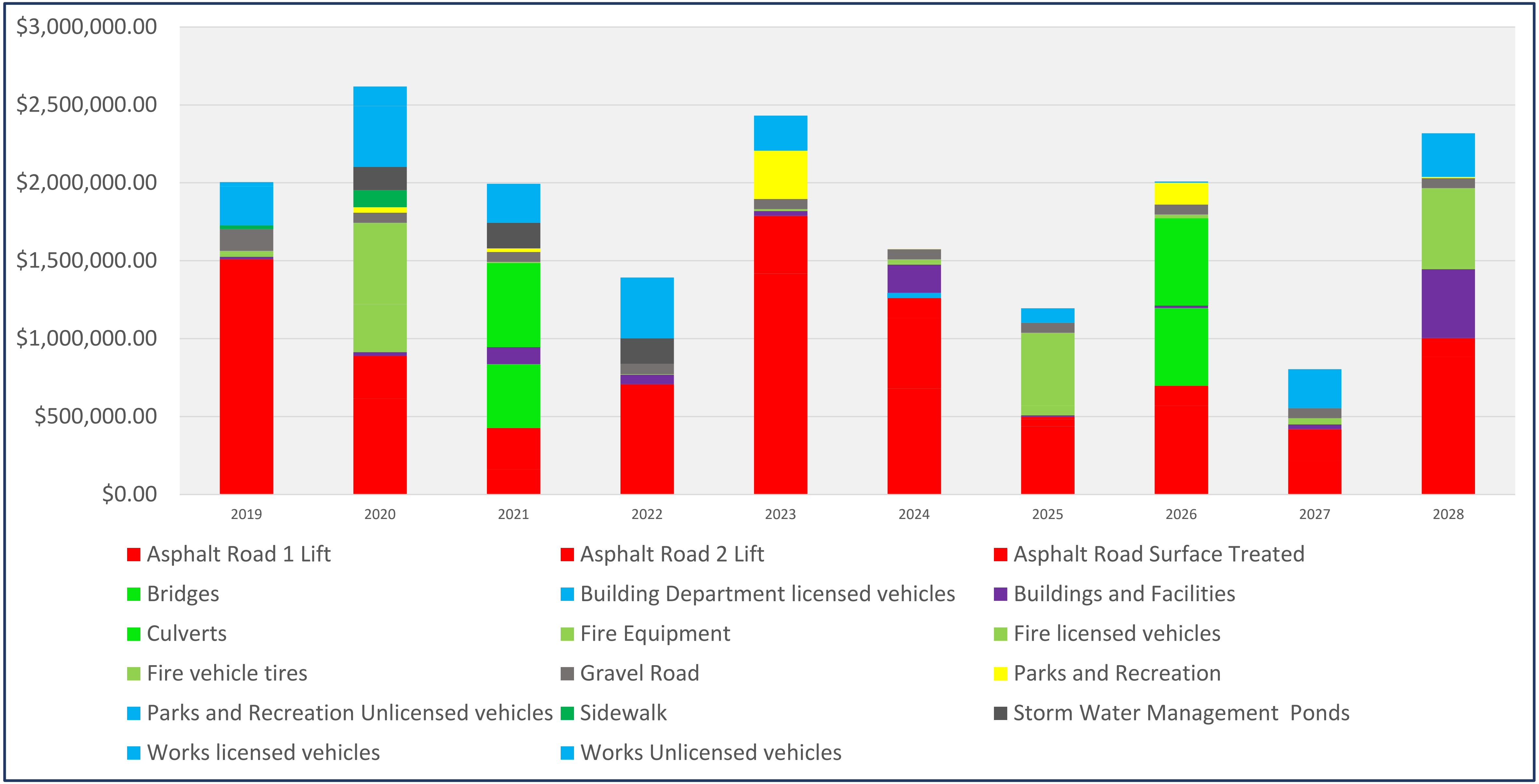
6. The lack of Data for Gravel Roads is an issue that may be improved by way of the regular collection of maintenance information for each gravel road segment.

7. The condition of road surfaces has not changed, only the methodology for classifying how their condition is interpreted has changed. This asset management plan considers that a road surface is in “poor” or “critical” condition based on how soon it is expected to be scheduled for remediation work. The capital planning methodology for road surfaces for the Township for this asset management plan is more conservative and specific than the last asset management plans past methodologies. The current condition classification methodology states that a road is to be remediated when it’s pavement condition index (PCI) reaches a threshold of 65 for class 3 roads, and 60 for class 4 and 5 roads. Based on the adopted expected deterioration rate of 2 pavement condition points per year class roads 3 are expected to be remediated every 17 years and class 4 and 5 roads every 20. This results in the majority of roads being classified as “Good” to “Fair” with the balance “Poor” to “Critical” due to expected remediation work for the road surface.

8. UEM and DFA have stated what is required by way of capital costs to maintain the Township assets based on the level of service policies included in the report. Any change in the financial recommendations would result in the Township not meeting the level of service.

9. A review of staffing levels of the Fire Department and the Township as a whole are beyond the scope of this Asset Management Plan.

10 Year Capital Plan to Support Existing Infrastructure



Financial Strategy

Ontario Regulation 588/17 requires that for the proposed level of service, a municipality prepare a 10 year financial strategy that:

- **identifies the costs of undertaking the lifecycle activities**
- **identifies the annual funding projected to be available**
- **explains the financing options examined**
- **identifies any funding shortfall and explains how the funding shortfall and the associated risks will be addressed**

Financial Strategy

It has been assumed there are no "significant operating costs" (no significant increase in operating costs)

Financial Strategies Options are based on a combination of Pay-As-You-Go and Debt Financing (when necessary), with consideration given to reserve targets and municipal debt capacity.

Financial Strategy

Financial Strategy Options considered three different levels of current funding (capital levy) increases:

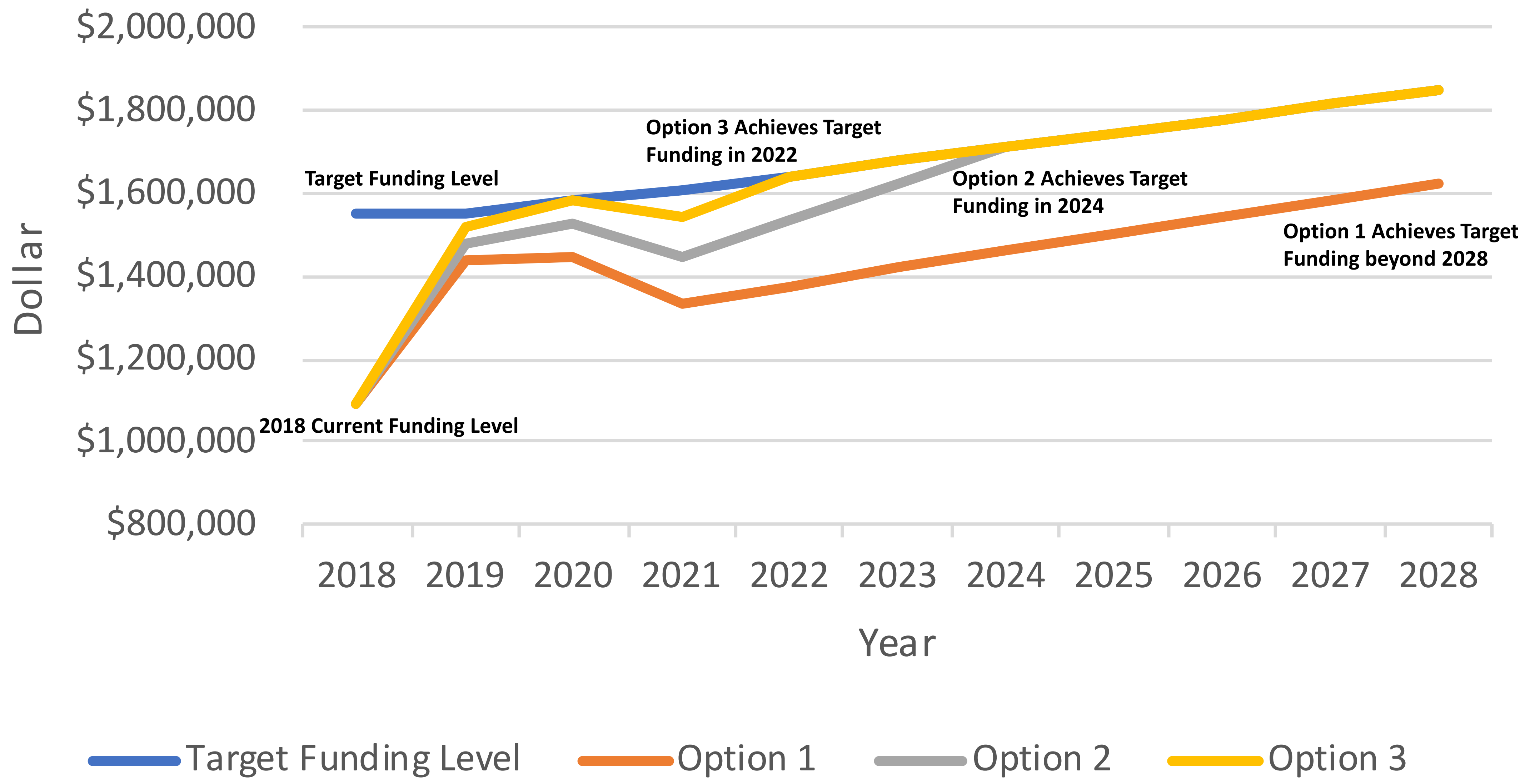
- **Option 1 – Capital Levy Increase equivalent to a 1% Tax Impact on the Typical Single Family Detached Dwelling**
- **Option 2 – Capital Levy Increase equivalent to a 2% Tax Impact on the Typical Single Family Detached Dwelling**
- **Option 3 – Capital Levy Increase equivalent to a 3% Tax Impact on the Typical Single Family Detached Dwelling (Recommended)**

All Financial Strategy Options incorporated Financial Policy considerations regarding annual reserve funding levels, reserve balance targets, and municipal debt capacity.

Financial Strategy

Financial Policy Considerations	
AMP Target Funding Levels	Target Level of AMP Funding to Equal 2% of Capital Asset Replacement Values
AMP Discretionary Reserve Target Balances	Discretionary AMP Reserve Balance to Range between 10% - 20% of 10 year inflated capital plan expenditures
Debt Capacity Restrictions	Debt Servicing as a percent of own source revenues to not exceed 10%

Total AMP Funding Level Comparison



Target Funding Level

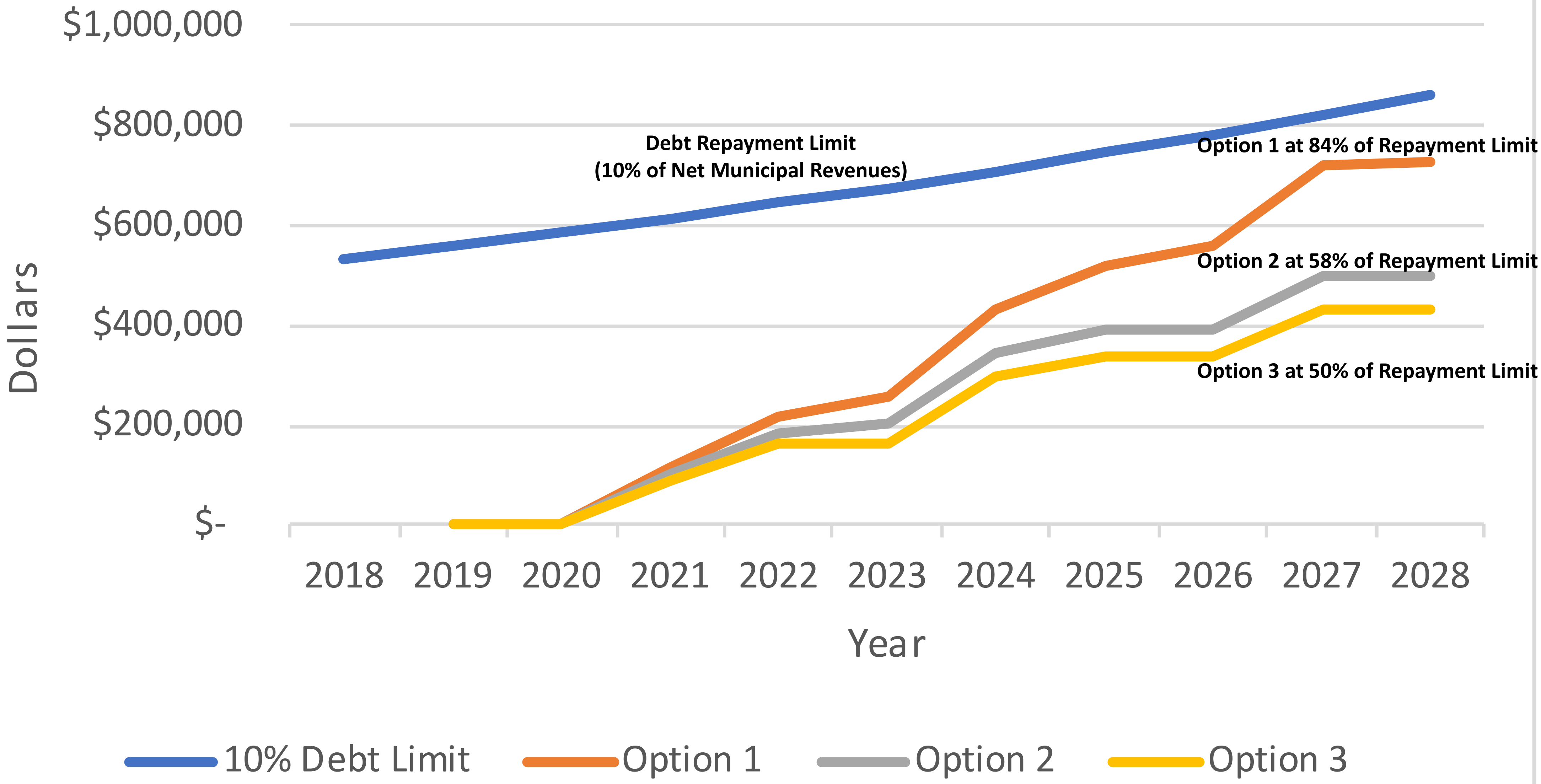
Option 3 Achieves Target Funding in 2022

Option 2 Achieves Target Funding in 2024

Option 1 Achieves Target Funding beyond 2028

2018 Current Funding Level

Debt Capacity Comparison



Recommended Financial Strategy Option

Option 3 (Capital Levy Increase to be Equivalent to a 3% Tax Impact on the Typical Single Family Detached Dwelling)

- **Achieves the Target AMP Funding Level by 2023**
- **Results in the least debt required to fund the proposed capital plan**
- **Best positions the Township to address AMP activities beyond 2028**

Questions ?

REPORT FIN-2019-021

TO:	Mayor and Members of Council
FROM:	Mary Hasan, Director of Finance/Treasurer
MEETING DATE:	April 17, 2019
SUBJECT:	2018 Lease Financing Agreement Summary Report File No. A09 LEA

RECOMMENDATIONS

That Report FIN-2019-021 regarding the 2018 Lease Financing Agreement Summary Report be received; and

That Council accepts the Treasurer's statement that all lease financing agreements are non-material and have been made in accordance with the Township's Lease Financing Agreement Policy as outlined in Schedule B to Report FIN-2019-021.

Background

Lease financing agreements represent long-term commitments of the municipality beyond the term of Council. It is a requirement pursuant to Section 11 of Ontario Regulation 653/05, as amended, at least once a year, the Treasurer report to Council to ensure all lease financing agreements have been made in accordance with the Township's approved policy which is attached as Schedule B to this report.

The intent of the Act and regulation is to impose a higher level of due diligence on lease financing agreements for municipal capital facilities.

A list of the Township's active lease financing agreements as of December 31, 2018 and December 31, 2017 are outlined in Schedule A. Each of the leases on the attached Schedule A represent a non-material lease in accordance with the Township's Lease Financing Agreement Policy.

Purpose

The purpose of this report is to comply with the Treasurer's reporting requirements as set out by Ontario Regulation 653/05.

Financial Implications

The Township's 2017 and 2018 leases consist of 1 photocopier lease, and 1 postage meter lease. The expiry dates for the current agreements range from 2021 to 2022. See below for a summary of the information provided in Schedule A to this report:

- Annual cost of lease financing agreements in 2018 is $5,023
- Remaining balance of the payments in future years is $16,837 as of December 31, 2018 and $19,903 as of December 31, 2017.
- Remaining balance of lease payments in future years as a percentage of the Township's combined long-term debt including leases is 100% as of December 31, 2018 and 14.0% as of December 31, 2017.
- Increase in the percentage above relates to the repayment of the long-term debt in 2018 (ie. as of December 31, 2018, the Township has zero long-term debt).

Applicable Legislation and Requirements

Ontario Regulation 653/05

Attachments

Schedule A – Treasurer's 2018 Lease Financing Agreements Summary Report

Schedule B – Lease Financing Agreement Policy

Schedule A

Township of Puslinch
Treasurer's 2018 Lease Financing Agreements Summary Report

Department	Lessor	Description of Lease	Lease Term	# of Units	Annual Cost	Full Term Cost	Dec. 31, 2017 Balance Remaining	2018 Cost	Dec. 31, 2018 Balance Remaining
Corporate	Pitney Bowes	Postage Meter	Dec. 1, 2015 to Nov. 30, 2018	1	$ 653	$ 1,958	$ 598	$ 598	-$ 0
Corporate	Pitney Bowes	Postage Meter	Dec. 1, 2018 to Nov. 30, 2021	1	$ 653	$ 1,958	N/A - entered into in 2018	$ 54	$ 1,903
Corporate	LBEL Inc.	Photocopier	Nov. 20, 2016 to April 20, 2022	1	$ 4,371	$ 24,040	$ 19,305	$ 4,371	$ 14,934
			Totals		**$ 5,676**	**$ 27,955**	**$ 19,903**	**$ 5,023**	**$ 16,837**
	Total of all other long-term debt (includes both principal and interest)						**$ 121,975**		**$ -**
						Percentage	**14.0%**		**100.0%**

Schedule B to Report FIN-2019-021
Township of Puslinch
Corporate Policy

TITLE: LEASE FINANCING AGREEMENT POLICY

DATE: May 6, 2015

SUBJECT: LEASE FINANCING AGREEMENT POLICY
File No. A09 LEA

Purpose:

1. To adopt a statement of the Township of Puslinch's (Township) lease financing agreement policies and goals. Ontario Regulation 653/05, as amended, requires the adoption of such a statement before a municipality may enter into a lease financing agreement.

2. To provide guidance to staff when contemplating lease arrangements for the provision of **Municipal Capital Facilities** as defined in Ontario Regulation 603/06, as amended.

3. To ensure that both staff and Council are aware of the entire cost of the financial lease, of any special risks to the **Township** that are attached to the lease agreement and that alternative sources of financing have been considered.

Definitions

Financing Lease: a lease allowing for the provision of **Municipal Capital Facilities** and the lease may or will require payment by the municipality beyond the term of Council;

Municipal Capital Facilities: includes land, as defined in the Assessment Act, works, equipment, machinery and related systems and infrastructures.

Material Lease: a **Financing Lease** that would result in a **Material Impact** for the **Township**.

Material Impact: means costs or risks that significantly affect, or would reasonably be expected to have a significant effect on, the debt and financial obligation limit prescribed under Ontario Regulation 403/02, as amended.

Township: the Corporation of the Township of Puslinch

Statement of Lease Financing Agreement Policies and Goals:

1. The **Township**'s objective is to preserve and improve the long-term financial health of the **Township** and to ensure that prices paid for goods and services make optimum use of **Township** resources. When staff consider the option of a lease financing arrangement, the evaluation of the option must strictly adhere to this goal.

2. Prior to entering into a **Material Lease** the following considerations will be taken into account:

    a. The financial risks and benefits of the lease transaction, such as a comparison between the fixed and estimated costs and the risks associated with the proposed agreement and those associated with other methods of financing, the effective rate(s) of interest, a sensitivity analysis for leases with variable lease payments, a schedule of all fixed amounts of payment and that which may be required by any extension or renewal of the agreement, and a statement of any contingent payment options associated with termination, replacement, loss, guarantees and indemnities;

    b. The non-financial risks and benefits of the lease transaction;

    c. County of Wellington feedback after written notification to the County is provided regarding the lease financing agreement being considered;

    d. The independent legal and financial opinions of the transaction, including the legality of the terms and provisions of any proposed agreement or agreements, and any other legal considerations affecting the lease transaction;

    e. An assessment regarding whether the financial and non-financial risks associated with the agreement are reasonable; and

    f. An assessment regarding whether the cost of financing in the proposed financing agreement is lower than other methods of financing available to the **Township** such as debt, reserves, operating funds.

    g. The costs and risks associated with a proposed lease financing agreement in the report shall be assessed as of the date the report is made. The summary of information in the report shall include all information required for the entire term of the proposed lease financing agreement, including any possible extensions or renewals.

    h. At any time after a report regarding a potential lease financing agreement has been made, but before the proposed lease financing agreement is entered into, if the Director of Finance/Treasurer becomes of the opinion that a changed circumstance with respect to the proposed agreement may result in a **Material Impact** for the **Township**, the Director of Finance/Treasurer shall as soon as reasonably possible update the report and present the updated report to Council.

3. The Director of Finance/Treasurer, in accordance with legislative requirements, shall submit an annual report on lease financing agreements to Council. The report shall include the following:

    a. A description of the estimated proportion of the total financing arrangements of the **Township** that is undertaken through lease financing agreements to the total long-term debt of the **Township** and a description of the change, if any, in that estimated proportion since the previous year's report;

    b. A statement by the Director of Finance/Treasurer as to whether, in his or her opinion, all lease financing agreements were made in accordance with the statement of leasing policies and goals adopted by the **Township**; and

    c. Any other information that Council may require or that, in the opinion of the Director of Finance/Treasurer, should be recorded.

Non-Material Lease Financing Agreements:

1. It is recognized that certain categories of **financing leases** will not involve costs or risks that will significantly affect, or would reasonably be expected to have an effect on the financial debt repayment and financial limits prescribed for the **Township.** The following leases are considered non-material leases:

    a. Leases for office equipment including photocopiers, multi-functional printers, postage meters, etc. which have been entered into in accordance with the **Township**'s Purchasing and Procurement Policy; and

    b. Leases of real property where the lease is nominal, token consideration or consideration that does not exceed the materiality level of the audited financial statements.

REPORT FIN-2019-012

TO:	Mayor and Members of Council
FROM:	Wayne Wood, PEng, Senior Engineer
MEETING DATE:	April 17th, 2019
SUBJECT:	Asset Management Plan – Final

RECOMMENDATION

That Report titled "The Township of Puslinch Asset Management Plan, prepared by Urban and Environmental Management Inc and DFA Infrastructure International" prepared in compliance with Ontario Regulation 588/17 be received, that the service levels outlined in Section 5.0 of the plan be approved and that the Township of Puslinch Asset Management Policy, Appendix 20.4 of the Township of Puslinch Asset Management Plan be approved.

DISCUSSION

Purpose

To present to Council the final report in regard to the Asset Management Policy which was presented in draft form to the public on February 5th, 2019. Comments from the public received on February 5th and subsequently were identified in the Final Report; which included UEM's response to such comments.

Background

The Province of Ontario passed Regulation 588/17 in late 2017, requiring that all municipalities prepare a policy and plan that provide for the cost-effective management of assets.

The key elements of such a Policy and Plan were are as follows:

- Provide defined levels of service and monitoring performance;
- Manage the impact of growth through demand management and infrastructure investment;
- Take a lifecycle approach to develop cost-effective management strategies for the long-term that meet defined levels of service;

- Identify, assess and appropriately control risks; and
- Develop a long-term financial plan that identifies required expenditures and how the plan will be funded.

The Township of Puslinch retained Urban and Environmental Management (UEM) Inc, to prepare such an asset management policy and plan. UEM associated with DFA International to assist in the development of the lifecycle management and financial strategy; a significant component of the plan.

Project Status

The UEM Team completed the development of an asset registry that meets the requirements of Ontario Regulation 588/17. Subsequently the UEM Team undertook an analysis of the levels of service and associated costs and created a 10-year capital plan. The UEM Team presented to the public on February 5, 2019 an overview of asset management, recommended service levels and associated financing to seek input. Subsequent to the public meeting on February 5th such input was considered and incorporated into the final report.

APPLICABLE LEGISLATION AND REQUIREMENTS

Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure

ATTACHMENTS

Schedule A, The Township of Puslinch Asset Management Plan
Schedule B, The Township of Puslinch Asset Management Policy

Attachment A

TOWNSHIP OF
PUSLINCH
EST. 1850

UEM Project: 18-400
Date: April 2019

PREPARED FOR:

The Township of Puslinch

Wayne Wood P. Eng.
Urban and Environmental Management
120 Colborne St, Brantford, ON
N3T 2G6

Mary Hasan, Director of Finance/Treasurer
7404 Wellington Road 34
Puslinch, Ontario
N0B 2J0

The Township of Puslinch Asset Management Plan

Table of Contents

1.0 Executive Summary

1.1 Regulation 588/17

The Municipal Finance Officers' Association of Ontario (MFOA) best summarized the reasons for implementing asset management including the regulatory basis for asset management in Ontario in the MFOA Strategic Management Policy Toolkit.

> 'The regulation is a progression of the Municipal Infrastructure Strategy launched in 2012 and the Infrastructure for Jobs and Prosperity Act of 2015. The regulation builds upon the Municipal Infrastructure Strategy and "Building Together" guide for Municipal Asset Management Plans launched in 2012 and the Infrastructure for Jobs and Prosperity Act of 2015., to strengthen the role of municipal asset management within municipal planning and budgeting. For example, asset management plans must now be considered in the development of annual budgets. The vehicle for this new form of municipal governance is a policy. In the regulatory content of Ontario, it is considered a strategic asset management policy, as it requires municipalities to describe processes as well as accountabilities.'

Ontario adopted Ontario Regulation 588/17 made under the Jobs and Prosperity Act, 2015 that set out the parameters for Asset Management Policies and Asset Management Plans.

The Asset Management Policy is to be approved by Council by July 1, 2019. A copy of the Asset Management Policy is included in Appendix 20.4 of this report.

1.2 The Asset Registry

The asset registry includes description, location, size, material type, and condition of assets. The asset registry also includes financial components such as unit cost, remediation cost and a total replacement cost for all asset components. The asset classes included are identified in the following chart on the next page.

Regulation 588/17 Asset Group	Asset Registry Asset Group
Core Municipal Infrastructure	Bridges
	Culverts
	Asphalt Roads 1 Lift
	Asphalt Roads 2 Lift
	Asphalt Roads Surface Treated
	Gravel Roads
	Storm Water Management Ponds
	Storm Sewers
Municipal Infrastructure	Buildings and Facilities
	Fire Equipment
	Fire Reservoirs
	Parks and Recreation
	Sidewalks
	Regulatory/Warning Signs
	Street Lights
	Fire Licensed Vehicles
	Fire Vehicle Tires
	Works Unlicensed vehicles
	Works licensed vehicles
	Parks & Building Department Licensed/Unlicensed Vehicles
Green Infrastructure	Street Trees

ES - 1 Puslinch Asset Classes

1.3 Levels of Service

Puslinch provides all of the legally mandated services, as well as other services desired by residents. The development of a "service-centric" asset management process entails understanding and answering the following questions for all services:

- What are the services that Puslinch is providing?
- What are the services that customers expect?
- What assets is Puslinch providing for each service?

1.4 Factors Affecting Levels of Service

Several factors affect the level of service delivery for particular asset types. The following are some of the factors:

- **Community Expectations:** This factor represents one of the major drivers in setting levels of service. Information is needed about the community's expected level of service and willingness to pay for this service. A balance then needs to be determined between that expected level of service and its associated costs.

- **Legislative requirements:** Legislative standards and regulations affect the way assets are managed. These requirements stipulate the minimum levels of service. Therefore, relevant requirements must be taken into consideration in setting levels of service.
- **Policies and objectives**: Existing policies and objectives should be considered when developing levels of service, with care taken to remain aligned with an organization's strategic planning documents.
- **Resource availability and financial constraints**: These constraints play a large role in an organization's ability to provide sustainable levels of service. Therefore, resource constraints play a significant part in determining affordable levels of service.

1.5 The Process of Developing a Level of Service Analysis

The process for developing and adopting level of service measures may be defined as follows:

Levels of Service: Compliance with all legislated requirements, protect and uphold public safety, community wellbeing and the environment; and, reliably meets the informed expectations of stakeholders and the public.

Level of Service Analysis can involve:

1. Developing Levels of Service
    - Customer vs. Technical Levels of Service
    - Current vs. Expected Levels of Service
    - Use of performance measures
2. Consultation, Communication, and Approval
    - Receiving input on the proposed Levels of Service analysis
    - Communicating the Levels of Service analysis to stakeholders
    - Seeking Council approval of Levels of Service analysis
3. Ongoing Review, Updates, and Improvements
    - Updating the Levels of Service analysis, as needed

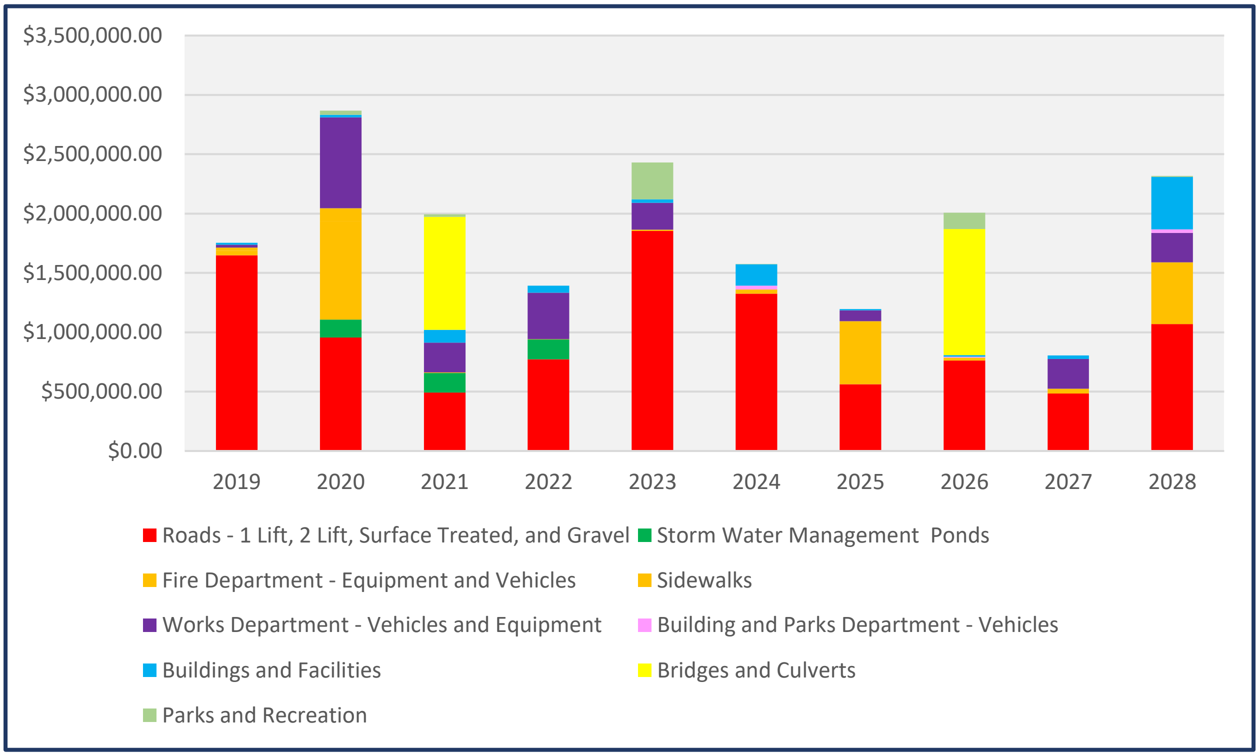
1.6 Developing Levels of Service

To be effective in developing levels of service, input should be gathered from and communicated to all interested parties. The services being provided, and the community expectations must be documented.

Based upon discussions with Staff and input from Council a series of Level of Service policies were developed and may be found in Section 5 of the Asset Management Plan.

1.7 10 Year Capital Plan

Based upon the asset registry which includes all physical assets, associated condition, age, and rehabilitation costs as well as Levels of Service, a 10-year capital plan was developed to model both Static (linear deterioration curve) and dynamic inputs (staff intervention). The following bar chart illustrates the 10-year capital plan.



ES - 2 10 Year Capital Plan

1.8 Financial Plan

Several financial strategy options were developed that identified annual projected funding over the 2019-2028 forecast period. Each option was examined with a recommendation towards a financial strategy that would see an annual increase in the Township's capital levy that impacts the taxes of a typical single-family dwelling by 3% until a sustainable level of funding is achieved.

The use of long-term debt is also necessary to undertake the capital plan in years where available capital financing, including funds within capital asset related reserves, are insufficient to finance the capital plan. Financial policies that govern the level of debt, the capital related reserves, and asset replacement funding are also discussed with policies recommended for the implementation of the financial strategy in Section 12 and 13 and 18.3.

1.9 Public Engagement

O. Reg 588/17 outlines the following requirements with respect to Asset Management Public Engagement:

- An Asset Management Policy must be developed and adopted by July 1, 2019 and reviewed and updated at least every 5 years. The Asset Management Policy outlines a requirement to include a commitment to provide opportunities for municipal residents and other interested parties to provide input into the Asset Management Plan (AMP).
- Municipalities are required to post their Asset Management Policy and Asset Management Plan on the Township's website, and make copies of these documents available to the public, if requested.

In reference to Puslinch, the public was invited to provide input during the development stages of asset management planning. In this manner, the public had the opportunity to shape the direction of asset management processes by having the opportunity to comment on the Asset Management Policy and on Levels of Service Policies as well as impacts on the Capital Budget.

The public was encouraged to provide comments on asset management topics in general. A presentation in regard to the Asset Management Plan was posted at the public counter of the Puslinch municipal office. A public meeting was held on February 5, 2019 in the Council Chambers of Puslinch. The Sign-in-sheet indicated that 7 individuals attended. As of February 8th, two emails were received by the Township.

Verbal comments of concern were as follows:

1. There is a need to establish a process that would allow the surface treatment of gravel roads or the paving of roads on which there are homes.
2. There was concern in regard to Old Morriston Park and the need for improvements that are not in the Township capital budget.

Verbal areas of clarification were as follows:

3. The methodologies used in order to quantify the condition of building components.
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Areas of concern in the emails were as follows:

6. Service Level Policy for Gravel Roads.
7. Lack of Data in regard to condition of Gravel Roads.
8. Change in condition of roads to poor.
9. Opinion not to borrow money.
10. Staff levels for Fire Department and Township as whole.

Responses to areas of clarification and areas of concern may be found in 16.2 Public Engagement of this report.

2.0 Introduction

2.1 Township of Puslinch Overview

Puslinch is a Township in south-central Ontario, in Wellington County, surrounding the south end of Guelph. The main industries of the Township are agriculture, transportation, manufacturing and aggregate extraction.

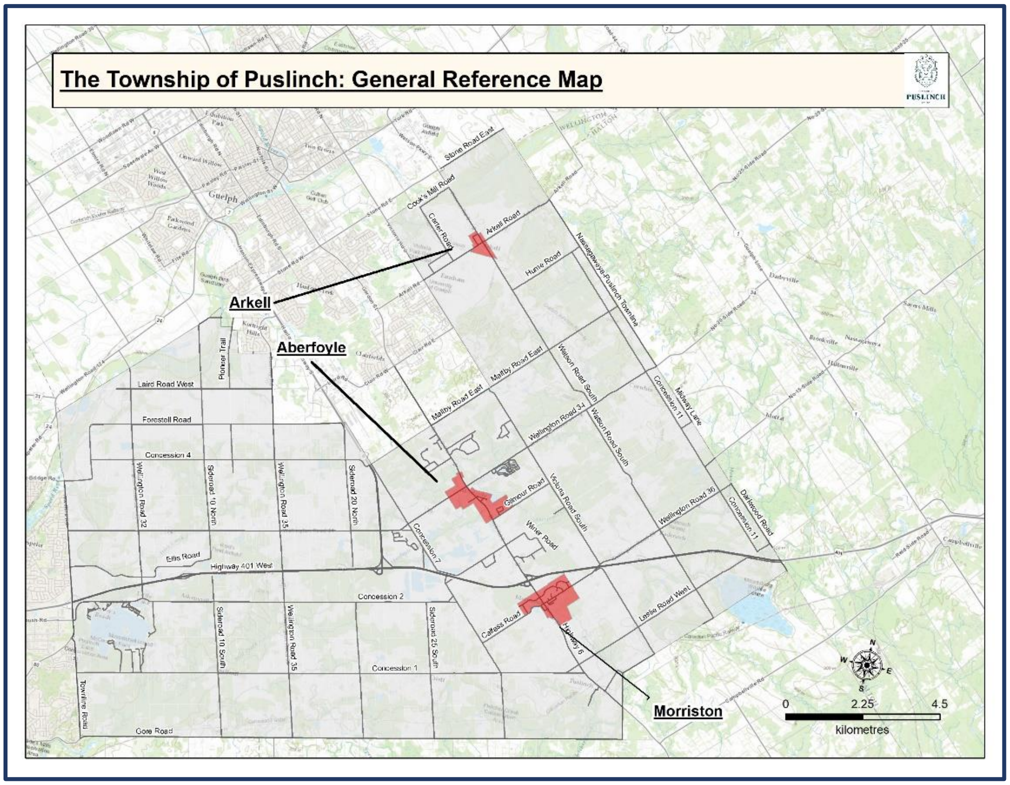
The Township has its own Strategic Plan, with the current version dated 2015 to 2020. Its mission statement is as follows: "Progressing together to provide reliable and sustainable services to our residents, businesses and visitors. We will protect our resources while respectfully building upon our heritage as a safe, fun and prosperous rural community."

The Township of Puslinch's main hamlets include Aberfoyle, Arkell, Badenoch, Little Lake and Morriston.

2.2 Township of Puslinch: General Information

The following figure shows a map of the Township of Puslinch showing main roads and Township Centres.

Table 8 of the County of Wellington Official Plan indicates that the Township of Puslinch had a population of 7,815 in 2016 and is expected to grow to 9,565 in 2036. Employment in 2016 was 4,020 with projected employment to rise to 5,160 by 2036.



2.0 - 1 Township Map

2.3 The Goal of Asset Management and Key Elements

The International Infrastructure Management Manual, Version 4, 2011, defines the goal of asset management as “meeting a required level of service, in the most cost-effective manner, through the management of assets for present and future customers”. The key elements of asset management are:

- Providing a defined level of service and monitoring performance;
- Managing the impact of growth through demand management and infrastructure investment;
- Taking a lifecycle approach to developing cost-effective management strategies for the long-term that meet defined levels of service;
- Identifying, assessing and appropriately controlling risks; and
- Having a long-term financial plan that identifies required expenditures and how the plan will be funded.

These elements of asset management are enabled through the use of capable staff, effective tools and systems, and a commitment to continuous improvement. A formal approach to the management of infrastructure assets is essential in order to provide services in the most cost-effective manner and to demonstrate this to Council, citizens, and other stakeholders.

2.4 The Need for Asset Management

Without appropriate information, it is difficult for municipal staff and elected officials to make decisions regarding asset replacement and rehabilitation. Being properly informed is the first step in ensuring that public money is spent in the most efficient and effective manner possible. An asset management plan is the medium for providing this information. The first step in creating an asset management plan is compiling an asset registry. Such a registry is a comprehensive list of all the organization’s assets including their age, replacement value, and condition. Key benefits of compiling such a registry is as follows:

- Prolonging asset life and aiding in making informed decisions regarding rehabilitation, repair, and replacement;
- Meeting community demand with a focus on system sustainability;
- Setting rates based on sound operational and financial planning;
- Budgeting focused on activities critical to sustained performance;
- Meeting service expectations and regulatory requirements;
- Improving response to emergencies; and
- Improving the security and safety of assets

2.5 Defining Sustainability

The Brundtland Commission of the United Nations on March 20, 1987, stated: “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The objective of asset management is to meet a required level of service, in the most cost-effective manner, through the management of assets for the present and future population of the Township. Lifecycle asset management encompasses all practices associated with considering management strategies as part of the asset lifecycle. The objective of sustainable asset management is to look at the lowest long-term cost when making decisions.

2.6 Provincial Requirements for Asset Management Plans

The Province of Ontario, through the Ministry of Infrastructure, released in June 2011 a long-term infrastructure plan called ‘Ontario Building Together’. The plan sets out a strategic framework that guides future investments in ways that support economic growth and respond to changing needs. A key element of this framework is ensuring good stewardship through proper asset management. Subsequent to the release of ‘Ontario Building Together’, The Province of Ontario issued Ontario Regulation 588/17 in late 2017.

2.7 Asset Management Policies

Ontario Regulation 588/17 requires that every Municipality develop an asset management policy that includes municipal goals and policies supported by the Municipalities’ asset management plan. Such policies influence long-term financial plans that provide for continuous improvement and adoption of appropriate practices that provide for the sustainable management of assets.

Policies must provide for infrastructure planning that recognizes issues such as:

1. Vulnerability due to climate change
2. Management of vulnerabilities
3. Anticipated costs due to vulnerabilities
4. Mitigating approaches to climate change
5. Disaster Planning
6. Contingency funding

In addition, policies must recognize and provide for processes that ensure asset management policies align with Ontario’s land use planning framework as well as the Official Plan of the County of Wellington and such policies must provide for Financial Plans that recognize capitalization thresholds, proximity owned municipal assets and financial policies impacting the replacement of assets.

2.8 Asset Management Plans

Ontario Regulation 588/17 requires that every Municipality prepare an asset management plan that provides current levels of service for each asset category. Energy usage and operating efficiency must be estimated for core municipal infrastructure assets such as:

i. Storm Water Management
ii. Roads
iii. Bridges and/or Culverts

Asset Management Plans include Asset Hierarchies, an overview of the State of Infrastructure for the Township of Puslinch and a detailed 10-year capital needs forecast, which identifies and prioritizes specific assets for inclusion in the Capital Budget.

2.9 Information Technology Systems Strategy

The Information Technology Systems Strategy is designed to align information systems with the Townships' asset management decision-making requirements. The Information Systems Strategy provides a summary of existing software systems related to asset management and identifies opportunities for consolidation or replacement of existing systems to meet the goals of the Asset Management Strategy.

2.10 Project Deliverables

The project scope involved developing the following deliverables:

1. Asset Management Policies
2. Asset Management Plans
3. Information Technology Plans

2.11 Data and Information Provided

The following information was provided by the Township of Puslinch and used in the completion of this project:

Delivered Items	
Condition Assessments, Inspections, Policy and Insurance	
2013 Asset Management Plan	2017 Bridge and Culvert Inspection
2016 Pavement Condition Index Report	2017 Storm Water Management Pond Inspection Report
2008 Road and Bridge Inventory Report	2008 Asset Valuation Report
2014 Building Inspection Report	Playground Equipment Inspection
Development Charges By-Laws	Insurance Schedules
Equipment Replacement Schedule	2019 Capital Budget and Forecast

Delivered Items	
Master Plans	
Community-Based Strategic Plan 2015	Community Improvement Plan 2016
Puslinch Master Fire Plan	Puslinch Space Needs Analysis
Recreation and Parks Master Plan	Parks Master Plan – Puslinch Community Centre
Financial Policies	
Investment Policy	Asset Maintenance Trust Fund Program – Council Resolution No. 2014-271
2017 Fleet Management Policy	Procurement Policy
Commodity Price Hedging Policy	Financial Policies regarding Establishment and Contribution to Reserves
Financial Administration and Budget Management	Sale and Other Disposition of Land Policy
Lease Financing Agreement Policy	Tangible Capital Asset Policy
Reserve Balances Documents	
Balances in Discretionary and Restricted Reserves	
Debt Documents	
Amortization Schedule	
Tax Levy	
2017 Final Tax Levy By-Law	2018 Final Tax Levy By-Law
Tangible Capital Listing	
Asset Acquisition List - 2013	Asset Acquisition List - 2014
Asset Acquisition List - 2015	Asset Acquisition List - 2016
Asset Acquisition List - 2017	Fixed Asset List 2017
Service Level	
2010 Fire Establishing By-law	Ontario Regulation 239/02: Minimum Maintenance Standards for Municipal Highways

Delivered Items	
Resource Documents	
Asset Management Training Workshop Documents	Municipal Finance Officers' Association
Policy and Strategy Templates	
GIS Files	
Roads	Bridges
Land Parcels	Address Points
Urban Centre	Traffic Lights
Traffic Count Data	
Roszell Road	Hume Road
Watson Road	4982 Concession 4
Laird Road	Summary Document
Asset Delivery	
Sidewalk Listing	Sidewalk Inspections
Puslinch Computer Listing	Fire Equipment Listing
Street Name Sign Listing	
Tender Documents/ Unit Costs	
Optimist Community Centre First Built	Gravel Unit Costs
Streetlight Poles Rented/Own Document	Tender Documents for various assets

2.0 - 2 Delivered Documents

2.12 Project Methodology

UEM has worked closely with Township staff of on this project. Workshops were held to expand on the benefits and potential components within an asset management strategy. The UEM Team's objective was to define an initial high-level asset management strategy and more detailed vision for asset management and asset reporting in Puslinch. The workshops aimed at providing information to staff on the best practices in asset management and to develop a common understanding of what the Township is aiming to achieve. The workshop environment also allowed the UEM Team to discuss current business practices to determine the current definition of Asset Management and develop an asset hierarchy.

Once the Asset Management Framework and Strategy were developed, UEM staff executed the strategy using Puslinch's asset data, developing initial outputs.

As part of the project, a review of current information technology systems was undertaken. An evaluation of potential improvements that would facilitate the evolution of asset management in Puslinch with recommendations are presented in Sections 18 and 19 of this report.

2.13 Reference Documents for Asset Management

The following documents were utilized in preparing both the Asset Management Policy and Asset Management Plan for the Township of Puslinch.

1. International Asset Management Manual
2. How to develop an Asset Management policy, strategy and Governance framework; FCM; Federation of Canadian Municipalities
3. Strategic Asset Management Policy Toolkit - Municipal Finance Officers' Association of Ontario (MFOA)
4. Asset Management Framework; MFOA
5. Development Charges Act (DCA)
6. County of Wellington Official Plan, *last updated June 1, 2018*

These documents recognize that Municipalities deliver many of the services that are critical to Ontarians and these services rely on well-planned, well-maintained infrastructure. The Province views asset management as a prerequisite for productive discussions about funding for municipal infrastructure.

2.14 Objectives

The administration of the Township is segmented into the following Departments: Public Works, Building and Planning, Parks and Recreation, Fire and Rescue, CAO/Clerk and Finance.

The Asset Management Policy and Plan were developed in consultation with all departments at the Township with the following objectives:

- Guide the Township in the creation of an Asset Management Policy and Plan conforming to Provincial guidelines and Ontario Regulation 588/17 as well as Ontario Regulation 239/02 Minimum Maintenance Standards for Municipal Highways.
- Document a vision for asset management and define the actions and resources that will enable improved asset management by the Township;
- Understand the long-term cost to sustain the assets owned by the Township to deliver the current and forecasted future needs to replace and maintain these assets;

- Review the Township's existing information systems required to support the Township's asset management plan and define the actions and resources that will enable improved use of technology by the Township.
- facilitate involvement with staff, Council and most importantly the Public in approval of service levels and the impact of service level changes to the Township's budget.

2.15 Strategic Plan

As previously indicated the Township undertook the development of a Community Based Strategic Plan 2015-2020.

Township Strategic Goals and associated objectives were developed that were to be integrated into an Implementation Plan. Relevant to the Asset Management Plan (AMP) were Goals and Objectives identified in the following chart:

Strategic Plan			
Strategic Goal	**Objective**	**Sub Objectives**	**Action**
Strategic Goal IV	Maintain Financial Strengths and Define Service Levels	Long-Term Financial Planning	Incorporate service level decisions into 10-year Capital Plan (i) Develop a long-term funding strategy for capital program (ii) Update Pavement Condition Index for Township Roads (iii) Update Asset Management Plan through identification and inspection of the Township's Storm Water Management Facilities (iv) Review and update the Township's Reserve and Reserve Fund Policy which considers the establishment of a Tax Stabilization Reserve (v) Develop a Debt Policy (vi) Complete a comprehensive update to the Township's Asset Management Plan (vii) Review and update the Development Charges By-law

		Fire Master Plan Service Levels and Recommendations	Incorporate and implement the outcomes of the decisions made on the Fire Master Plan recommendations into the Township's service delivery standards and budget, 2016–2024.
		Recreation and Parks Master Plan Service Levels and Recommendations	Incorporate and implement the outcomes of the decisions made on the Recreation and Parks Master Plan and the ORCP Ad-hoc Committee into the Township's service delivery standards and budget, 2016–2024.
		Service Delivery review – Other Departments	i.) Identify other areas for review i.e. Public Works, Governance. ii.) Report to Council with an action plan to define and outline the departmental service delivery items. iii.) Report to Council with a proposed schedule for review of other departments. iv.) Incorporate and implement the outcomes of the decisions made into the Township's service delivery standards, 2018-2024.

2.0 - 3 Strategic Plan

2.16 Upper Tier Influences

The following documents were reviewed to determine influences of the County of Wellington upon Puslinch.

1. Wellington County Economic Development Strategic Plan
2. County of Wellington Official Plan
3. Places to Grow – Growth Plan 2017

3.0 Climate Change

Physical assets (such as buildings and transportation systems) operate in a dynamic environment where they are exposed to variability in environmental conditions. An important input to asset management is an adequate understanding of this variability. This typically includes the estimation of environmental conditions that can be expected over the life of an asset or a system of assets (e.g. a road system). In order to offset the negative aspects of such viability, environmental criteria should be used as inputs into the following;

- the design and construction of an asset
- the planning of operations to gain an understanding of maintenance requirements for the life of the asset.

Environmental criteria provides a statistical view of the changing conditions within which the asset must operate such as changes in air temperature as an input in the design of a road. An analysis of the most extreme environmental conditions that an asset is designed to withstand is a critical design input.

However, for determining extremes, the extent of information available on environmental conditions is almost always significantly less than the design period of an asset. Essentially, knowledge of past conditions is no longer valid for making projections about the future. Since changes in climate are not traditionally incorporated into asset management decision-making, new techniques must be established to offset the effects of climate change.

The risks associated with the uncertainty of the environment have generally been accommodated through appropriate safety margins. The incorporation of climate change into asset design has so far been limited. However, a risk assessment approach can be used which considers four major conceptual factors in assessing climate change impact and adaptation. These are exposure to climate stressors, vulnerability, resilience, and adaptation.

Climate Change Exposure refers to the degree to which a system is exposed to extreme climate variations and the nature of those variations.

Vulnerability refers to the potential for loss due to exposure to a climate stressor, such as the degree to which a system is susceptible, and unable to cope and considers the structural strength, integrity and function of assets or asset systems in terms of the potential for damage or functional disruption as a result of climate stressors. It’s important to recognize that asset risk is a function of exposure and vulnerability.

Resilience is used to refer to the capacity of a system to absorb disturbance without losing essential function, such as the ability of a system to continue to operate as a result of built-in redundancy. For example, the adequate operation of a road system despite the loss of a single road or bridge or the relative ease that a single asset can be repaired or replaced.

Adaptation or ‘adaptive capacity’ is the ability of the asset to adjust to climate change, including climate variability and extremes. This works to moderate potential damages or to cope with consequences of changing climates including taking advantage of respective opportunities to extend the asset lifecycle.

Adaptive strategies fall into three categories:

1. protect
2. accommodate
3. retreat

An example of a protection strategy is wetland restoration. An accommodation strategy is preparing for an event such as periodic flooding by having operational plans in place to minimize disruptions. Retreat involves no attempt to protect the asset, e.g. a facility or structure may be abandoned under certain conditions.

An important concept in the risk assessment approach is that of thresholds. In the context of asset management, such thresholds are points within a decision-making process at which specific actions are taken. Thresholds are indicators when the condition of an infrastructure component falls below a certain standard or may be economic when replacement costs are less than repair costs.

Such an indicator as risk combines an assessment of present-day vulnerabilities pertaining to specific climate factors including projections as to how they might change under climate change scenarios. However, risk also takes into account the severity of a given impact, the amount of infrastructure affected and the ability to adapt to climate change.

Certain authorities have developed a methodology for determining thresholds by using a two-stage process. The first stage includes examining the necessity for taking action. No action is deemed necessary if it is determined that a given impact is unlikely to occur within the design life of the asset or if current standards would adequately address climate impact. The second stage applies when action is required immediately or in the near future compared to the cost of doing nothing, retrofitting the infrastructure or designing new infrastructure.

Along with the concept of adaptive strategies is the concept of interventions. Interventions are triggered when a certain threshold is reached and consists of a ‘set of responses’, which are a particular measure, an example being the application of a hard surface on a gravel road. Adaptation previously took into account future changes including climate change, physical changes to an asset, and deterioration of an existing asset. While such adaptations are designed for making assumptions about future change, the magnitude of future change is unknown.

An approach to adaptation takes into account the uncertainty of future change and enables decisions to be made that are based on actual rates of change. The primary future changes that will affect the implementation of and preparation of an adaptation plan are:

- Climate change. This presents the greatest challenge in terms of future uncertainty.
- Socio-economic change.
- Deterioration of the existing assets.
- The physical environment in which assets are located.
- Public attitudes toward modifying service levels.

The types of adaptation envisaged within the Puslinch asset management plan to cope with the uncertainty of future change includes the following:

- Changes to the timing of new interventions.
- Ability to change between options.
- Adaptation of engineering responses.
- Land use planning that provides flexibility in the selection of options.
- Adaptation to new infrastructure, for example, the construction of a new road.

The timing of a decision to implement an intervention is based on:

- The rate of change of the indicator (which is unlikely to be linear).
- The threshold value when an intervention is required.
- An estimate of how the indicator will continue to change, in order to estimate the date when it reaches the threshold value.
- The lead time for planning and constructing the intervention.

The procedure outlined above will take place over a number of years.

In regard to Puslinch, it is accepted that climate change is having an impact on assets. However, the rate of change is such that climate change will not have a significant financial impact on the assets of Puslinch over the next ten-year period. The deterioration rate of the physical condition of assets is not significant at the present time. Reference should be made to recommendations which highlight the need to include climate change as a consideration in undertaking future updates of asset condition such as a Roads Needs Study.

4.0 Level of Service Policies

Determining municipal level of service policies requires first developing a baseline for acceptable and affordable levels of service. This is done by first examining present-day service levels, community needs, regulatory or legal obligations and the cost of service delivery. Once present-day service levels have been examined, this baseline can be compared against level of service expectations.

Initially, current levels of service were documented as well as the annual cost to each service delivery. Any higher-level service, even at a cost of delivery, in all likelihood will require an increase in budget. However, such an increase in budget may be justified if a service level change is required to achieve compliance with regulation codes or standards.

Levels of Service Analysis is a component of asset management planning that is significant and has a great deal of impact. The core purpose of a Municipality is to provide services to residents and other stakeholders. Assets help to provide those services and most of the resources devoted to asset management planning are spent on infrastructure. Physical assets are simply a portion of what is required to deliver the various levels of service as determined by the Township. The Township needs to ensure that the infrastructure performs to meet the level of service goals at an affordable and sustainable cost. An objective of Levels of Service analysis is to find a balance between the expected level of service and the cost of providing that level of service.

A Levels of Service analysis includes:

- Service identification with the identification of assets involved in providing the services and the stakeholder's impact;
- Determination of levels of service, based on community expectations;
- Comparison of existing levels of service to expected technical levels of service;
- Use of performance measures to assist in comparing existing service levels to expected levels; and
- An assessment of the lifecycle cost implications of moving from existing levels of service to expected (desired) levels of service over a forecast period.

In addition, the following should be identified in the Levels of Service Policies.

- The options for the proposed levels of service and the risks associated with those options to the long-term sustainability of the Township.
- How the proposed levels of service differ from the current levels of service.
- Whether the proposed levels of service are achievable.
- The Township's ability to afford the proposed levels of service.

4.1 Identifying Services

Identifying and determining services are beneficial for several reasons. For asset management planning, identifying services is an important step in developing the Levels of Service analysis. Once the Township has identified the services it is providing and what services it wishes to provide, then the levels of service to be provided can be determined. Service reviews can be undertaken by both formal and informal means and involve a number of stakeholders including staff and Council.

4.2 Service Reviews

Given that the asset management planning process is in place to determine how assets will provide services to residents and other stakeholders, the identification of services is a critical “first step” to initiate the Levels of Service analysis. Municipalities provide all of the legally mandated services, as well as other services desired by the residents. The development of a “service-centric” asset management process entails understanding and answering the following questions for all services:

- What are the services that Puslinch is providing?
- What are the services that customers expect?
- What are the assets provided for each service?

4.3 Factors Affecting Levels of Service

Several factors affect the levels of service delivery for particular asset types. The Township’s policy objectives, community expectations, legislative requirements, and resource constraints are some of the factors that generally influence the levels of services. The following details are some of the factors:

- **Community expectations:** This factor represents one of the major drivers in setting levels of service. Information is needed about the community’s expected levels of service and willingness to pay for this service. A balance then needs to be determined between expected levels of service and associated costs.
- **Legislative requirements:** Legislative standards and regulations affect the way assets are managed. These requirements stipulate the minimum levels of service. Therefore, relevant requirements must be taken into consideration in setting levels of service.
- **Policies and objectives**: Existing policies and objectives should be considered when developing levels of service, with care taken to remain aligned with the Township’s planning documents.
- **Resource availability and financial constraints**: Theses constraints play a large role in the Township’s ability to provide sustainable levels of service. Therefore, resource constraints play a significant part in determining affordable levels of service.

4.4 Current vs Expected Levels of Service

The concept of comparing current vs. expected Levels of Service is very important to the overall Levels of Service analysis process. Current levels of service are essentially the service levels that are being provided by Puslinch at the present time. They can be defined through qualitative descriptions, lifecycle cost related projects, and/or performance measurements. The current year’s budget reflects the cost of providing current levels of service. However, the current years’ budget may or may not include adequate funding to maintain current levels of service over time. Information on current levels of service enables an understanding of the difference between the service levels currently being provided and the service levels expected.

Levels of service are differentiated between:

- **Community Expectations:** Based on what the customer and community expect to receive;
- **Customer Levels of Service**: Measuring community expectations against attributes such as reliability, quality, safety, efficiency, and capacity. Outlines what the customer will receive from a levels of service standpoint; and
- **Technical Levels of Service:** How Puslinch will provide the levels of service, often using operational or technical measures.

4.5 The Process of Developing a Levels of Service Analysis

The process for developing and adopting levels of service measures may be defined as follows:

Levels of Service analysis can involve:

1. Developing Levels of Service
   - Customer vs. Technical Levels of Service
   - Current vs. Expected Levels of Service
   - Use of performance measures

2. Consultation, Communication, and Approval
   - Receiving input on the proposed Levels of Service analysis
   - Communicating the Levels of Service analysis to stakeholders
   - Seeking Council approval of Levels of Service analysis

3. Ongoing Review, Updates, and Improvements
   - Updating the Levels of Service Analysis, as needed

4.6 Defining Customer Expectations

The process of defining customer expectations involve any or all the following:

- Staff input;
- Use of industry/local knowledge;
- Existing reports that refer to customer expectations;
- Council input; and/or
- Seeking public input.

Involving Council and/or public in the process of defining customer expectations provides a direct connection between the community and their expectations that may not be identified through other sources. Other sources can involve assumptions and estimations of customer expectations. Such direct public impact can be determined by way of public meetings and submission of comments from the public.

4.7 Developing Levels of Service

To be effective in developing levels of service, input should be gathered from and communicated to all interested parties. The services being provided, and the community expectations should be documented based upon input from applicable departments and their staff. Levels of service policies must be created and approved by Council.

4.8 Consultation, Communication, and Approval

The Levels of Service analysis was completed in ‘draft form’. Consultation and Communication was a process that needed to occur to finalize approval of levels of the service. From a consultation and communication point of view a public meeting was scheduled to review the draft Levels of Service analysis and to provide feedback. Stakeholders included other staff members, Council, and the public.

The levels of service are approved through the adoption of the Asset Management Plan.

4.9 Ongoing Review, Updates and, Improvements

The establishment of a Levels of Service analysis is not a one-time occurrence. Rather, it is a constant and evolving process with ongoing consideration to customer expectations, legislative or technological requirements/changes, corporate mission and objectives, and financial opportunities/constraints. The frequency of these reviews should be established and followed by staff as part of the Asset Management Policy.

It is important to note that although seeking public input is important, this input must be compared with financial implications.

Establishing Levels of Service targets is often an iterative process. The process starts with public (community) expectations of service levels and then measuring these expectations against constraints such as financial considerations, resources, and affordability. Only after these constraints have been considered will it be determined whether public expectations can in fact be approved as expected Levels of Service for the Township`s asset management process.

4.10 Comparing Current Levels of Service to Expected Levels of Service

- An identification of existing Levels of Service;
- A determination of expected (or desired) Levels of Service; and
- An assessment of the implication of moving from existing Levels of Service to expected (desired) Levels of Service over a forecast period.

If current Levels of Service equates to what service level is currently provided, expected Levels of Service outlines the overall objective or target Levels of Service to be reached at some point in time. The amount of time it will take to reach expected Levels of Service depends on the assumptions Puslinch makes within the asset management planning process. For example, a municipality could decide to meet expected Levels of Service in a particular area in 10 years. When that scenario is assessed with the Lifecycle Management Strategy and the Financing Strategy and concluded to be too expensive too quickly, the Levels of Service analysis can be updated to include another scenario to reach expected Levels of Service in 15 or 20 years. Alternate scenarios can also represent different levels of service.

5.0 Levels of Service Policies

Based on the discussion in Section 4, Levels of Service Policies were developed for all asset classes in the Township of Puslinch.

5.1 Bridges and Culverts

Regulation 588/17 Asset Group: **Core Municipal Assets**
Major Asset Class: **Bridges and Culverts**

Township Current Level of Service Policy:

Township bridges and dulverts are inspected by a Professional Engineer every two years.

UEM Proposed Level of Service Policy:

To inspect according to the Ontario structure inspection manual and Ontario Regulation 104/97. This inspection shall occur every two years and shall adjust the BCI based on the recommendations of the qualified engineer. The inspection report shall include all repairs that exceed the capital threshold in the capital budget to the schedule recommended by the qualified engineer.

The asset registry must be updated at least once per year to reflect whether the asset was inspected or not. For those not inspected, the BCI will be maintained based upon the requirements of the Ontario Regulation 104/97.

Lifecycle/Deterioration Rate:

Expected Life 50 Years for all Bridge and Culvert Structures.

Consequence of Failure items impacted by failure to achieve

Health and Safety
Financial
Legal/Regulatory Compliance
Environmental

Budget Implications

Bridge and Culvert Inspection Reports $15,000 every 2 years.

Source Documents

Ontario Structure Inspection Manual.

O. Reg. 104/97: Standards for Bridges.

5.2 Gravel Roads

Regulation 588/17 Asset Group: **Core Municipal Assets**
Major Asset Class: **Gravel Roads**

Township Current Level of Service Policy:

All Township owned gravel roads are regularly maintained in the form of grading and gravel addition. The Township does not have a policy for when a gravel road should be surface treated including asphalt and or reconstruction.

The Township completes dust control annually. Further applications of dust control are completed as required.

UEM Proposed Level of Service Policy:

The Service level for gravel roads is the Minimum Maintenance Standard for Gravel Roads. Repairs will include grading and if required an application of additional granular material. Other alternatives should be considered such as surface treatment including asphalt and/or reconstruction if all of the following criteria are met:

- Full regrading is completed more than 6 times during each of two consecutive non-winter periods. The non-winter period is from May 1st to November 1st; and
- an inspection of the gravel base has been completed by a qualified engineer and confirms that the road base can support a hard-top surface, without additional construction required; and
- the average daily traffic volume exceeds 400 vehicles; and
- the Township has approved funding for the project.

For all gravel roads that have been fully graded following the half load season, the PCI will be assumed to be 90.

Note: Regrading is triggered by the following:

- Frost leaving the gravel road.
- Pot holes in the gravel road.
- Rainfall resulting in a significant number of washouts.
- Rutting due to truck traffic.

Lifecycle/ Deterioration Rate

5 PCI points adjustment per grading.

Consequence of Failure items impacted by failure to achieve service level:

Health and Safety
Financial

Budget Implications

Inspection of Gravel Base $6000 per average from intersection to intersection as required.

Gravel Road Surface Treatment Cost $52,000/km based upon tender document 18-136 provided by the City of Guelph. Pricing excludes costs associated with reconstruction of base and drainage works.

Gravel Road Study: $25,000

Source Documents

O. Reg. 239/02: Minimum Maintenance Standards for Municipal Highways

Gravel Road Management, Wyoming Technology Transfer Center Sept 2010

Economics of Upgrading an Aggregate Road, Minnesota Department of Transportation
Sept 2005. *Note*: Ontario Service Document not available.

5.3 Hard Surface Roads

Regulation 588/17 Asset Group: **Core Municipal Assets**
Major Asset Class: **Hard Surface Roads**

Township Current Level of Service Policy:

The 2013 Asset Management Plan and 2016 Pavement Condition Index (PCI) Report indicated that the Township will strive to maintain all hardtop and non-paved roads in a good to fair condition. For hard surface roads, this will approximately correspond to a PCI value of 65 or greater. The 2013 Asset Management Plan recommended completing a full PCI update every 5 years.

UEM Proposed Level of Service Policy:

Class 3 roads be rehabilitated or reconstructed at a PCI of 65

Class 4 roads be rehabilitated or reconstructed at a PCI of 60

Class 5 roads be rehabilitated or reconstructed at a PCI of 60

The pavement condition index should be renewed in 2021 and should be renewed every 5 years thereafter. A traffic volume study should be undertaken every 5 years beginning in 2020.

The asset registry must be updated at least once per year to reflect the current condition whether the condition be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

Based upon a deterioration rate of 2 points per year the condition decreases from 100 to 60 over 20 years.

Consequence of Failure items impacted by failure to achieve service level:

Health and Safety
Financial

Budget Implications

Traffic Volume Study, $25,000 every 5 years.

Pavement Condition Index Report, $24,500 every 5 years.

Source Documents

2016 Pavement Condition Index Study.

2011-2017 Traffic Volume Data.

5.4 Storm Water Management Ponds

Regulation 588/17 Asset Group: **Core Municipal Assets**

Major Asset Class: **Storm Water Management Ponds**

Township Current Level of Service Policy:

The Township completes visual, non-documented inspections of storm water management ponds as part of routine road inspections.

UEM Proposed Level of Service Policy:

Inspection of storm water management ponds should occur on average four times per year during the first two years of operation, and then at least annually.

The asset registry must be updated at least once per year to reflect the current condition whether the asset be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

50 years for pond components and 20 years for Hicken bottom.

Consequence of Failure items impacted by failure to achieve service level:

Environmental
Legal/Regulatory Compliance

Budget Implications

The estimated annual cost of storm water management pond inspections is $5000.

Source Documents

Section: 6:3:1 Storm Water Management Planning and Design Manual – Ontario.

5.5 Storm Water Management Systems

Regulation 588/17 Asset Group: **Core Municipal Assets**
Major Asset Class: **Storm Water Management Systems**

Township Current Level of Service Policy:

The Township does not annually inspect the storm water management systems or clean the storm water management systems as required to minimize the movement of silts through the outlets. The Township externally contracts the cleaning out of catch basins every two years as required.

UEM Proposed Level of Service Policy:

In reference to catch basin cleaning, as a general rule it should be done annually but the frequency should be adjusted based upon the volume of material removed. Inspection of storm water management systems should occur on average four times per year during the first two years of operation and then at least annually.

The asset registry must be updated at least once per year to reflect the current condition, whether the asset be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

50 year expected life.

Consequence of Failure items impacted by failure to achieve service level:

Environmental
Legal/Regulatory Compliance

Budget Implications

The estimated annual cost of storm water management systems inspections is $5000.

Source Documents

Section 4:2:3 Storm Water Management Planning and Design Manual – Ontario)

Section 6:2:3 Storm Water Management and Planning Design Manual – Ontario

5.6 Street Trees

Regulation 588/17 Asset Group: **Green Infrastructure**
Major Asset Class: **Street Trees**

Township Current Level of Service Policy:

The Township completes required maintenance of trees but there is no schedule for inspection.

UEM Proposed Level of Service Policy:

This service level policy includes all trees that have been assumed by the Township through a development agreement. Subsequent to planting a tree the agency or company planting trees shall be responsible with all maintenance including pruning and replacement if necessary. After acceptance by the Township, the tree shall be inspected after 10 years and shall be inspected every 5 years thereafter to determine any required maintenance.

The Township will hire an arborist or potentially the services of the University of Guelph to visually inspect only the trees planted in the subdivisions within the Township.

It is recognized that there are numerous trees on public lands and road rights of way that may impact the safety of the public and maintenance activities. The Township overtime should document the location of such trees, their condition and required maintenance. However staff shall develop a tree program taking into consideration the above and present such a program to Council.

The asset registry must be updated at least once per year to reflect the current condition whether the condition be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

50 Years Expected Life.

Consequence of Failure items impacted by failure to achieve service level:

Environmental

Budget Implications

Tree Inspections
$6,000 on the year of inspection.

Source Documents

UEM Professional Recommendation.

5.7 Buildings and Facilities

Regulation 588/17 Asset Group: **Municipal Assets**
Major Asset Class: **Buildings and Facilities**

Township Current Level of Service Policy:

The Township's last Building Condition Assessment (BCA) report was completed in 2014. The BCA report recommended completion of an Arc Flash Study for all electrical equipment in the Township's facilities. The Township has not completed an Arc Flash Study at this time. The BCA report recommended that as part of a regular operations and maintenance program that all equipment and wire terminations be investigated via infrared scanning every 3 to 5 years. The Township has not completed infrared scanning of all equipment and wire terminations at this time.

UEM Proposed Level of Service Policy:

Buildings and Facilities owned by the Township of Puslinch should be inspected by a qualified structural engineer on a routine basis, however not more than 5 years apart, to determine necessary improvements, repairs or replacements. In addition to the qualified structural engineer an additional qualified engineer shall be retained to address electrical, HVAC and mechanical components. The cost of any needed improvements shall be integrated into the capital plan by way of updates to the asset registry.

In addition to the inspections by such qualified engineers' a qualified company or individual shall undertake an Arc-Flash study every 5 years and infrared scanning of all electrical equipment to determine the adequacy of such equipment.

The asset registry must be updated at least once per year to reflect the current condition whether the asset be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/

50 Years Expected Life.

Consequence of Failure items impacted by failure to achieve service level:

Financial

Budget Implications

Building Condition Assessment $25,000.

Infra-Red Scanning $3,000.
Arc Flash Study $7,500.

Source Documents

2014 Building Condition Report.

Ontario Electrical Safety Code (OESC).

5.8 Fire Equipment

Regulation 588/17 Asset Group: **Municipal Assets**
Major Asset Class: **Fire Equipment**

Township Current Level of Service Policy:

The Township completes annual documented inspections of fire equipment in accordance with the related NFPA standards.

UEM Proposed Level of Service Policy:

The service level policy for Fire Equipment shall be in accordance with the related NFPA standards: 1911, 1962, 1932, 1855, 1858, 1852, 1851 and 1971.

The asset registry must be updated at least once per year to reflect the current condition whether the condition be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

Varies depending on type of equipment.

Consequence of Failure items impacted by failure to achieve service level:

Health and Safety
Internal Demand/Operational
Financial

Budget Implications

No significant budget implications.

Source Documents

National Fire Protection Association Standards.

5.9 Fire Reservoirs

Regulation 588/17 Asset Group: **Municipal Assets**
Major Asset Class: **Fire Reservoirs**

Township Current Level of Service Policy:

The Township completes annual documented inspections of fire reservoirs in accordance with Ontario Fire Code 213/07 and NFPA Standard 25 for the inspection and maintenance of all municipally owned fire reservoirs.

UEM Proposed Level of Service Policy:

The Fire Department shall on an annual basis inspect all fire reservoirs owned by the Township in accordance with the Ontario Fire Code 213/07 and NFPA Standard 25 to ensure that such fire reservoirs can be easily accessible and that any components above the roof of the reservoir are in good condition. Such reservoirs shall not be obstructed by vegetation of any form such as plants, bushes and trees.

The Fire Department shall inspect the reservoirs every 5 years to ensure the integrity of the reservoir.

The asset registry must be updated at least once per year to reflect the current condition whether the asset be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

50 Years Expected Life.

Consequence of Failure items impacted by failure to achieve service level:

Internal Demand/Operational
Financial

Budget Implications

No significant budget implications.

Source Documents

UEM Professional Recommendation.

5.10 Fleet – Works, Parks, Building and Fire Department Vehicles & Equipment

Regulation 588/17 Asset Group: **Municipal Assets**

Major Asset Class: **Fleet – Various Departments**

Township Current Level of Service Policy:

All Commercial Motor Vehicles owned by the Township require an Annual Inspection Certificate as required by the Ministry of Transportation (MTO).

Fire and Rescue Services Fleet:

- Visual non-documented 360-degree inspection prior to the fleet leaving the Fire Station or Works Department.
- Weekly documented MTO Schedule 1 Inspection completed for commercial motor vehicles.
- Fire and Rescue Services fleet require annual testing of pumps and aerial devices (i.e. ladders) in accordance with NFPA Standard 1911.
- Non-destructive testing of aerial devices (i.e. ladders) is required every 5 years in accordance with NFPA Standard 1911.

Public Works Fleet:

- Daily documented MTO Schedule 1 Inspection completed for commercial motor vehicles.

Non-commercial motor vehicles (i.e Pick-up trucks):

- Daily documented inspection logbook completed for all non-commercial motor vehicles.

Lifecycle

Varies from 7-25 years by vehicle

Consequence of Failure items impacted by failure to achieve service level:

Internal
Demand/Operational
Financial

Budget

No significant budget implications

Source Documents

Fleet Management Policy: Puslinch

UEM Proposed Level of Service Policy:

Fleet shall be maintained in conformance with licensing practices of the Province of Ontario including the Ministry of Transportation and shall include a daily visual inspection of any licensed vehicle before the vehicle leaves the fleet storage facility of the Township. Fleet of the Township shall be determined for replacement based on the criteria noted in the Fleet Management Policy. Inspection of fire and rescue services vehicles shall also be based on relevant NFPA standards.

Further to the proposed service level policy described above. It is recommended by UEM that the Township retain their current service level policy.

The asset registry must be updated at least once per year to reflect the current condition whether the asset be inspected or not (those not inspected will be updated based on lifecycle standards).

5.11 Parks and Recreation

Regulation 588/17 Asset Group: **Municipal Assets**
Major Asset Class: **Parks and Recreation**

Township Current Level of Service Policy:

The Township completes visual, non-documented weekly inspections of parks while performing maintenance activities.

The Township completes monthly documented playground inspections.

UEM Proposed Level of Service Policy:

All Parks and Recreation facilities including but not restricted to baseball diamonds, baseball diamond lights, soccer fields, tennis courts and trails available for public use shall be inspected as frost leaves the ground in late winter or early spring to ensure the safety of such Parks and Recreation assets. Included are both internal and external fencing, hard surfaces, bleachers and any other ancillary assets located within Parks and Recreation areas. Upon identification of any surface deficiencies that may endanger the public repairs shall be undertaken prior to such infrastructure being deemed available for public use.

Subsequent inspections should occur monthly until Parks and Recreation assets are closed prior to the winter season.

For assets, an example being "Trails" that may be open for public use throughout the winter inspections shall occur following winter storms to ensure the safety of the public.

The asset registry must be updated at least once per year to reflect the current condition whether the asset is inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

Varies from 15-40 years depending on asset type.

Consequence of Failure items impacted by failure to achieve service level:

Financial

Budget Implications

No significant budget implications.

Source Documents

UEM Professional Recommendation.

5.12 Regulatory Signs/Warning Signs

Regulation 588/17 Asset Group: **Municipal Assets**
Major Asset Class: **Regulatory Signs/Warning Signs**

Township Current Level of Service Policy:

The Township externally contracts the completion of retro reflectivity inspections of regulatory/warning signs annually.

UEM Proposed Level of Service Policy:

The Township shall retain a qualified company/individual that shall test the retro reflectivity of each sign once per calendar year with each inspection taking place no more than 16 months from the previous inspection. In conformance with the retro reflectivity specified in the Ontario Traffic Manual and when not meeting such requirements the Township shall replace the sign. Further, the Township shall conform with the requirement for class 3,4 and 5 highways as per the Ontario Regulation 239/02: Minimum Maintenance Standards For Municipal Highways.

The standard for the frequency of inspecting regulatory signs or warning signs to verify that they meet the retro-reflectivity requirements of the Ontario Traffic Manual is once per calendar year, with each inspection taking place not more than 16 months from the previous inspection. O. Reg. 23/10, s. 8; O. Reg. 47/13, s. 12 (1); O. Reg. 366/18, s. 13.

Class of Highway	Time
1	7 days
2	14 days
3	21 days
4	30 days
5	30 days

If a regulatory sign or warning sign is illegible, improperly oriented, obscured or missing, the standard is to repair or replace the sign within the time set out in the Table to this section after becoming aware of the fact. O. Reg. 23/10, s. 8; O. Reg. 366/18, s. 13.

Lifecycle/ Deterioration Rate

15 years expected life for sign and post.

Consequence of Failure items impacted by failure to achieve service level:

Health and Safety
Internal
Demand/Operational
Financial
Legal/Regulatory
Compliance

Budget Implications

No significant budget implications.

Source Documents

Ontario Regulation 239/02: Minimum Maintenance Standards for Municipal Highways

5.13 Sidewalks

Regulation 588/17 Asset Group: **Municipal Assets**
Major Asset Class: **Sidewalks**

Township Current Level of Service Policy:

The Township completes annual documented sidewalk inspections.

UEM Proposed Level of Service Policy:

In accordance with Ontario. Regulation. 239/02: Minimum Maintenance Standards for Municipal Highways, the standard for the frequency of inspecting sidewalks is once per year with each inspection occurring no more than 16 months from the previous inspection. Any discontinuity that exceeds 2cm shall be treated or repaired within 14 days of the inspection.

Under winter conditions sidewalks must be inspected within 48 hours of the end of snow accumulation to ensure that there is less than 8cm of snow accumulated on the sidewalk and to reduce to the level of 8cm within the same 48-hour period. The same time period of 48 hours shall apply when ice forms on a sidewalk and shall require either removal or a treatment such as sand, salt or a combination of both to the sidewalk within the same 48-hour period.

The asset registry must be updated at least once per year to reflect the current condition whether the asset be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

20 year expected life.

Consequence of Failure items impacted by failure to achieve service level:

Financial

Budget Implications

Sidewalk Winter Maintenance $20,000 annually using staff or contracted clearing.

Source Documents

Ontario Regulation 239/02: Minimum Maintenance Standards for Municipal Highways.

5.14 Street lights and Poles

Regulation 588/17 Asset Group: **Municipal Assets**
Major Asset Class: **Street Lights and Poles**

Township Current Level of Service Policy:

The Township completes visual, non-documented yearly inspections to note any light deficiencies.

UEM Proposed Level of Service Policy:

All luminaires shall be inspected once per calendar year with each inspection taking place not more than 16 months from the last inspection. The standard of repair should be as outlined in Section 10 of Ontario Regulation 239/02: Minimum Maintenance Standards for Municipal Highways. The same standard of inspection shall apply to luminaire arms and poles and supporting luminaires that are owned by the Township.

The technology with streetlighting is evolutionary at the present time in Puslinch. The Township is in the process of modifying their streetlighting to LED fixtures while maintaining existing fixtures and poles. After the completion of the conversion to LED fixtures, the policy should be to replace fixtures in a cyclical manner every 20 years. Poles should be inspected by staff every 5 years to determine the need to replace based on a pole life of 30 years.

The asset registry must be updated at least once per year to reflect the current condition whether the asset be inspected or not (those not inspected will be updated based on lifecycle standards).

Lifecycle/ Deterioration Rate

30 year expected life for poles and 20 years for fixtures.

Consequence of Failure items impacted by failure to achieve service level:

Health and Safety

Budget Implications

$20,000 for testing every 5 years.

Source Documents

Section 10, Ontario Regulation 239/02: Minimum Maintenance Standards for Municipal Highways.

5.15 Sewage Assets

Regulation 588/17 Asset Group: **Municipal Assets** Major Asset Class: **Sewage Collection Systems, Sewage Pumping Stations, Sewage Treatment Plants**

Township Current Level of Service Policy:

UEM Proposed Level of Service Policy:

Lifecycle/ Deterioration Rate

Consequence of Failure items impacted by failure to achieve service level:

Budget Implications

Source Documents

5.16 Water Assets

Regulation 588/17 Asset Group: **Municipal Assets**
Major Asset Class: **Water Treatment Plants. Water Pumping Stations, Water Storage Facilities, Raw Water Supply, Water Distribution Mains**

Township Current Level of Service Policy:

Lifecycle/ Deterioration Rate

Consequence of Failure items impacted by failure to achieve service level:

UEM Proposed Level of Service Policy:

Budget Implications

Source Documents

5.17 Parklands

Regulation 588/17 Asset Group: **Green Infrastructure**
Major Asset Class: **Parklands**

Township Current Level of Service Policy:

Lifecycle/ Deterioration Rate

Consequence of Failure items impacted by failure to achieve service level:

UEM Proposed Level of Service Policy:

Budget Implications

Source Documents

6.0 The Asset Registry

Through multiple meetings with staff of Puslinch, UEM developed an Asset Registry. The Township was able to provide knowledge of the physical components of many assets in the asset registry by providing reports and documentation. The asset registry includes description, location, size, material type, and conditions of all known assets. As the project evolved, UEM completed the financial components of the asset registry. The asset registry financial components consist of unit cost, remediation cost and a total replacement cost for all asset components.

Regulation 588/17 Asset Group	Asset Registry Asset Group
Core Municipal Infrastructure	Bridges
	Culverts
	Asphalt Roads 1 Lift
	Asphalt Roads 2 Lift
	Asphalt Roads Surface Treated
	Storm Water Management Ponds
	Storm Sewers
	Gravel Roads
Municipal Infrastructure Assets	Buildings and Facilities
	Fire Equipment
	Fire Reservoirs
	Parks and Recreation
	Sidewalks
	Regulatory/Warning Signs
	Street Lights
	Fire Licensed Vehicles
	Fire Vehicle Tires
	Works Unlicensed Vehicles
	Works Licensed Vehicles
	Parks and Recreation Unlicensed vehicles
	Building Department licensed vehicles
Green Infrastructure	Street Trees

6.0 - 1 Asset Class Hierarchy

This asset registry was developed through the incorporation of all departments input data. Because of the all-inclusive design of the asset registry the Township of Puslinch may assume that the data in this report is the most current. Further, updating is highly recommended to begin first from this asset registry and amendments should occur through a qualified QA/QC process of the existing assets. The copy of the asset registry may be found in Appendix 20.5.

6.1 Types of Asset Attributes

This asset registry has been developed with certain asset attributes that allow for clear identification, quantification, description, and evaluation of each asset in the registry. UEM has collected attribute types that will allow the Township to do certain levels of reporting. These attribute types are at a higher level and can be best understood through a review of the table that follows. "Yes" and "No" columns indicate if the Asset Registry has the Parameter included in its architecture.

Parameter	Yes	No	Description of use
Asset Identifiers, Location, and Descriptors	✓		To identify, describe and locate the asset. Will also define asset in terms of position in an asset hierarchy.
Detailed Technical Data	✓		To individualize and quantify each asset from similar assets.
Valuation Data	✓		Data that allows the organization to assess costs of the assets (both historical and current) and record/track amortization.
Maintenance Data		✓	Data that identifies the work to be completed and work completed against an asset.
Condition Data	✓		Data used to assess asset risk and determine the actual remaining useful lives of assets.
Predictive Data		✓	Data used to allow future behaviour of assets to be predicted. These would include deterioration curves and treatment effect details.
Performance Data		✓	Data recording demand and capacity performance. Unplanned maintenance activity is recorded against asset including cause and costs. Planned maintenance procedures adopted for critical assets.
Risk Data	✓		Data used to analyze the risk of an asset's failure and determine the risk to organizations if the asset were to fail.
Lifecycle data	✓		Data used to plan future costs associated with operations, maintenance, creation, renewal, disposal of assets. The cost of any strategy should also be determined.
Optimized Lifecycle Data		✓	Data used to optimize analysis of works considering the following factors: risk, maintenance, operations, life extension, age and condition of the asset, asset decay, treatment options, and cost.

6.0 - 2 Types of Asset Attributes

6.2 Asset Attributes: Asset Identifiers, Location, and Descriptors

UEM has prepared the asset registry with the ability for each asset to be located through a strict asset hierarchy. This hierarchy ensures that there is no duplication of any asset and or carryover of such asset into different locations. This Hierarchy was devised first through qualifying each asset class in its appropriate regulation group. Secondly, each asset was loaded into asset classes. This was done by grouping assets with like characteristics or management structures.

6.3 Detailed Technical Data

The level of detail for each asset class has been individually assessed through meetings with department heads of Puslinch.

6.4 Condition Data

UEM through consultation with staff has generated condition data for the majority of assets in the asset registry. For Majority of the asset classes in Puslinch Condition data classification was established through reports/data prepared by consultants.

The addition to these reports was through staff consultation to amend condition data when required. This is inclusive to all assets for which a report/dataset was not provided and or concern was raised from staff or UEM regarding the quality of data provided. The methodology for condition data is summarized in the following table:

Asset Class	Condition Rating Methodology
Bridges and Culverts	Staff provided report
Hard Surface Roads	Staff provided report
Gravel Roads	Consultation with staff
Storm Water Management Ponds	Staff provided report
Storm Sewers	Consultation with staff
Buildings and Facilities	Staff provided report
Fire Reservoirs	Staff provided data
Parks and Recreation	UEM visual condition assessment
Fire Vehicles	Consultation with staff
Fire Equipment	Staff provided data
Street Trees	Consultation with staff
Sidewalks	UEM visual condition assessment
Works, Building Department and Parks and Recreation Vehicles	Consultation with staff
Regulatory/Warning Signs	Consultation with staff
Street Lights	UEM visual condition assessment

6.0 - 3 Asset Condition Data Rating Methodology

6.5 Assets with No Condition Data

For some assets no condition data was available to be entered into the asset registry. Thus, for this asset management plan each asset without a condition rating would be assumed to deteriorate at a linear rate from its point of acquisition. For these assets only, the data attributes, acquisition date and life expectancy were used to classify their condition. In other words, these condition ratings would be a function of their remaining serviceable life.

6.6 Condition Data: Standardization

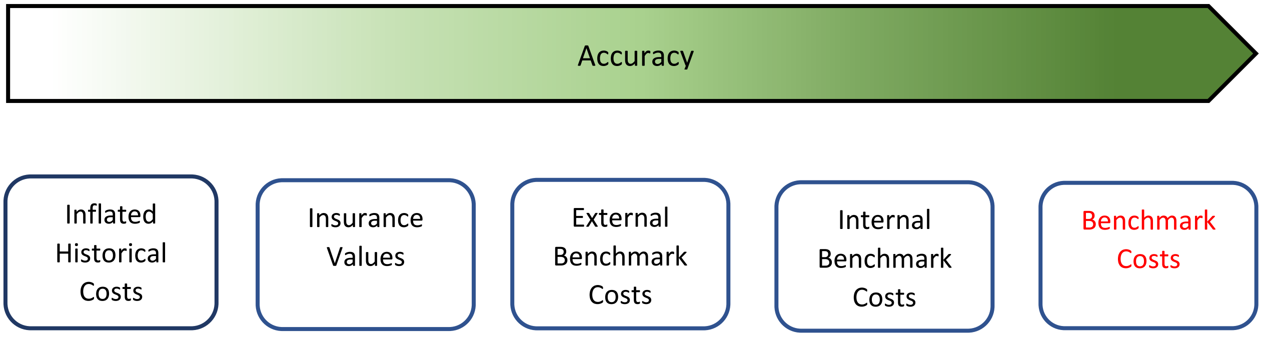
To standardize all condition data UEM employed a 1-5 rating scale. This scale ensured that assets could be incorporated into the same data model and analyzed without assets being over or under-prioritized. A sample of this standardization process has been showcased in the following table:

Asset Class	Condition Rating Type	Condition Rating	Condition Index	Condition Index Methodology
Bridges & Culverts	BCI	70	3	Good: BCI Range 70 -100 Fair: BCI Range 60 -70 Poor: BCI Less than 60
Roads	PCI	99	5	UEM standardized condition for Roads where a PCI of 100 converts to 5 for "Excellent", 90 converts to a 4 for "Good", 80 converts to a 3 for "Fair", 70 converts to a 2 for "Poor", and 60 or fewer converts to a 1 for "Critical"
Regulatory /Warning Signs	Condition Rating	5	5	Provided datasets from the Township were already standardized - no intervention required.
Fleet	Fleet Kilometres	55,000	3	UEM adhered to the Township's Current Fleet Management Policy when standardizing each vehicle in the fleet. Each vehicle type has their own metric for determining condition. Further clarification of methods, procedures can be identified more clearly in the Asset Registry.
Fire Equipment	Condition Rating	5	5	Provided datasets from the Township were already standardized - no intervention required.
Park and Recreation	Visual Condition Rating	2	2	UEM through a visual inspection of park and recreation assets devised a condition rating based on the total assessment of each part of the park and recreation asset. In some cases, low condition ratings were given to asset due to the lack of adherence to regulations or codes.

6.0 - 4 Condition Rating Standardization

6.7 Valuation Data: Remediation Costs

UEM has employed Benchmark Cost to asset class remediation valuation where possible. This valuation methodology is consistent for all assets in the asset registry and may be considered for future use so long as costs are inflated at an appropriate rate.



6.0 - 5 Valuation Methodology

6.8 Valuation Data: Replacement Costs

UEM has employed Benchmark Costs to asset class replacement valuation where possible. The source of this valuation data is external or Reproduction Costs. This valuation methodology is consistent for:

- Hard Surface Roads
- Gravel Roads
- Surface Treated Roads
- Parks and Recreation
- Sidewalks
- Regulatory/Warning Signs
- Bridges and Culverts
- All Fleet Assets
- Trees
- Fire Equipment
- Fire Reservoirs
- Regulatory/Warning Signs

Benchmark Costs were not applied to Storm Sewers, Storm Water Management Ponds, and Buildings and Facilities. UEM relied upon historical costs, external research and internal consultation with staff of Puslinch to value these assets.

A summary of the specific methodology for remediation cost and/or replacement costs has been summarized in greater detail in the summary page for each asset class in Section 7.0.

6.9 Data Confidence

To summarize the Asset Registry and its ability to effectively manage and deploy core financing reports such as PSAB 3150, FIR Reporting, GIS mapping, and capital plans, UEM developed a scorecard for the data quality of each asset class. The score summarizes in bullet form the strengths of each asset class as well the weaknesses. The methodologies used to create a data confidence score are summarized in Figure 6.

The Data Confidence Score devised from Figure 7 Table will help the Township identify which assets need more attention.

6.10 Data Confidence Trend

UEM devised a Data Confidence Trend for each asset class in the asset registry. The methodology for formulating Data Confidence is the balance between the positive and negative attributes of each asset classes data structure.

To clarify, the Data Confidence Trend is a balance between multiple factors which in the summary indicates the current trend of data quality that has been collected by the Township over time. Using multiple sources of confidence (as showcased in the below stated table 6.0 - 6) a rating methodology of data confidence was devised. 100% confidence meaning that the data can be taken essentially as fact whereas 0% confidence is that the data should be verified in the future.

(%) for valuation is the confidence of the financial data that has been loaded into the asset registry. The reliability of the summarized trends in data confidence is exclusively related to UEMs understanding of the Township's current policies and practices, data sources and or verification from staff.

Example Factors	High Confidence	Moderate Confidence	Low Confidence
When was the date of data collection?	Data is up to date	There needs to be changes to the data since it's been collected	There are many changes required since it's been collected
What is the relative completeness of the Dataset?	The Data is fully complete and present for the data set	The Data is partially complete and present for the data set	The Data is not complete and present for the data set
What is the source of the data source?	Qualified Consultant/Firm	Unconfirmed Sources	Personal Accounts, Undocumented Sources
Is there Staff confirmation of the reliability of the data?	Full Confirmation across departments	Partial Confirmation to some Departments	No Confirmation from Departments

6.0 - 6 Condition Rating Standardization

Program Area	Inventory and Condition	Valuation	Data Confidence Trend	Comments
Bridges	**100%**	**75%**	⬆	The Inventory data is extensive as it relates to bridge and culvert structures. In 2017 a Bridge and Culvert Inspection was completed which gave a detailed summary of the recommended capital expenditure of the Bridge and Culvert structures over 10 years. The Value of each crossing has been compiled from the Bridge and Culvert Inspection report.
Culverts				
Hard Surface Roads	**75%**	**85%**	⬆	The Inventory data is extensive and has been compiled from the 2016 Road Condition Assessment with further adjustments being completed through consultation with Staff. The Township does not currently follow lifecycle event schedule set out by the condition data. The Valuation of each road segment has been formulated from consultation with staff.
Gravel Roads	**25%**	**85%**	⬇	The Inventory data has been completed through consultation with staff. The Township currently does not have a formal policy for documenting gravel road condition. The Valuation of each road segment has been formulated from consultation with staff.

Program Area	Inventory and Condition	Valuation	Data Confidence Trend	Comments
Regulatory/ Warning Signs	**100%**	**100%**	⬆	• The Inventory data has been delivered by staff in multiple data formats with extensive detail on the condition and location of each sign. • The Valuation of each sign has been formulated with consultation from staff.
Sidewalks	**100%**	**75%**	➡	• Inspection data was not adequate in creating condition profiles for each sidewalk. • The Inventory and condition data for sidewalks has been compiled through a visual assessment in summer of 2018 by UEM staff. Discontinuity in the sidewalk surface was not verified by UEM staff. • Further, the valuation of each sidewalk has been formulated through professional recommendations from UEM staff.
Street Lights	**25%**	**75%**	⬇	• The Inventory data for street light fixtures is evolutionary as the Township upgrades to LEDs. The pole locations have been compiled from delivered datasets from the Township. • Pole condition has been developed through random sample assessment by UEM staff. • The valuation of each street light pole has been developed through recommendations by UEM staff.

Program Area	Inventory and Condition	Valuation	Data Confidence Trend	Comments
Storm Sewers	**25%**	**50%**	⬇	• The Inventory and condition data for Storm Sewers have been acquired through consultation with Puslinch Staff. • There is no condition for any storm sewer asset in the Township of Puslinch. • The valuation of each Storm Sewer segment has been developed through recommendations by UEM staff.
Buildings and Facilities	**100%**	**85%**	⬆	• The Inventory data has been compiled from the 2014 Buildings Inspection report. • The valuation of each building component was sourced by UEM staff whereas repair/remediation activities have been sourced from the 2014 Buildings Inspection report.
Fire Equipment	**100%**	**100%**	⬆	• The Inventory data is extensive and was delivered by Puslinch staff. • The Valuation of each asset was delivered by Puslinch staff.
Fire Reservoirs	**85%**	**100%**	⬆	• The Inventory data is extensive and was delivered by Puslinch staff. The condition for each Fire Reservoir has been sourced from consultation with Puslinch staff. • The valuation of each Fire Reservoir was developed through recommendations by UEM staff.

Program Area	Inventory and Condition	Valuation	Data Confidence Trend	Comments
Storm Water Management Ponds	**95%**	**75%**	⬆	• The Inventory data has been compiled from the 2017 Storm Water Management Inspections. • The Valuation of each asset was delivered by Puslinch staff. The valuation of each Storm Water Management Pond has been developed through recommendations by UEM staff.
Parks and Recreation	**95%**	**75%**	⬆	• The Inventory and condition data for Parks and Recreation was compiled through a visual assessment in summer of 2018 by UEM staff. • The Valuation of each Park and Recreation asset was delivered by Puslinch staff and through UEM's recommendations.
All Fleet Assets	**100%**	**100%**	⬆	• The Inventory data was compiled by Puslinch staff and from the fleet management analysis report. • The condition for each vehicle was compiled from the fleet management analysis report with help by Puslinch staff. • The valuation of each vehicle was compiled from the fleet management analysis report.
Street Trees	**50%**	**100%**	⬇	• The Inventory data was delivered by Puslinch staff. This inventory does not reflect all the known Street Tree assets in the Township of Puslinch. • The condition of each asset is unknown. • The valuation of each tree asset has been delivered by Puslinch staff.

6.0 - 7 Data Trend Summary Table: Puslinch Asset Classes

6.11 Asset Registry Data Quality Score

B

Data Quality Score Summary:

The Asset Registry has a very good data foundation but, in some areas, requires improvement. For that reason, the data quality score for the asset registry is a B. To improve the quality data score UEM recommends taking certain actions in the **Areas of Improvement** as follows.

Areas of Improvement:

Gravel Roads: As per the proposed service level policy all gravel roads have been assumed to have a PCI of 90. This assumption is based strictly on staff understanding of the gravel surface from a maintenance perspective. Moving forward, grading activities should be stored in a tabular format and used as a basis of condition tracking. This recommendation is consistent with the recommendations section of this report.

Sidewalks: Sidewalk inspections should be more adequate, with more technical details to create a condition score that is akin to the proposed service level policy. Such technical details should include a report of any discontinuity in the sidewalk surface and a condition rating that ranges from 1-5.

Street lights: A full condition assessment of each pole should be conducted in order to adequately assess the possible capital needs in the future.

Street Trees: An identification of each Street Tree and input into the Asset Registry with species type, location and lifecycle attributes should be undertaken as a future activity.

Storm Sewers: Verification of location and full condition assessment of each storm sewer catch basin and outlets.

7.0 State of The Infrastructure

This section of the Asset Management Plan documents the current condition of assets using the best available information regarding physical condition, age, and financial data. Replacement values were assigned to each asset based on current unit pricing generated from research for each specific asset class. Information sources, assumptions and asset-specific information are discussed in subsequent sections, with an overview provided in the section below.

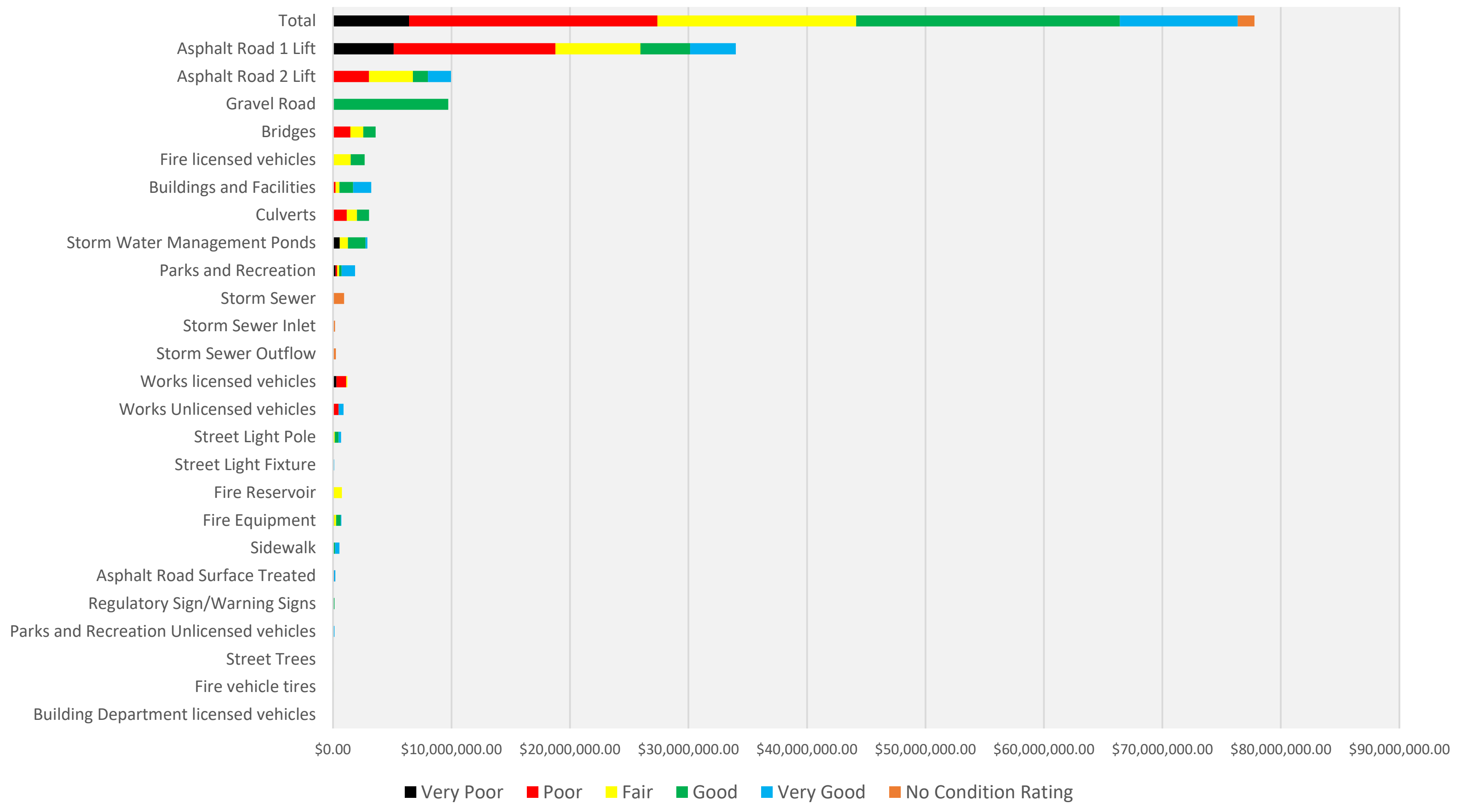
7.1 Total Asset Replacement Cost

UEM through data provided by the Township has estimated that the total asset replacement cost for all assets owned by the Township is $77.7 million dollars as of 2018.

7.2 Lifecycle Management Methodology

To plan and project for future expenditures, an asset can either be scheduled to be replaced based on a condition assessment or assumed to reach a critical state of repair at a certain point in time. This point in time is calculated based on its construction year and expected life. The asset registry has incorporated both types of lifecycle management, which when analyzed with no recognition of the asset classes results in skewed results. For this reason, each asset class was analyzed independently to give a realistic picture of the lifecycle management strategy, potential capital expenditures, and risk.

7.3 Total Asset Replacement Cost by Asset Class



As stated in section 6 of this report, the replacement cost calculation for each asset has been determined using the best-known information available. Once each assets replacement cost was calculated each asset was summarized to it's appropriate asset class grouping to acquire the total replacement cost for the asset class. The result of this analytics is the above figure.

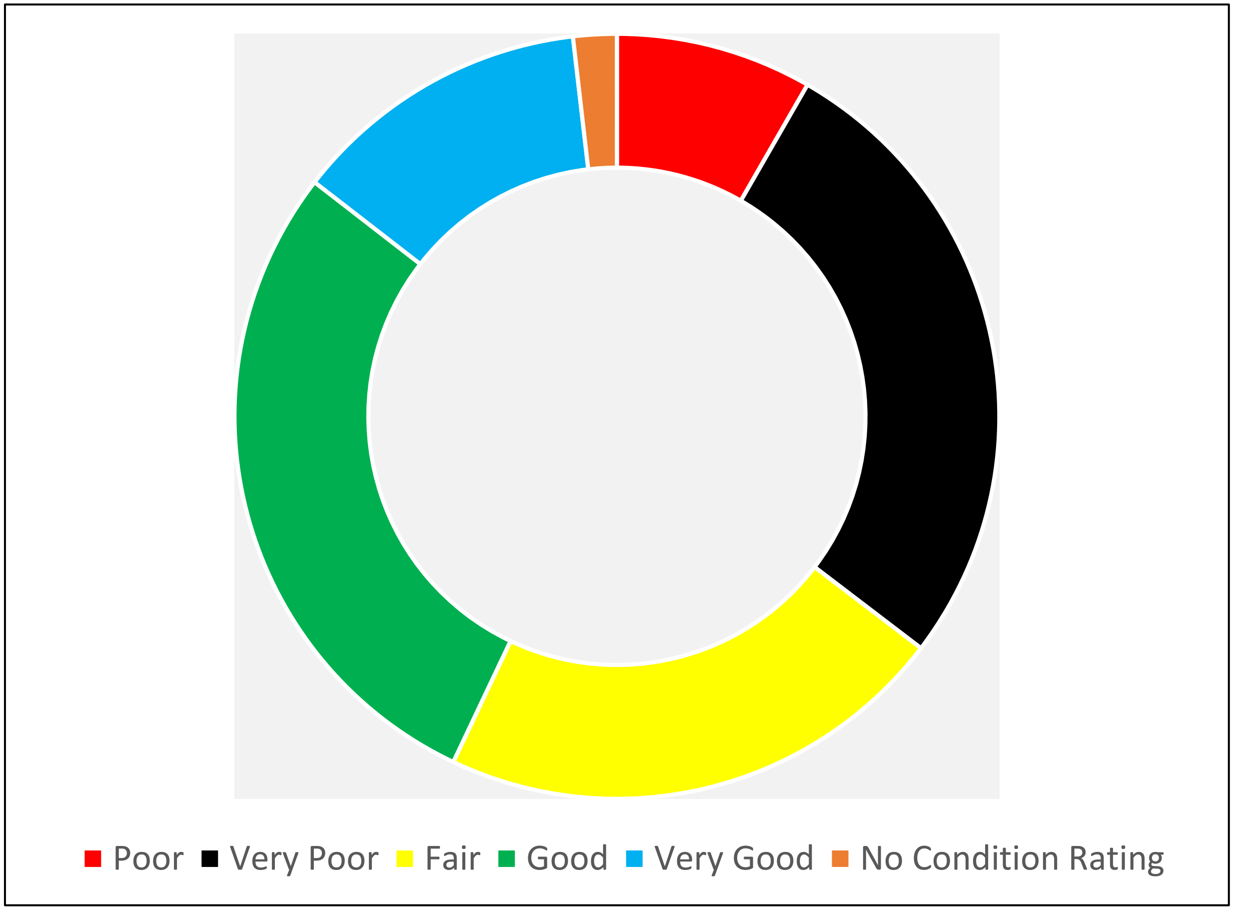
7.0 - 1 Total Asset Replacement Cost by Asset Class

7.4 Sum-Total: Puslinch Assets Classes Asset Rating Categories

The total asset replacement cost is illustrated in Figure 2. This pie graph showcases the financial impacts that each rating category may have on capital planning and budgeting.

UEM recognizes that assets are only scheduled for replacement/remediation when they reach a critical state based on lifecycle or on a condition assessment. A key component of this asset management plan is incorporating the lifecycle and expected replacements into the 10-year capital plan.

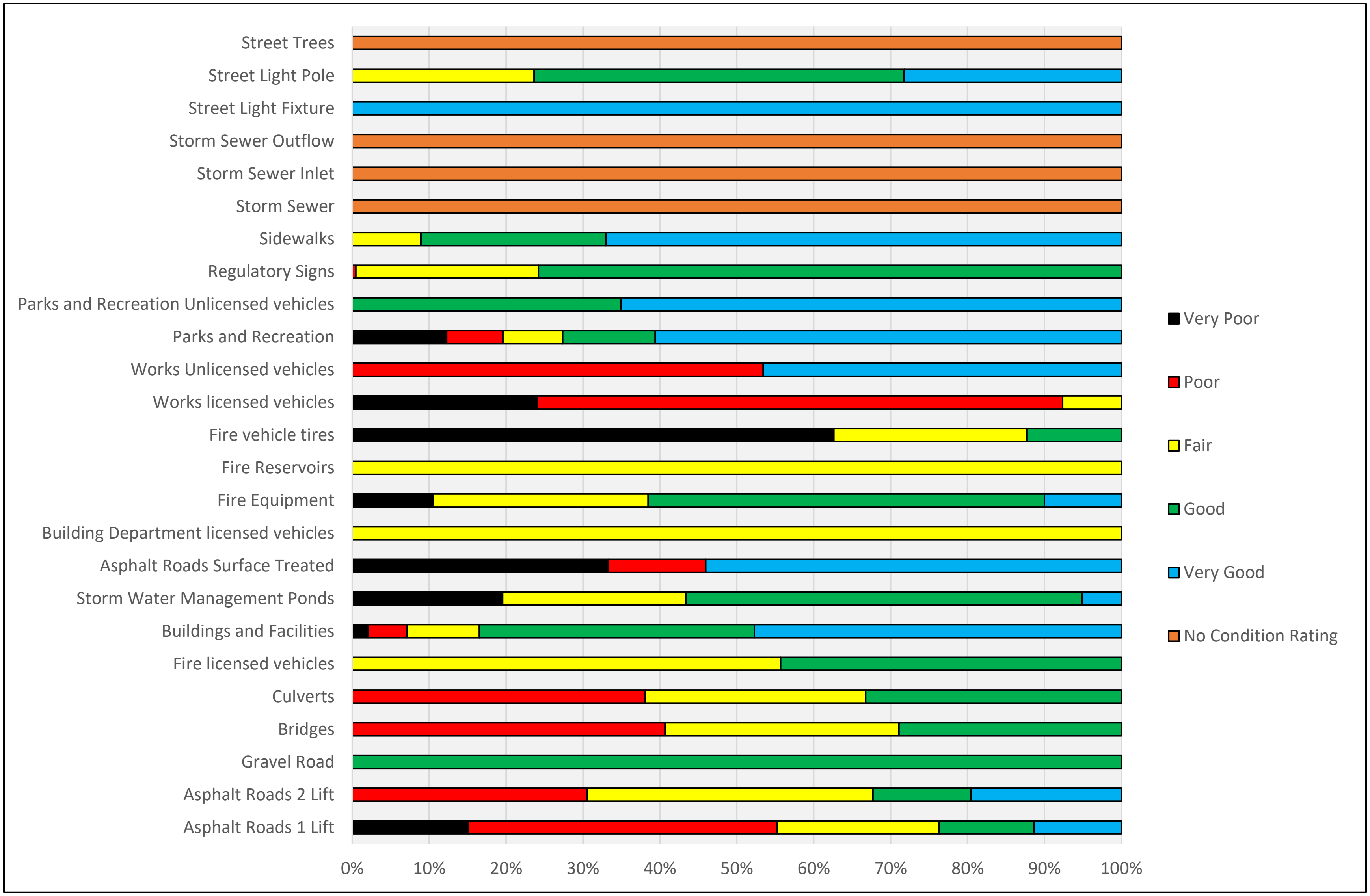
Figure 2 is intended to illustrate, at the highest level, the state of the infrastructure as it relates to the condition ratings of all asset classes.



7.0 - 2 Total Asset Replacement Cost by Rating Category

No Condition Rating	Very Poor	Poor	Fair	Good	Very Good	**Total**
$1.4 Million	$6.4 Million	$20.9 Million	$16.8 Million	$22 Million	$9.8 Million	$77.7 Million

7.5 Asset Condition Rating: Puslinch Asset Classes



7.0 - 3 Asset Rating Distribution All Asset Classes

7.6 Bridges

Lifecycle Management Methodology:

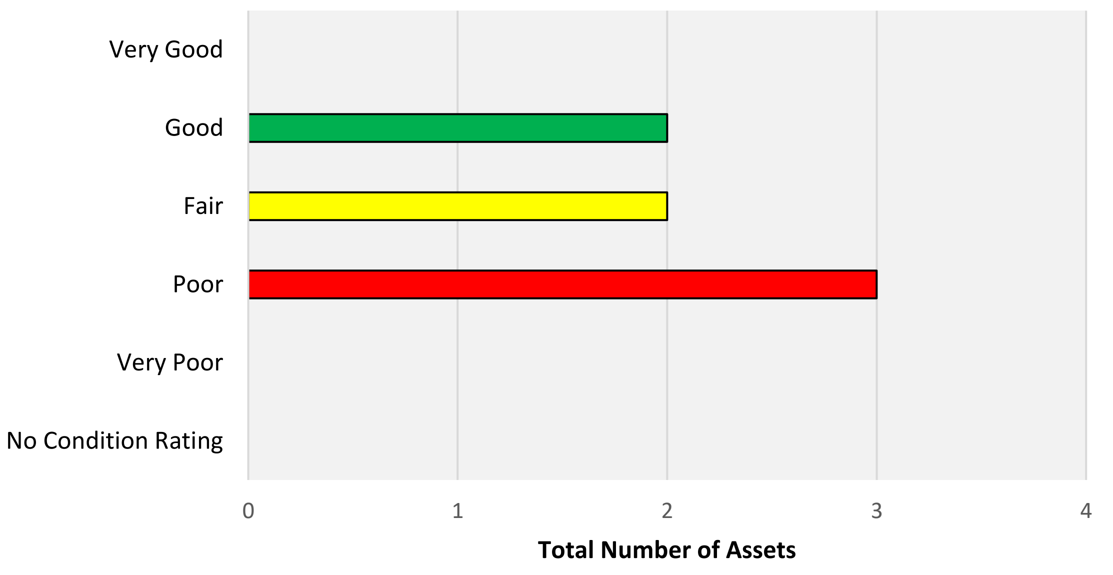
Bridge structures in Puslinch were inspected in 2017 by qualified engineers in order to describe their condition. Bridges based on their BCI on average are in "fair" condition. Though the condition of some bridges is "Poor" the lifecycle management methodology (extracted from the Bridge and Culvert Inspection report) resulted in repairs for a few identified bridge structures. Thus, the BCI was not the leading factor when determining lifecycle activities for Bridges. However, the BCI does infer upon probable future expenditures should further deterioration occur on the structure.

Replacement Cost Calculation:

Bridge Replacement cost has been sourced from the 2017 bridge and culvert inspection report. For all assets in this asset registry $6,500 per square metre was used as a baseline replacement cost.

Source Documentation:

2017 Bridge and Culvert Inspection Summary Report. *August 2017*



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$-	$1,460,680.00	$1,092,650.00	$1,039,090.00	$-	$3,592,420.00

7.7 Culverts

Lifecycle Management Methodology:

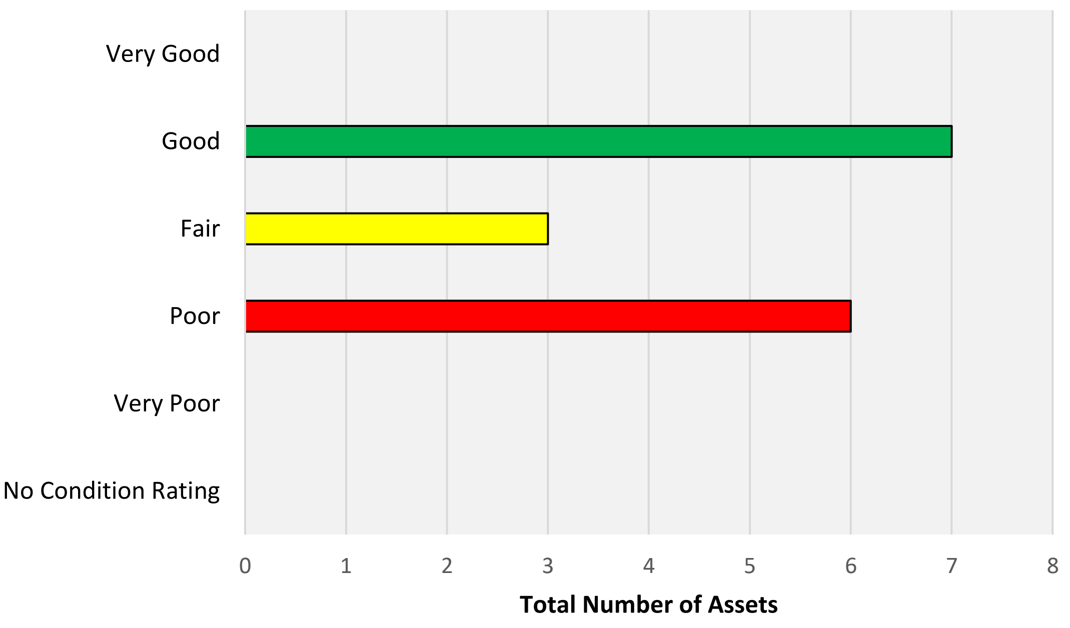
Culvert structures in Puslinch were inspected in 2017 by qualified engineers in order to describe their condition. Culverts based on their BCI are on average in “fair” condition. Though the condition of some Culverts is “Poor” the lifecycle management methodology (extracted from the Bridge and Culvert Inspection report) resulted in repairs for a few identified culvert structures. The BCI was not the leading factor when determining lifecycle activities for Culverts. However, the BCI does infer upon future expenditures should further deterioration occur on the structure.

Replacement Cost Calculation:

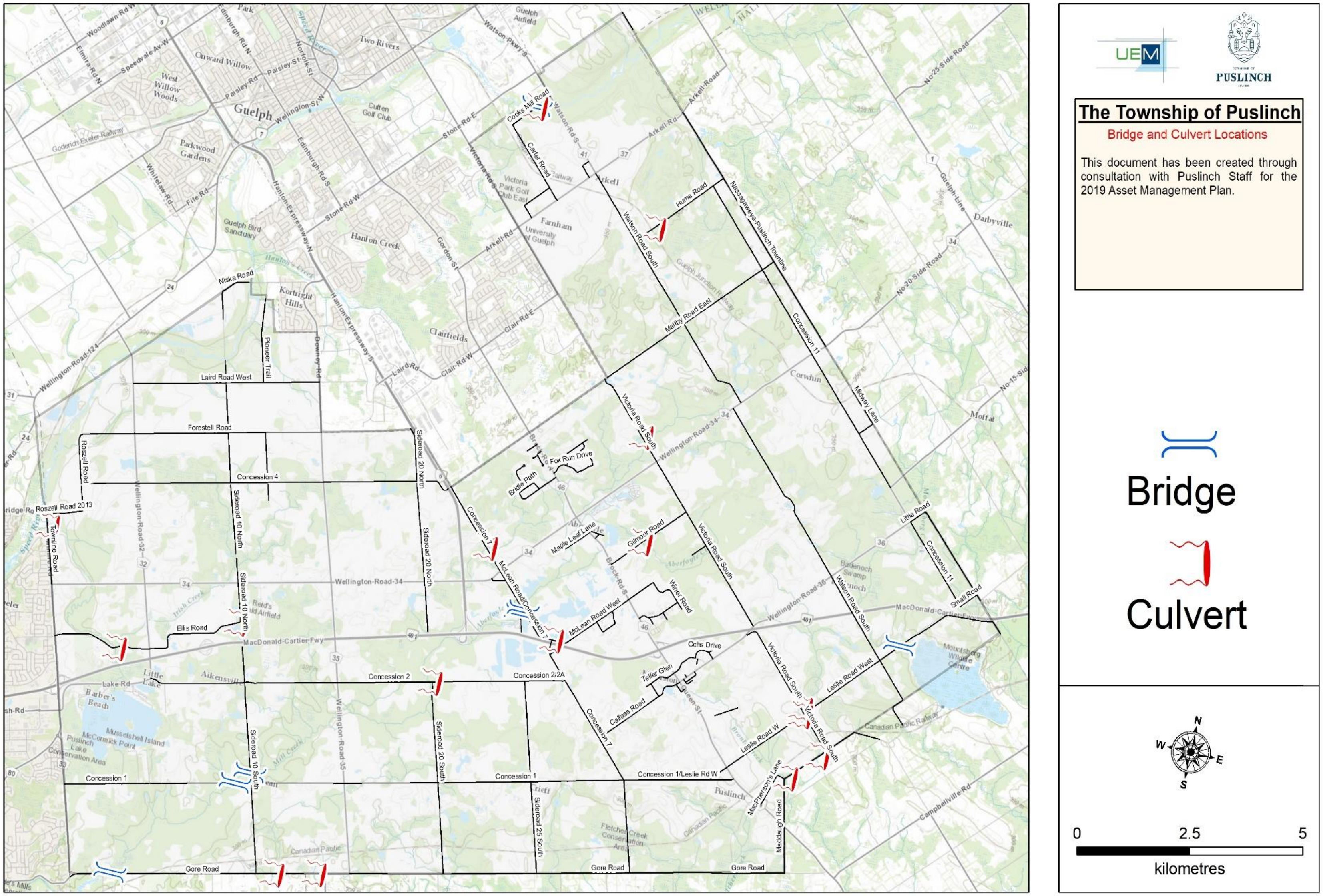
Culvert replacement costs have been sourced from the 2017 bridge and culvert inspection report. For all culvert assets in this asset registry $4,500 per square metre was used as a baseline replacement cost.

Source Documentation:

2017 Bridge and Culvert Inspection Summary Report. *August 2017*



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$-	$1,155,780.00	$869,535.00	$1,008,328.50	$-	$3,033,643.50



7.0 - 4 Bridge and Culvert Locations

7.8 Roads – 1 Lift, 2 Lift, Surface Treated and Gravel Roads

Lifecycle Management Methodology:

Road structures in Puslinch were inspected in 2016 by qualified engineers to describe their condition. The road network condition based on each road segment's PCI, is on average in "fair" Condition. The lifecycle management methodology for lifecycle activities is based on a threshold PCI index of 65 for class 3 roads, 60 for class 4 roads and 60 for class 5 roads.

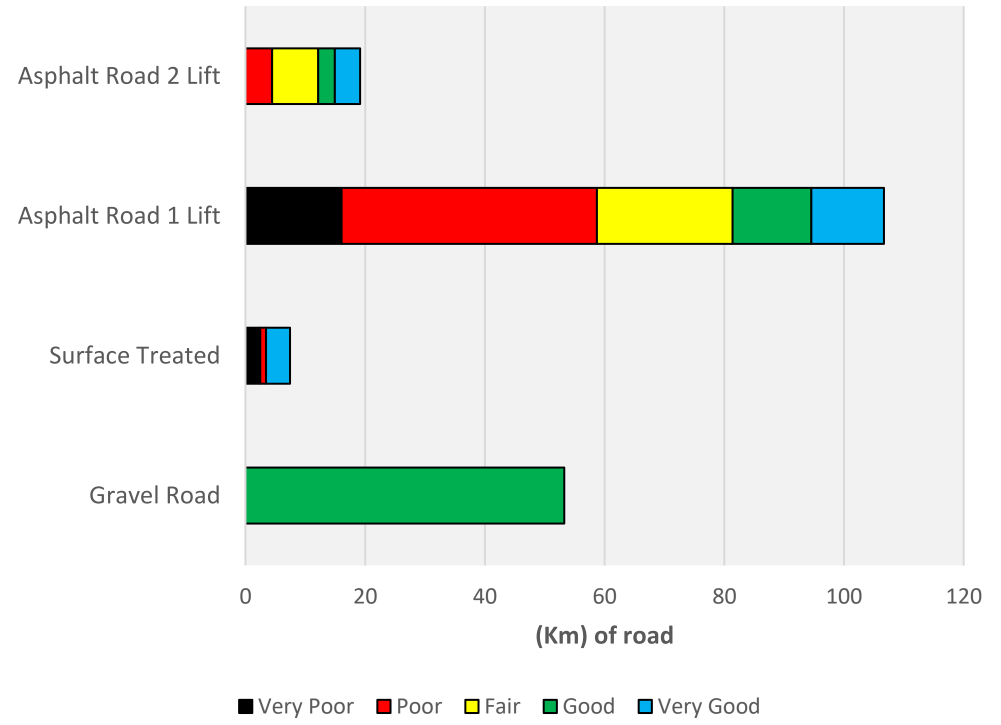
Replacement Cost Calculation:

Two Lift Hard Surface roads have been calculated to be replaced at a cost of $461 per metre, One Lift at $318 per metre, Surface Treated at $56 per metre and gravel roads at $177.5 per metre.

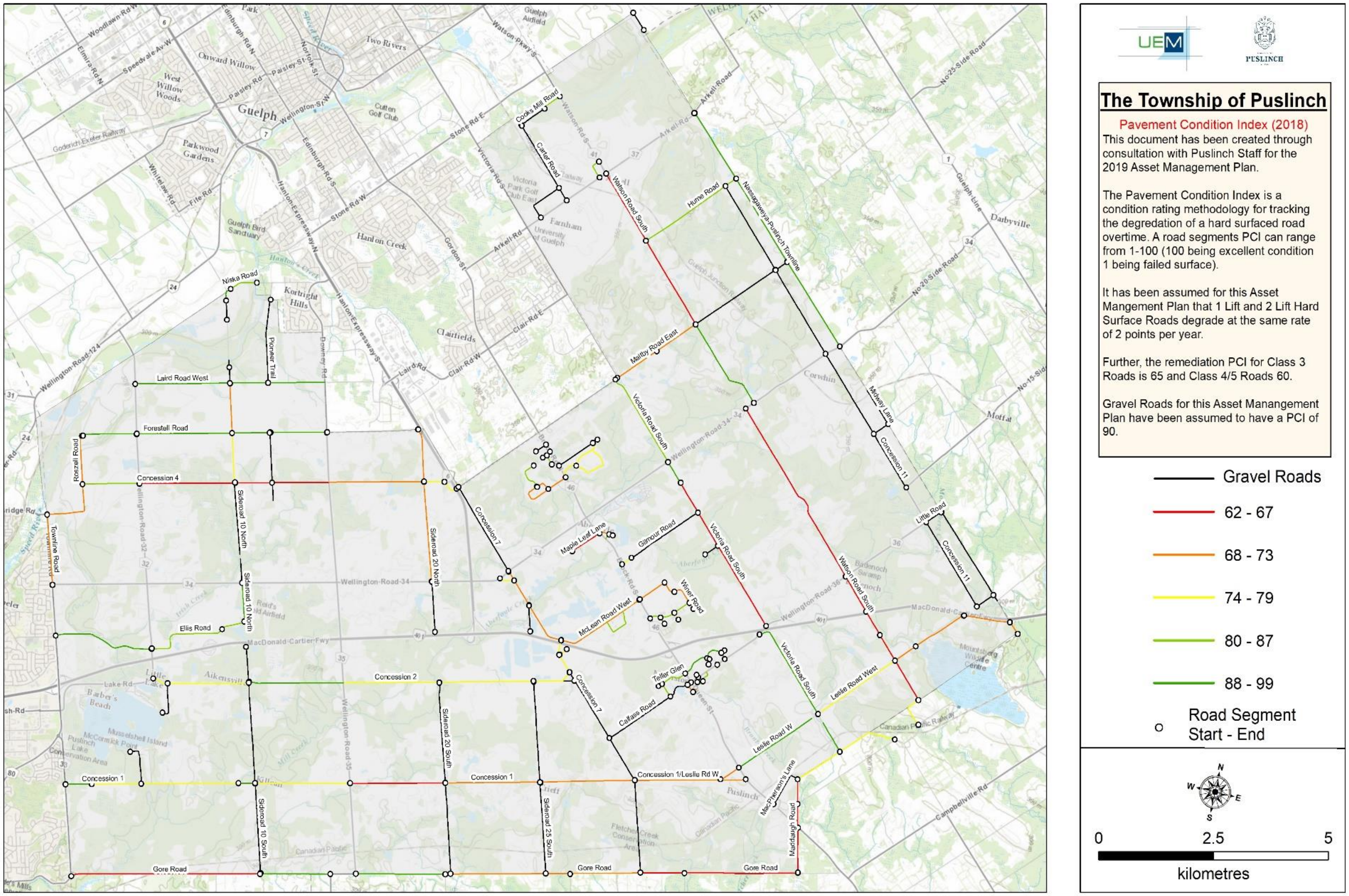
Source Documentation

2016 Road Condition Assessment

Tender Advertisement 2018 Road Rehabilitation and Culvert Upgrades Township of Puslinch Contract NO. PW18



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$5,182,937.41	$16,726,891.38	$10,872,475.22	$15,188,380.90	$5,917,478.54	$53,888,163.44



The Township of Puslinch

Pavement Condition Index (2018)

This document has been created through consultation with Puslinch Staff for the 2019 Asset Management Plan.

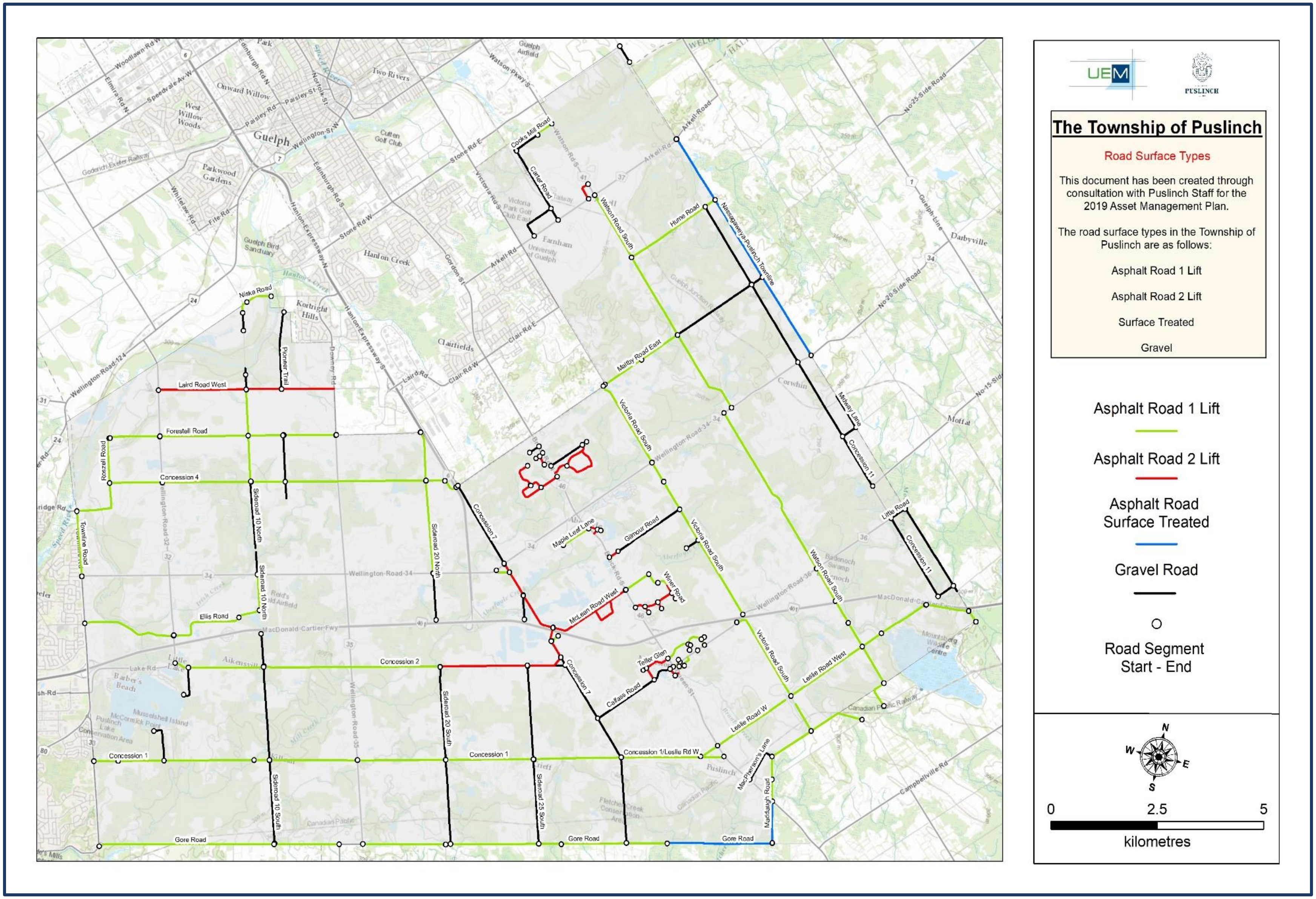
The Pavement Condition Index is a condition rating methodology for tracking the degredation of a hard surfaced road overtime. A road segments PCI can range from 1-100 (100 being excellent condition 1 being failed surface).

It has been assumed for this Asset Mangement Plan that 1 Lift and 2 Lift Hard Surface Roads degrade at the same rate of 2 points per year.

Further, the remediation PCI for Class 3 Roads is 65 and Class 4/5 Roads 60.

Gravel Roads for this Asset Manangement Plan have been assumed to have a PCI of 90.

7.0 - 4 Pavement Condition Index



The Township of Puslinch

Road Surface Types

This document has been created through consultation with Puslinch Staff for the 2019 Asset Management Plan.

The road surface types in the Township of Puslinch are as follows:

Asphalt Road 1 Lift

Asphalt Road 2 Lift

Surface Treated

Gravel

7.0 - 5 Road Surface Type Map

7.9 Buildings and Facilities

Lifecycle Management Methodology:

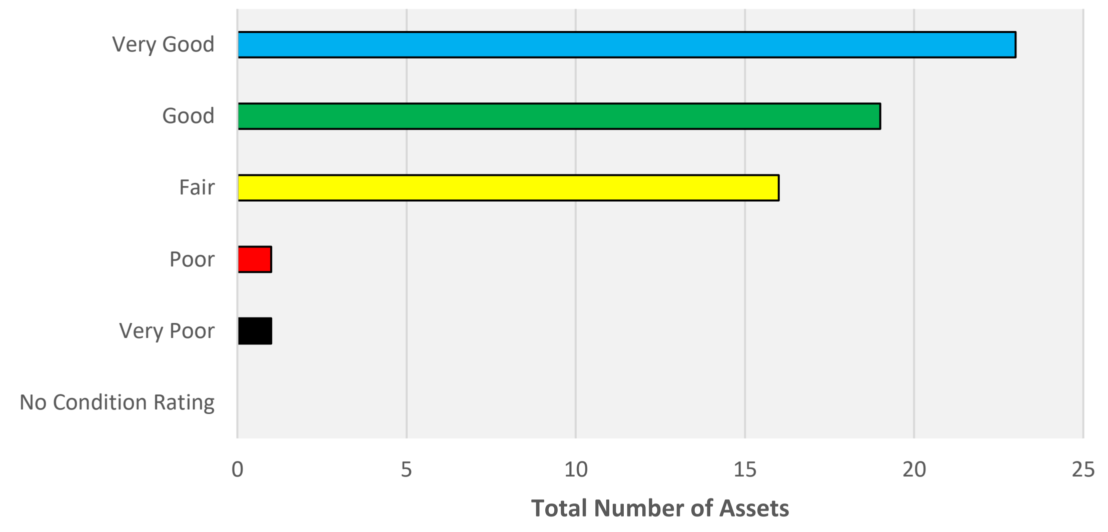
Building and Facilities were broken down into distinct components to create appropriate Lifecycle and Financial attributes. The components were as following: Structure, Roof, Walls & Windows, Interior Finishes, Mechanical, Electrical, Fire, Life-Safety, and Septic Tank. UEM identified these components and updated their condition according to available data provided from the 2014 Building Inspection Report. In the asset registry each component can be managed using a linear deterioration rate but the Townships current practice of following a remediation schedule is more appropriate and should continue.

Replacement Cost Calculation

The replacement cost for each Building and Facilities component has been individually assessed based on the component type. The costing methodology has been extracted exclusively from RS Means Square Foot Cost Data.

Source Documentation

Square Foot Costs with RS Means Data,



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$66,042.05	$162,750.00	$306,413.60	$1,156,772.66	$1,543,417.20	$3,235,395.50

7.10 Parks & Recreation

Lifecycle Management Methodology:

Parks & Recreation assets were individually assessed by UEM in the summer of 2018 through visual inspections. The assets were given a condition rating on a scale of 1-5 and as well an expected life based on the asset type. For all parks and recreation assets a linear deterioration rate was assumed. Lifecycle (replacement and remediation) events are triggered by an asset reaching its end of expected life.

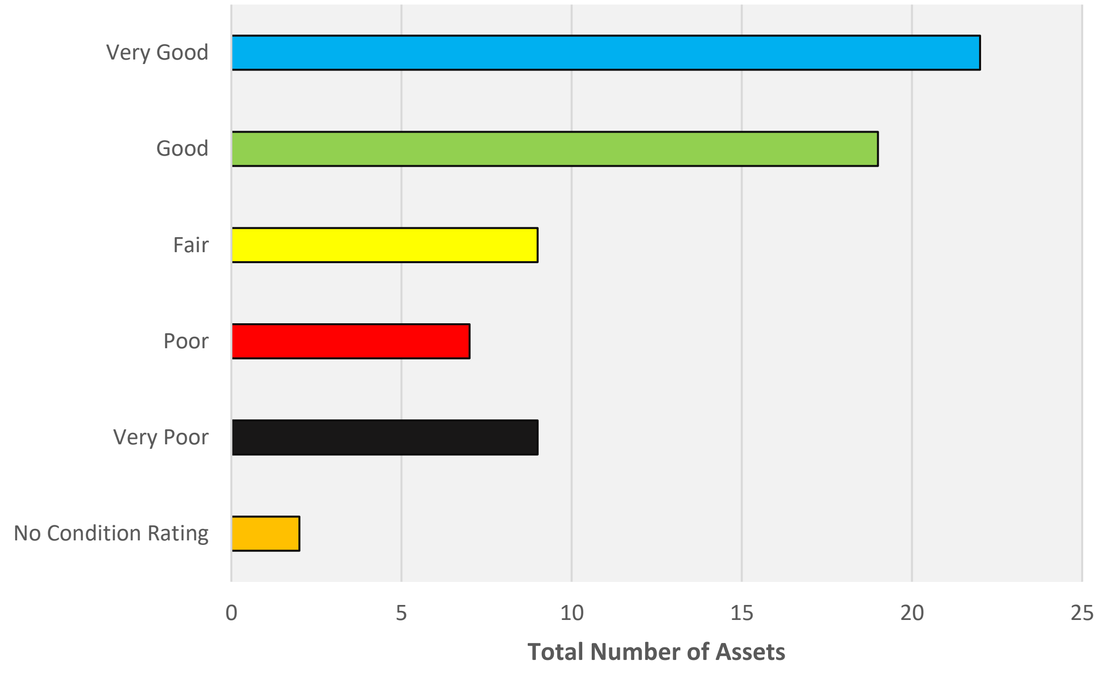
Replacement Cost Calculation

The replacement cost for each park and recreation asset has been individually assessed based on the asset type. Through documents provided by the Township and internal/external research each asset was provided a replacement cost. Further detail in regard to the specific cost calculations for each asset can be reference in the asset registry.

Source Documentation

Aberfoyle Ball Diamond Lighting Upgrades Contract.

Various Tender Documents provided by Township.



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$228,053.00	$136,273.00	$154,875.00	$243,506.50	$1,126,711.00	$1,859,018.50

7.11 Sidewalks

Lifecycle Management Methodology:

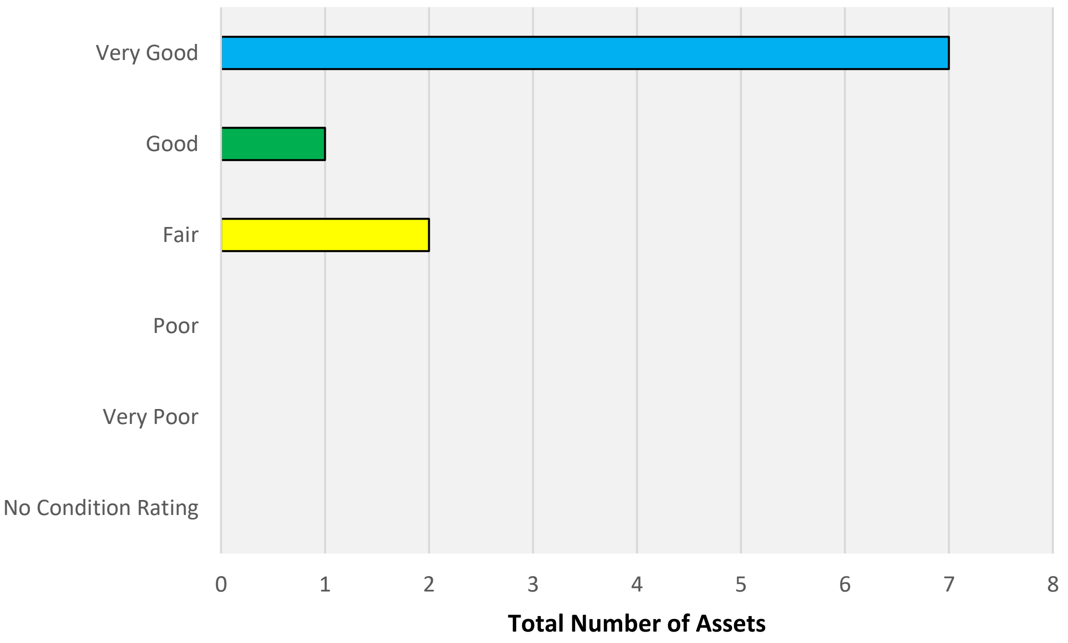
Sidewalk assets were individually assessed by UEM in the summer of 2018 through visual inspections. The assets were given a condition rating on a scale of 1-5 and as well an expected life based on the asset type. For all sidewalks a linear deterioration rate was assumed. Lifecyle (replacement and remediation) events are triggered by an asset reaching it's expected life or failure to adhere to O. Reg. 239/02: Minimum Maintenance Standard for Municipal Highways.

Replacement Cost Calculation:

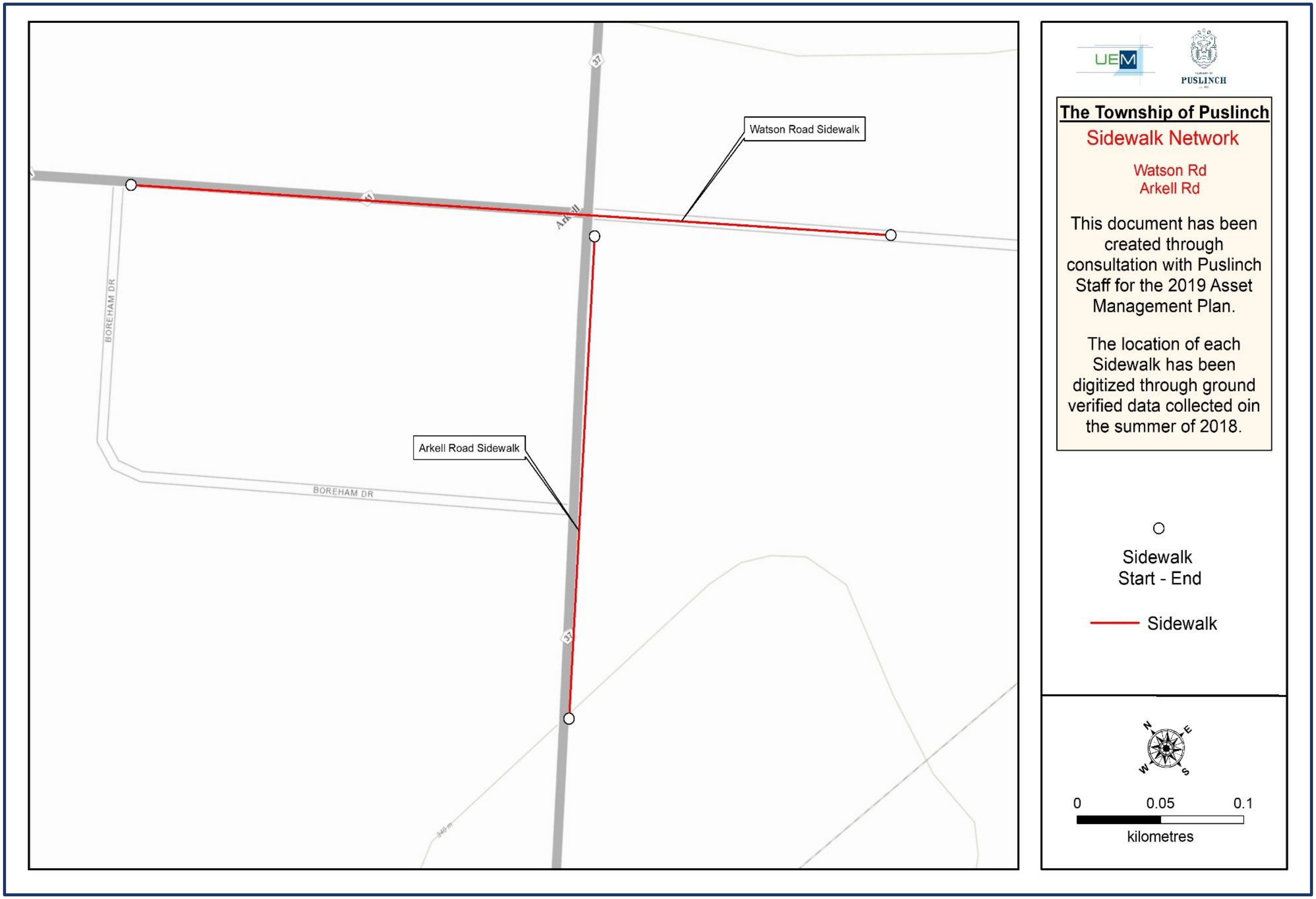
The replacement cost for sidewalks has been estimated at 143$ per linear metre.

Source Documentation

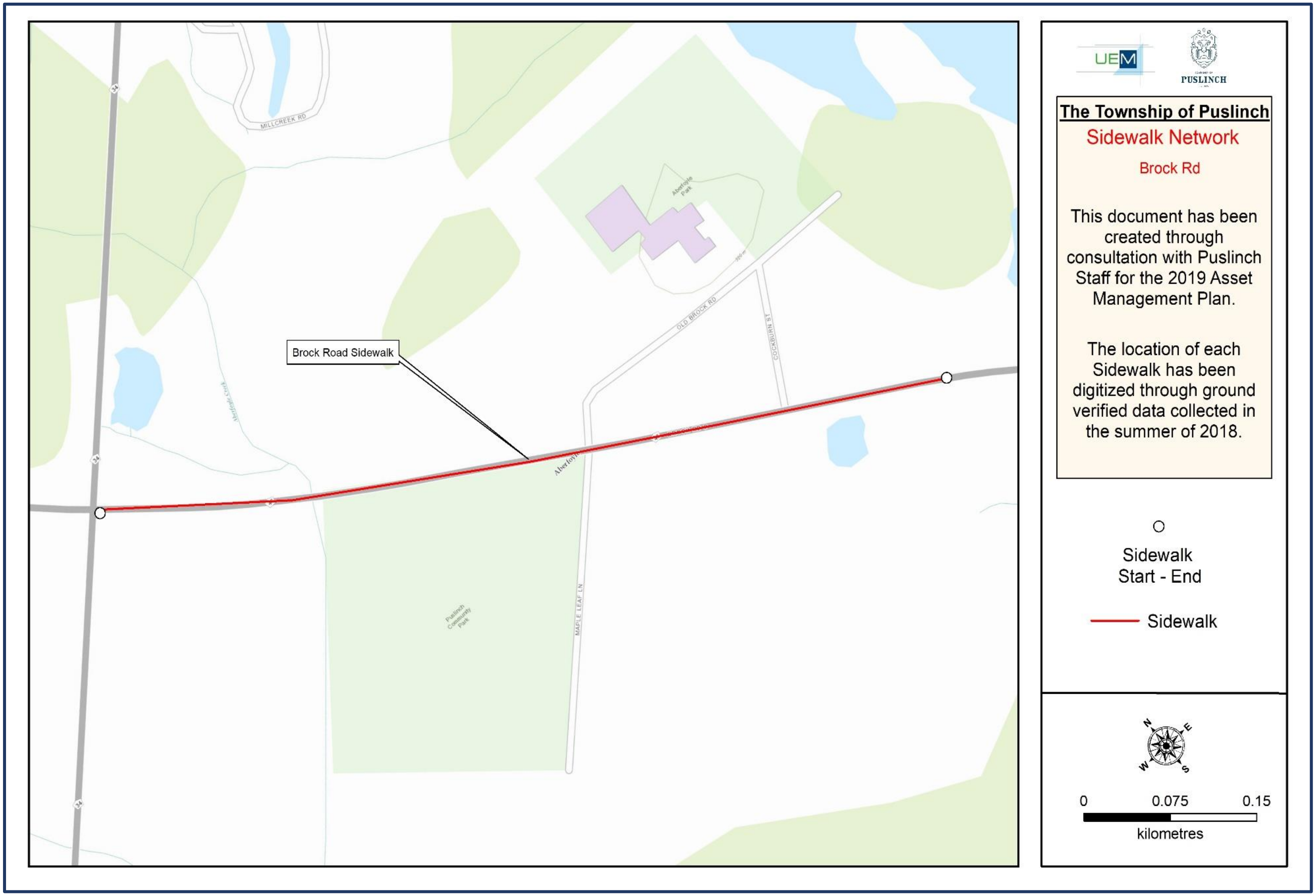
Professional Consultation with industry experts.



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$-	$-	$48,620.00	$131,131.00	$365,508.00	$545,259.00



7.0 - 6 Watson Road, Arkell Road



The Township of Puslinch

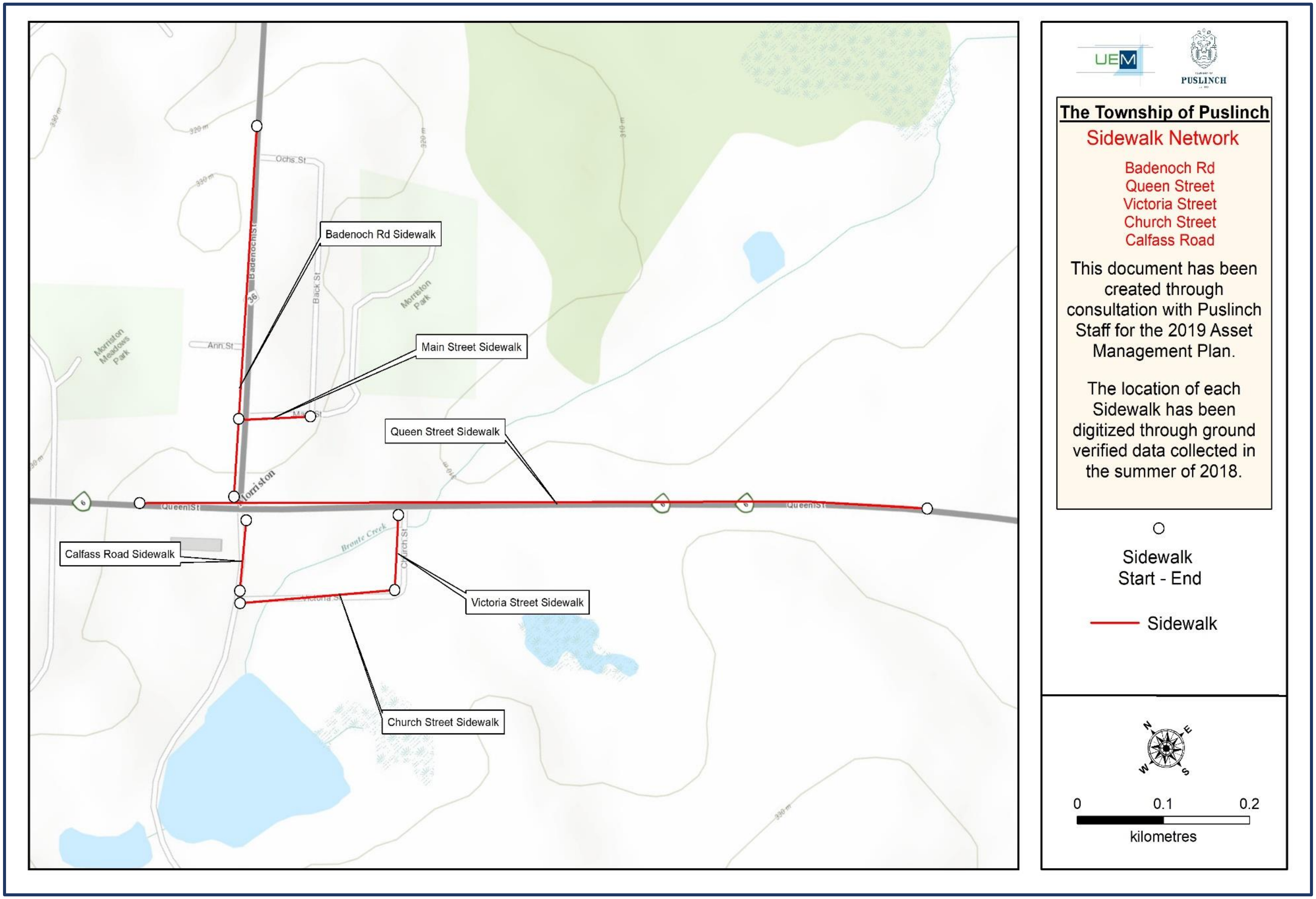
Sidewalk Network

Brock Rd

This document has been created through consultation with Puslinch Staff for the 2019 Asset Management Plan.

The location of each Sidewalk has been digitized through ground verified data collected in the summer of 2018.

7.0 - 7 Brock Road



7.0 - 8 Badenoch Road, Queen Street, Victoria Street, Church Street, Calfass Road

7.12 Fire Reservoirs

Lifecycle Management Methodology:

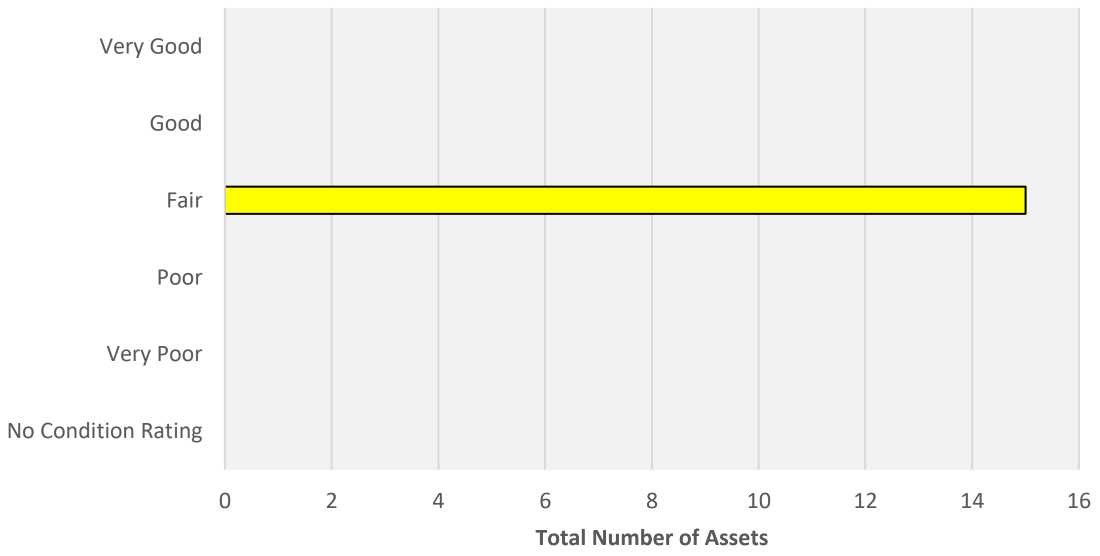
Fire Reservoirs were identified in the asset registry using the defined lifecycle attributes provided by UEM. Each Fire Reservoir was given a condition rating based on the proximity to its defined end of service life. The physical condition of the reservoir was not considered for condition assessment only the percentage of life remaining. The end of service life for Fire Reservoirs are assessed based on the condition data provided by individual inspections of each fire reservoir.

Replacement Cost Calculation:

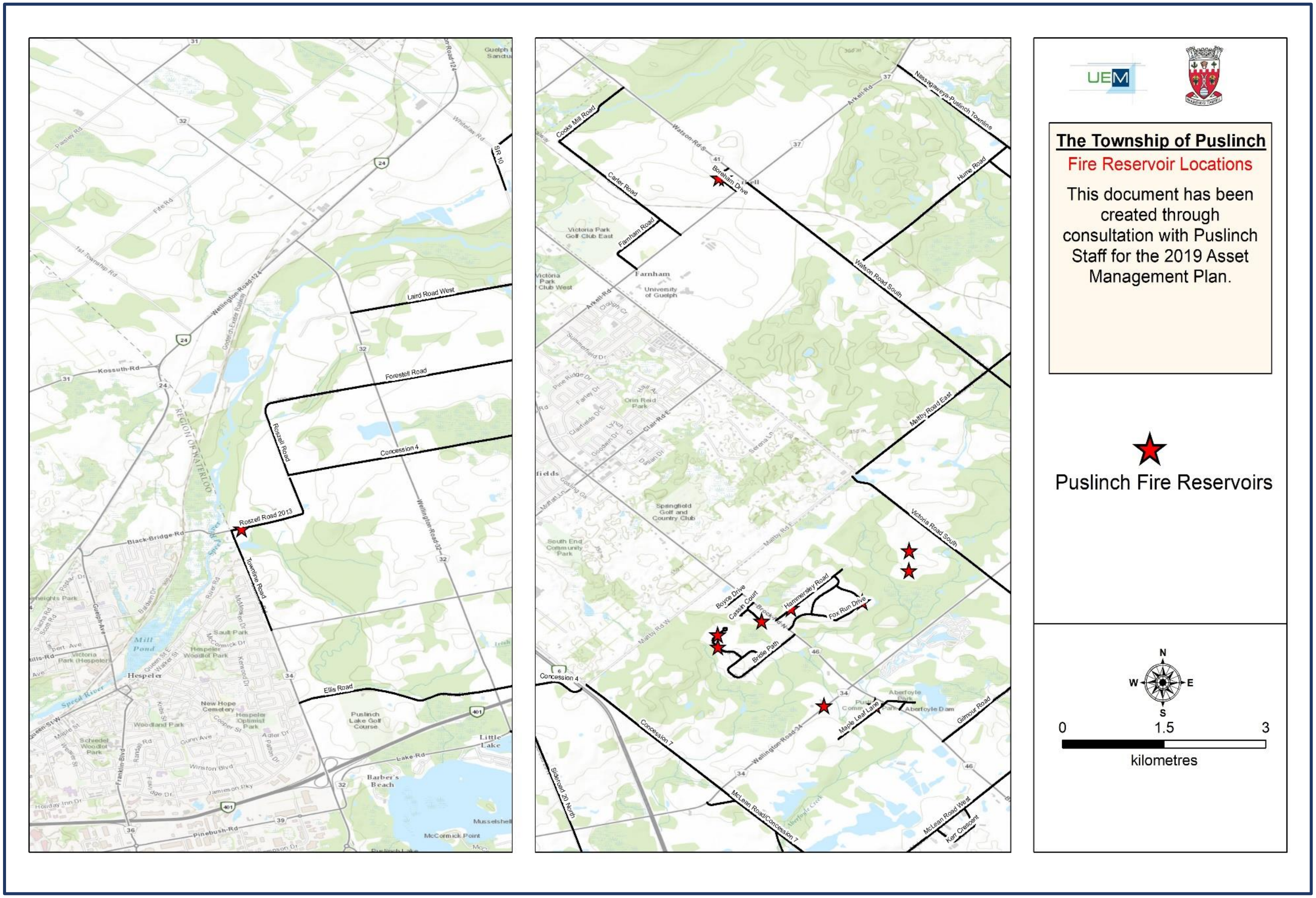
Each Fire Reservoir Asset has been loaded into the Asset Registry with a replacement cost of $50,000. This figure has been derived through UEM internal consultation.

Source Documentation

UEM Professional Recommendation



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$-	$-	$ 750,000.00	$-	$-	$ 750,000.00



7.0 - 9 Puslinch Fire Reservoir Locations

7.13 Fire Vehicle Assets - Fire Licensed Vehicles & Tires

Lifecycle Management Methodology:

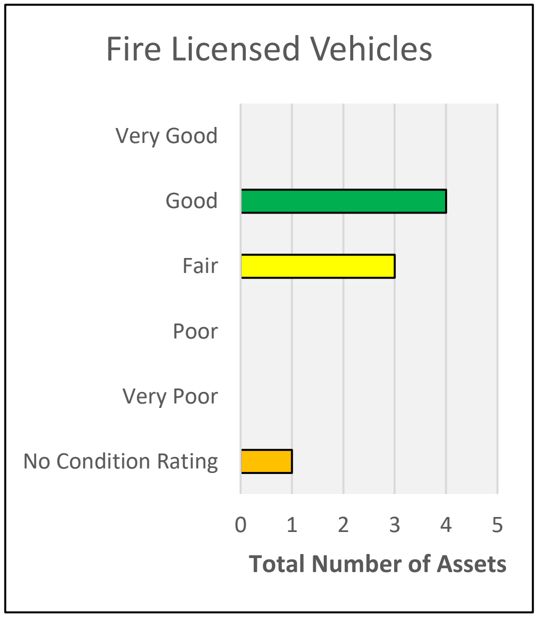
Fire Vehicle Assets were identified in the asset registry using the defined lifecycle attributes provided in the 2017 Fleet Management Report. Each Fire Vehicle asset was given a condition rating based on the proximity to its defined end of service life. The physical condition of the vehicle was considered for condition classification when available, however, the majority of fire vehicle assets condition ratings were defined based on its proximity to its expected end of service life which were formed by the Township's accepted Fleet Management Policies.

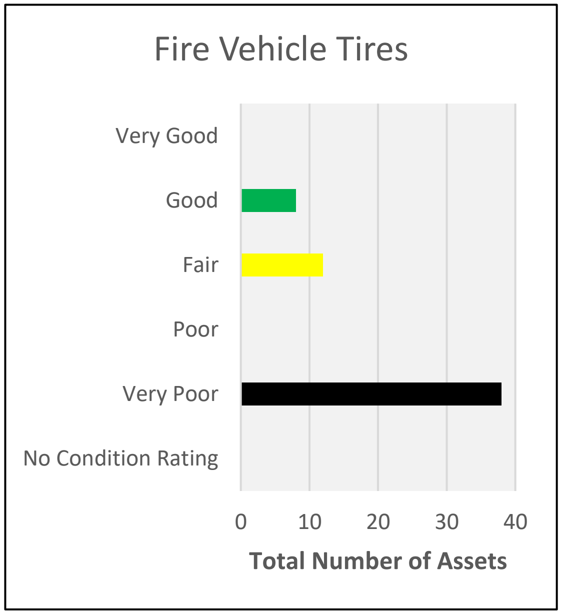
Replacement Cost Calculation:

Each Fire Vehicle asset has been individually valued based on the recommendations of 2017 Fleet Management Report and staff. For all vehicle assets in the asset registry the replacement cost should be loaded as a new vehicle replacement cost.

Source Documentation

Provided datasets by Township staff





Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$22,604.00	$-	$1,497,066.00	$1,187,426.00	$-	$2,707,096.00

7.14 Storm Water Management Ponds

Lifecycle Management Methodology:

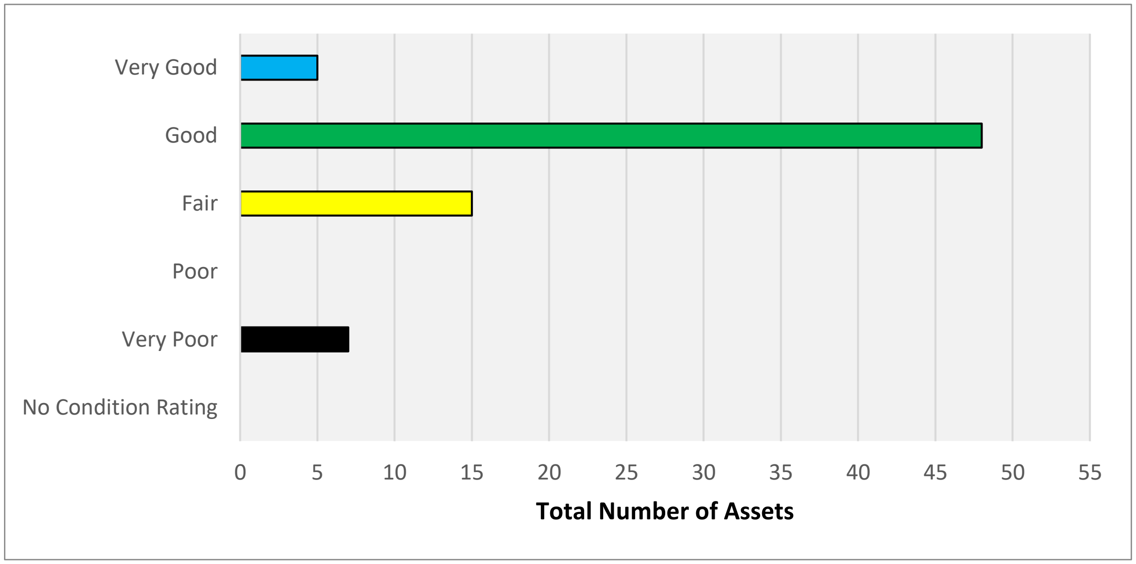
Storm Water Management Ponds were identified in the asset registry with a linear deterioration rate. However, in 2017 the Township acquired the services of a consultant to assess the state of repair of all storm water management ponds. This assessment provided a remediation schedule and comment on the general state of repair of each storm water management pond.

Replacement Cost Calculation:

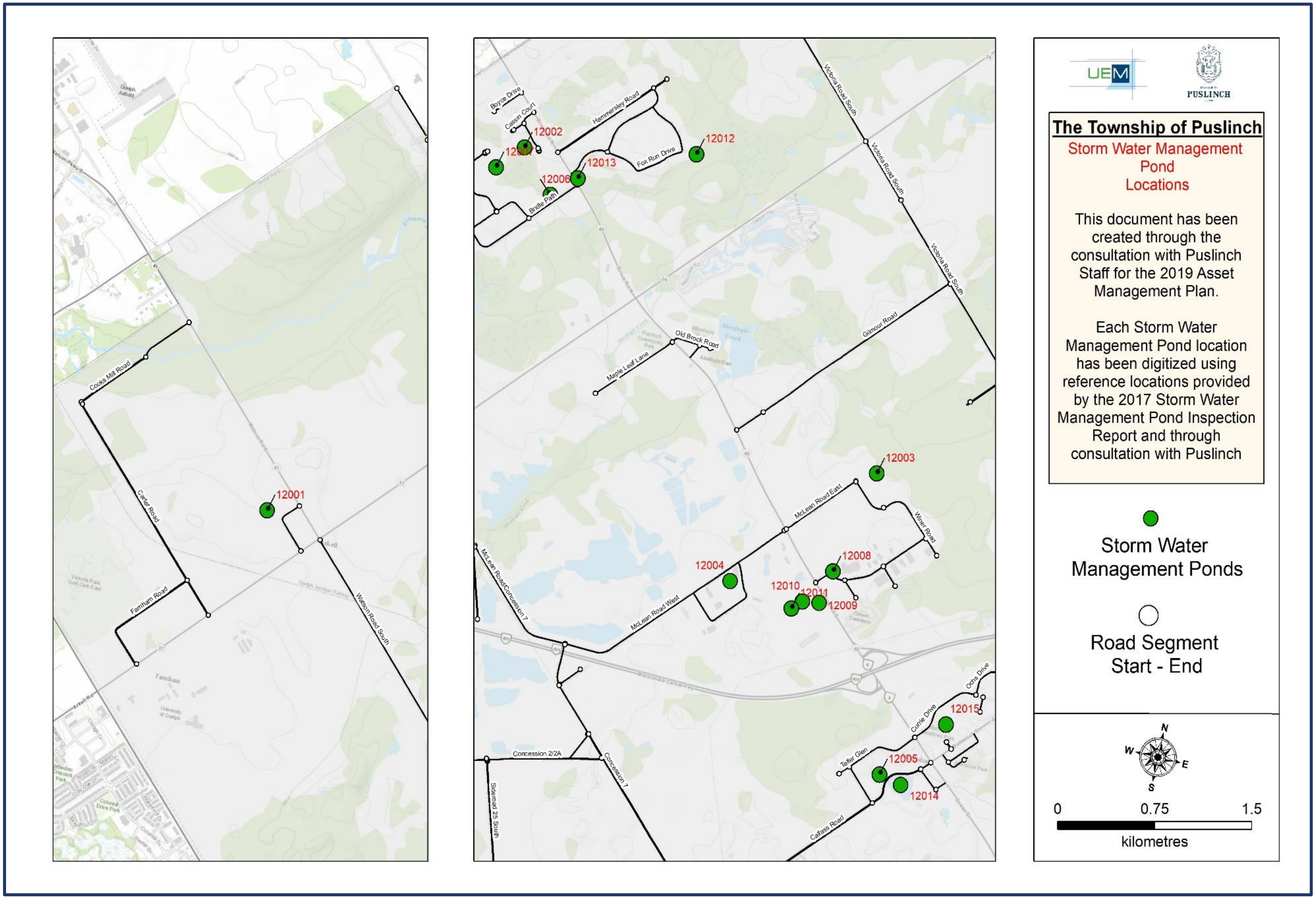
The replacement cost of each storm water management pond component has been individually calculated. The tailwall has been calculated at $2000, Headwall $2000, Outlet Device $2000, and the pond enclosure is the acquisition cost minus the tailwall, headwall and outlet device.

Source Documentation

Provided datasets by Township staff.



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$565,487.68	$-	$687,860.60	$1,490,273.45	$146,453.92	$2,890,075.65



7.0 - 10 Storm Water Management Pond Locations

7.15 Parks and Building Department and Equipment – Licensed & Unlicensed Vehicles

Lifecycle Management Methodology:

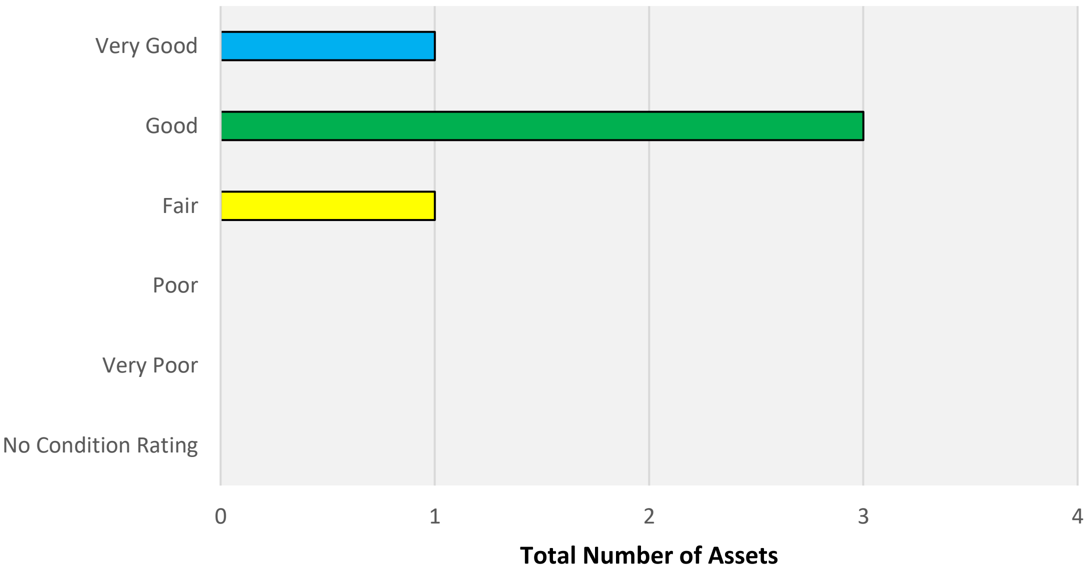
Parks and Building Department vehicle assets were identified in the asset registry using the defined lifecycle attributes provided in the 2017 Fleet Management Report. The physical condition of the vehicle was considered for condition assessment if it was available in the form of vehicle kilometers or the proximity to its end of expected life based on Township Fleet Management Policies. The same lifecycle management methodology is consistent for all identified Parks and Building Department vehicular equipment.

Replacement Cost Calculation:

Each Parks and Building Department Vehicle asset has been individually valued based on the recommendations in the 2017 fleet management report and staff. For all vehicle assets in the asset registry the replacement cost were loaded as a new vehicle replacement cost.

Source Documentation

Provided datasets by Township staff



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$-	$-	$33,000.00	$43,000.00	$80,000.00	$156,000.00

7.16 Works Department – Licensed & Unlicensed Vehicles

Lifecycle Management Methodology:

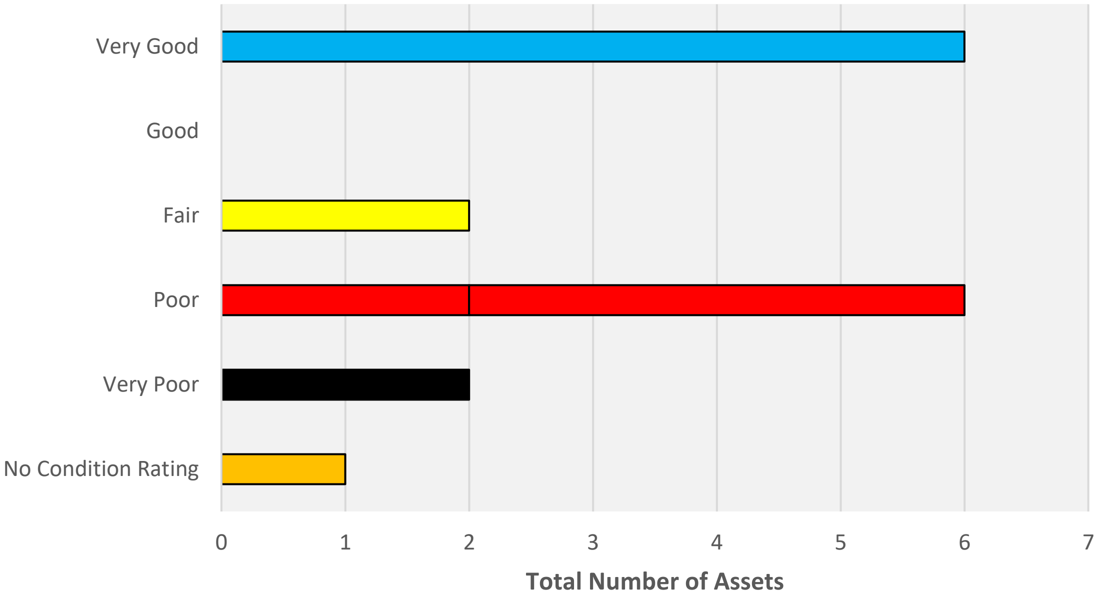
Works Vehicle Assets were identified in the asset registry using the defined lifecycle attributes provided in the 2017 Fleet Management Report. The physical condition of the vehicle was considered for condition assessment if it was available in the form of vehicle kilometers or the proximity to its end of expected life based on Township Fleet Management Policies. The same lifecycle management methodology is consistent for all identified works vehicle equipment.

Replacement Cost Calculation:

Each Works Vehicle asset has been individually valued based on the recommendations in the 2017 fleet management report and staff. For all vehicle assets in the asset registry the replacement cost were loaded as a new vehicle replacement cost.

Source Documentation

Provided datasets by Township staff



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$290,000.00	$1,300,000.00	$92,000.00	$40,000.00	$374,000.00	$2,096,000.00

7.17 Storm Sewers

Lifecycle Management Methodology:

Storm Sewer assets were identified in the asset registry using a linear deterioration rate for each individual asset component. There is no available condition data for storm sewers. For that reason, no condition data was entered into the asset registry

Geographic Information System

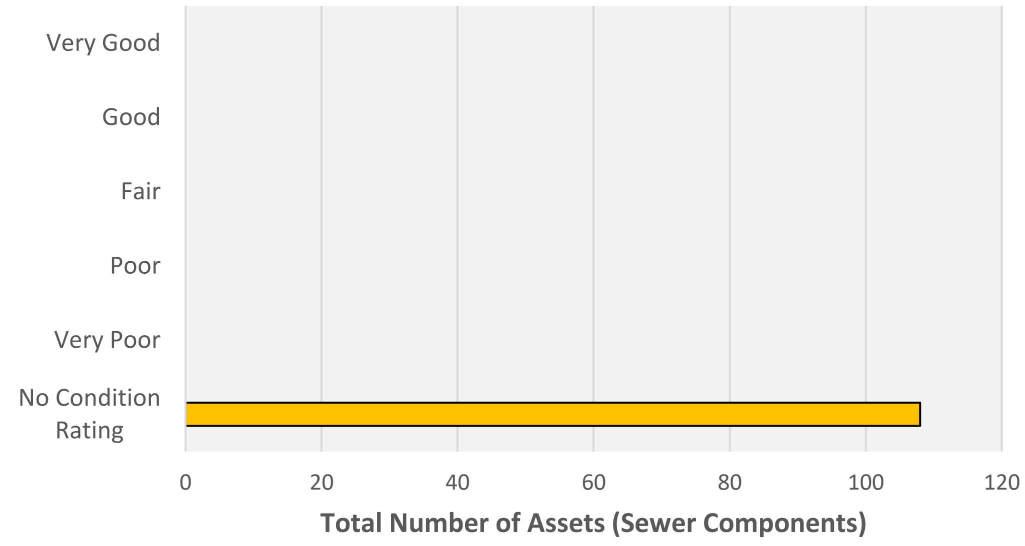
Each Storm Sewer Inlet, and Storm Sewer line has been generated through staff consultation. Field inspections of the spatial referencing has not been completed.

Replacement Cost Calculation:

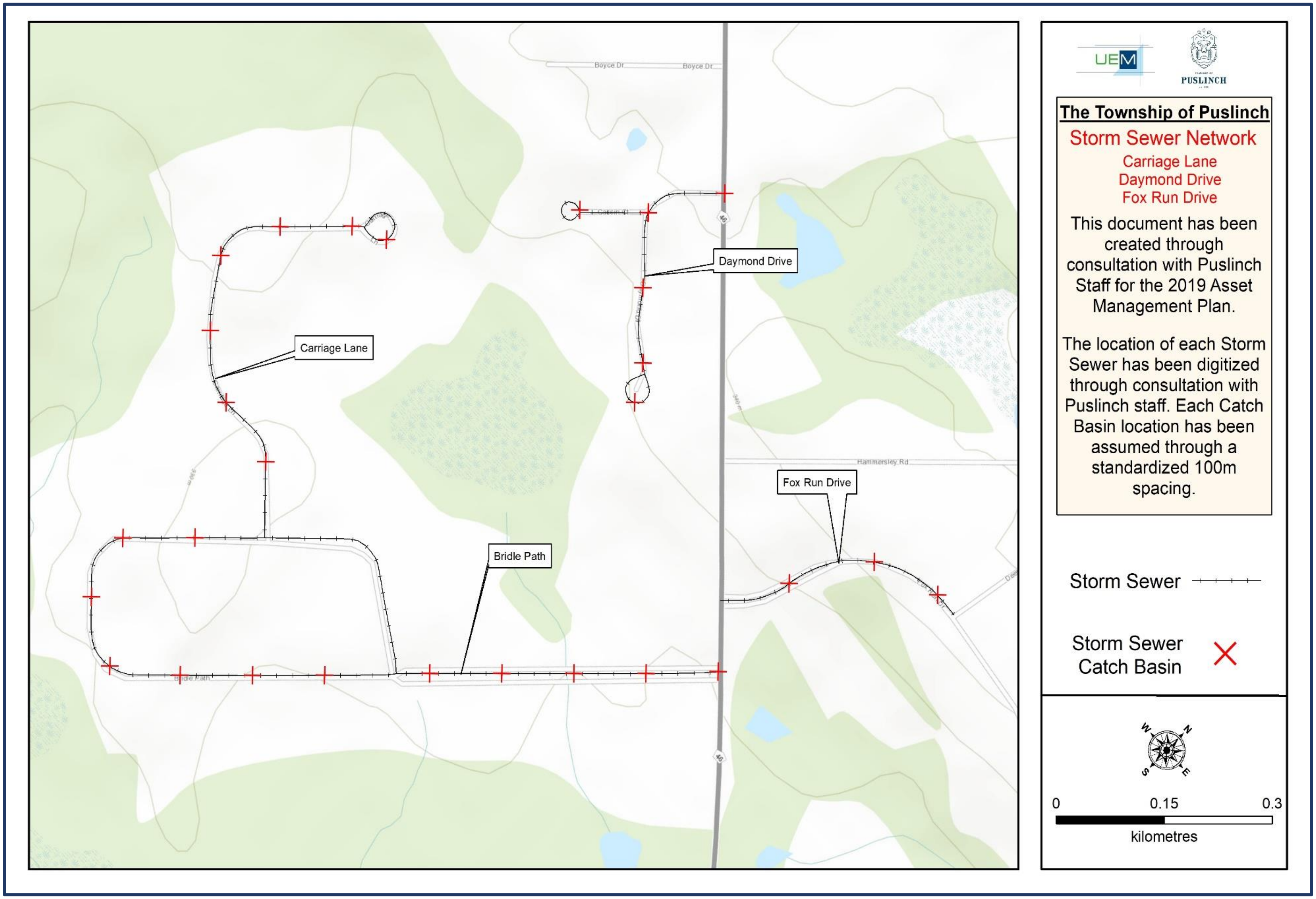
Replacement cost for the whole storm sewer system has been calculated based on unit costs of the Outlets at $5,000 and catch basins at $ 3,724. The whole storm sewer replacement cost is a function of the outlet, catch basins and linear storm mains at a replacement cost of 63$ per m. More detail can be sourced in the asset registry.

Source Documentation

Town of Friday Harbor, Storm Water Management Plan 2005



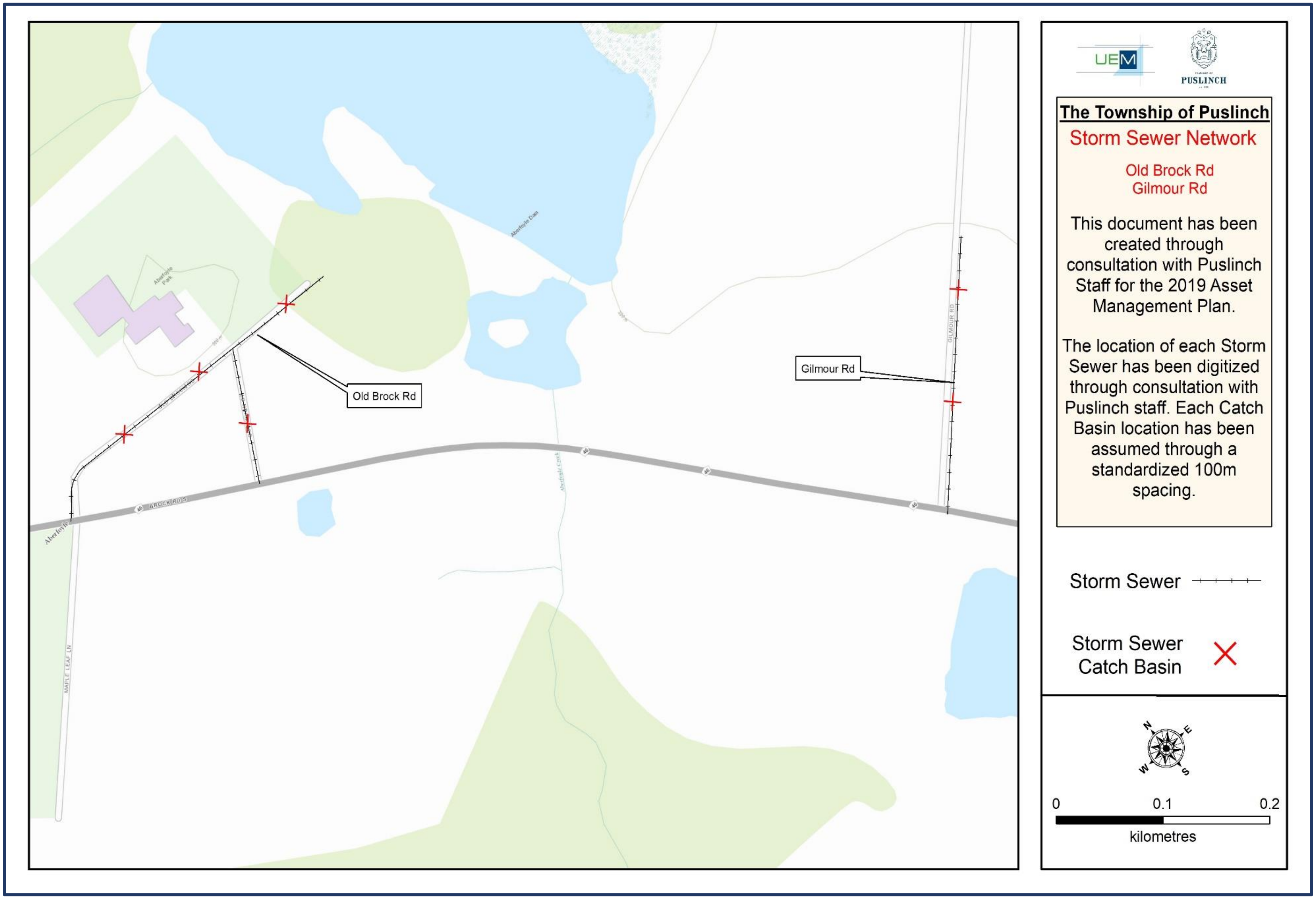
Total Replacement Cost
$1,360,711.11



This document has been created through consultation with Puslinch Staff for the 2019 Asset Management Plan.

The location of each Storm Sewer has been digitized through consultation with Puslinch staff. Each Catch Basin location has been assumed through a standardized 100m spacing.

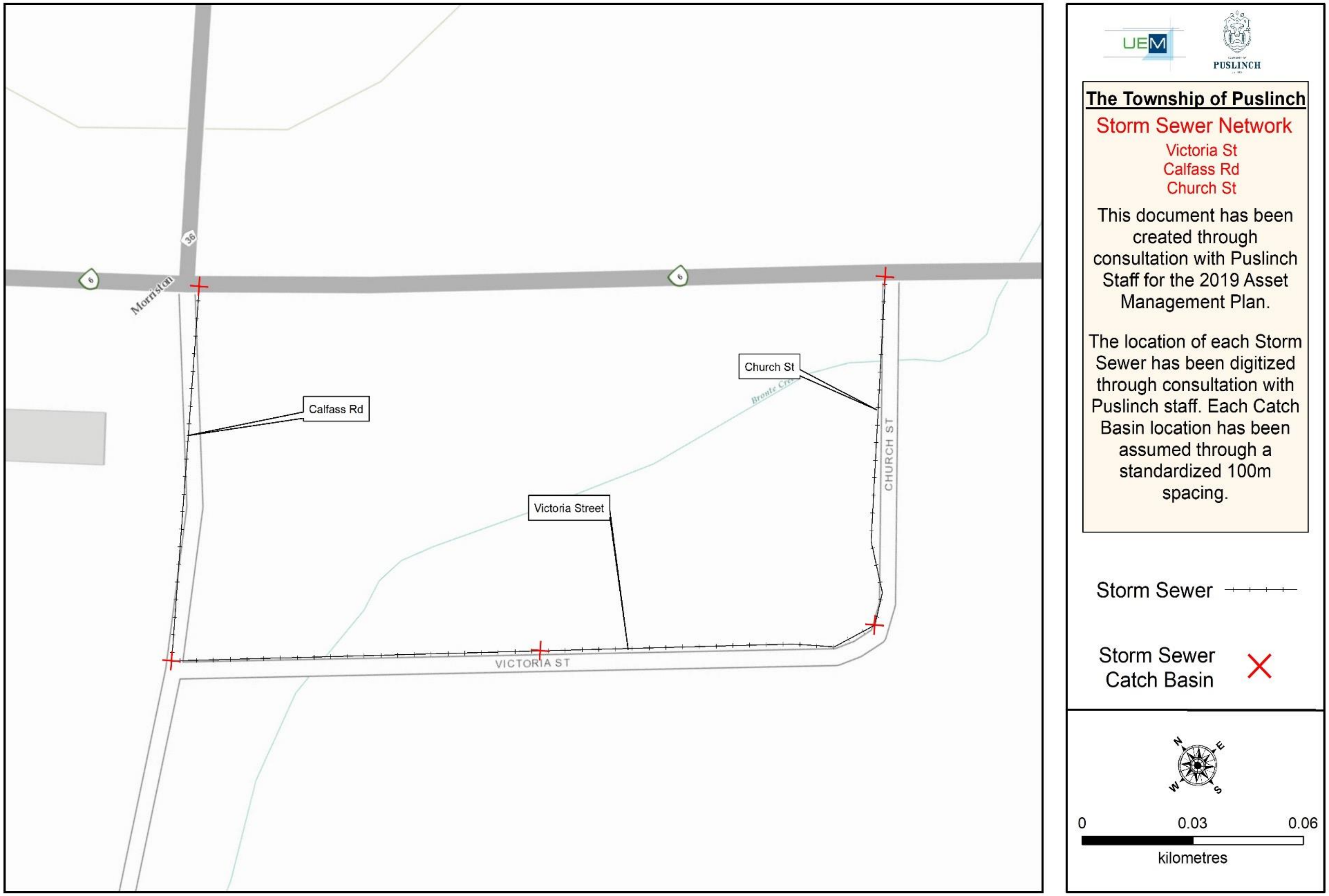
7.0 - 10 Storm Sewer Network: Carriage Lane, Daymond Drive, Fox Run Drive



This document has been created through consultation with Puslinch Staff for the 2019 Asset Management Plan.

The location of each Storm Sewer has been digitized through consultation with Puslinch staff. Each Catch Basin location has been assumed through a standardized 100m spacing.

7.0 - 11 Storm Sewer Network: Old Brock Rd, Gilmour Rd



This document has been created through consultation with Puslinch Staff for the 2019 Asset Management Plan.

The location of each Storm Sewer has been digitized through consultation with Puslinch staff. Each Catch Basin location has been assumed through a standardized 100m spacing.

7.0 - 12 Storm Sewer Network Victoria St, Calfass Rd, Church St

7.18 Street Lights

Lifecycle Management Methodology:

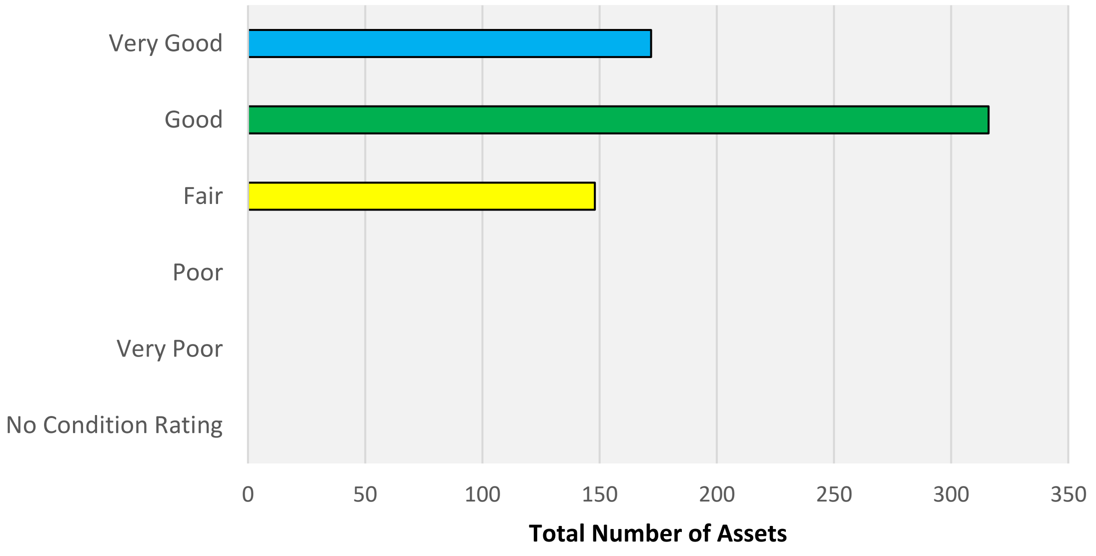
Street Light assets were identified in the asset registry using a linear deterioration rate for each individual asset component. Condition ratings were provided for each pole based on a random sample assessment done by UEM during the summer of 2018.

Replacement Cost Calculation:

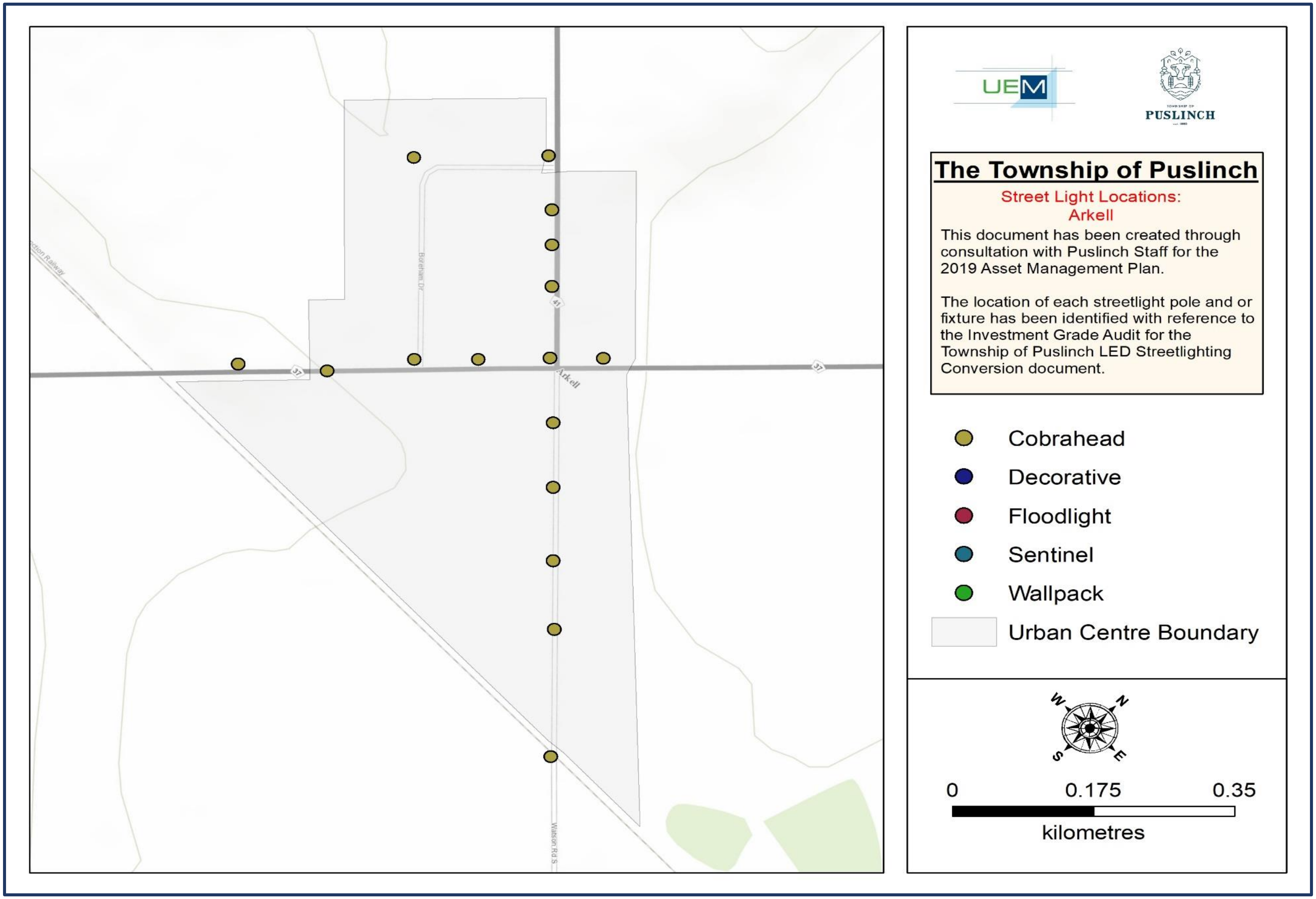
Each Street Light has been broken down into two parts: Fixture and Pole. The cost for each fixture is consistent across all pole types at $300; the pole cost varies from $1,300 to $4000 depending on the type.

Source Documentation

UEM professional recommendation



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$-	$-	$181,325.39	$368,581.67	$215,306.63	$765,213.69



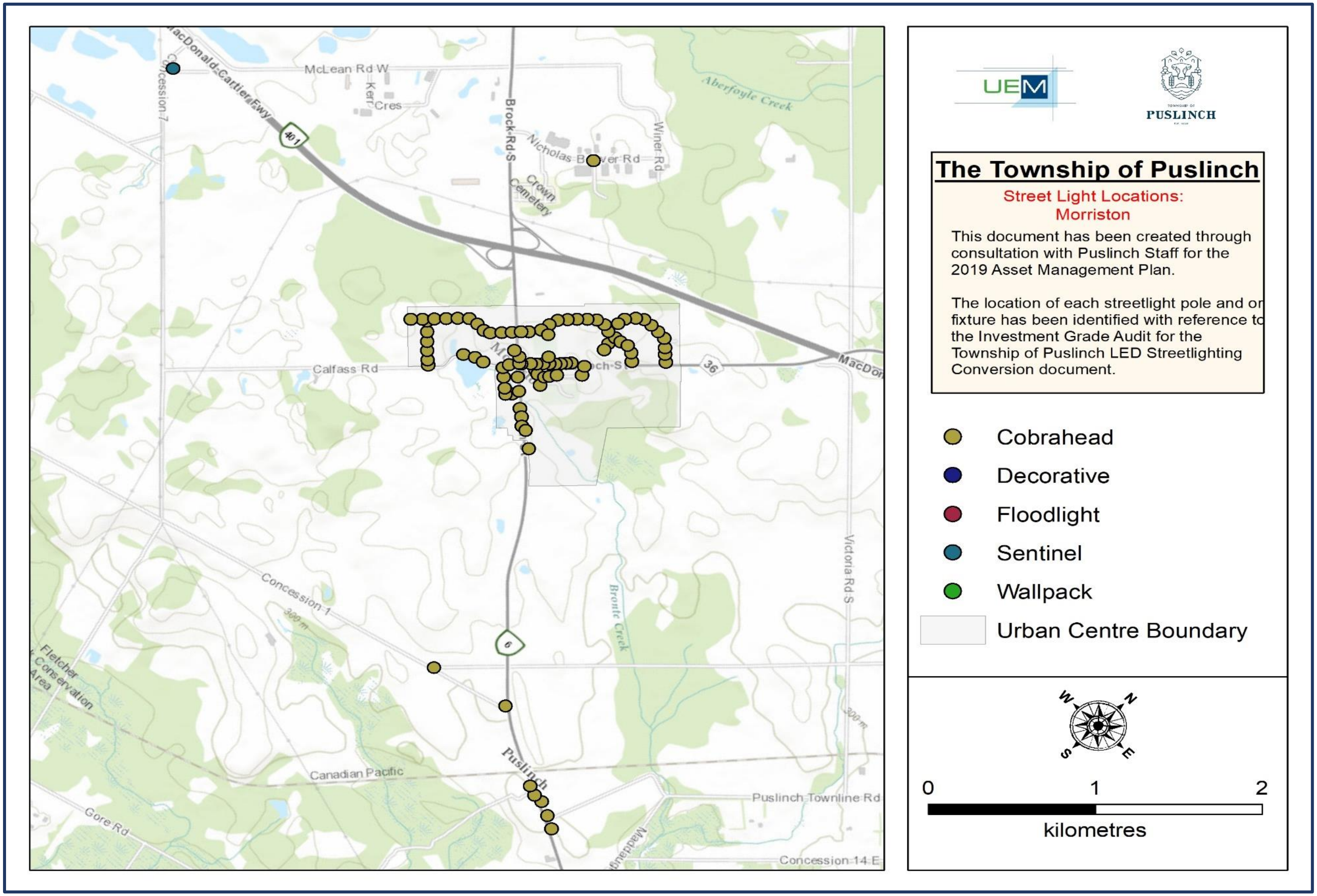
The Township of Puslinch

Street Light Locations:
Arkell

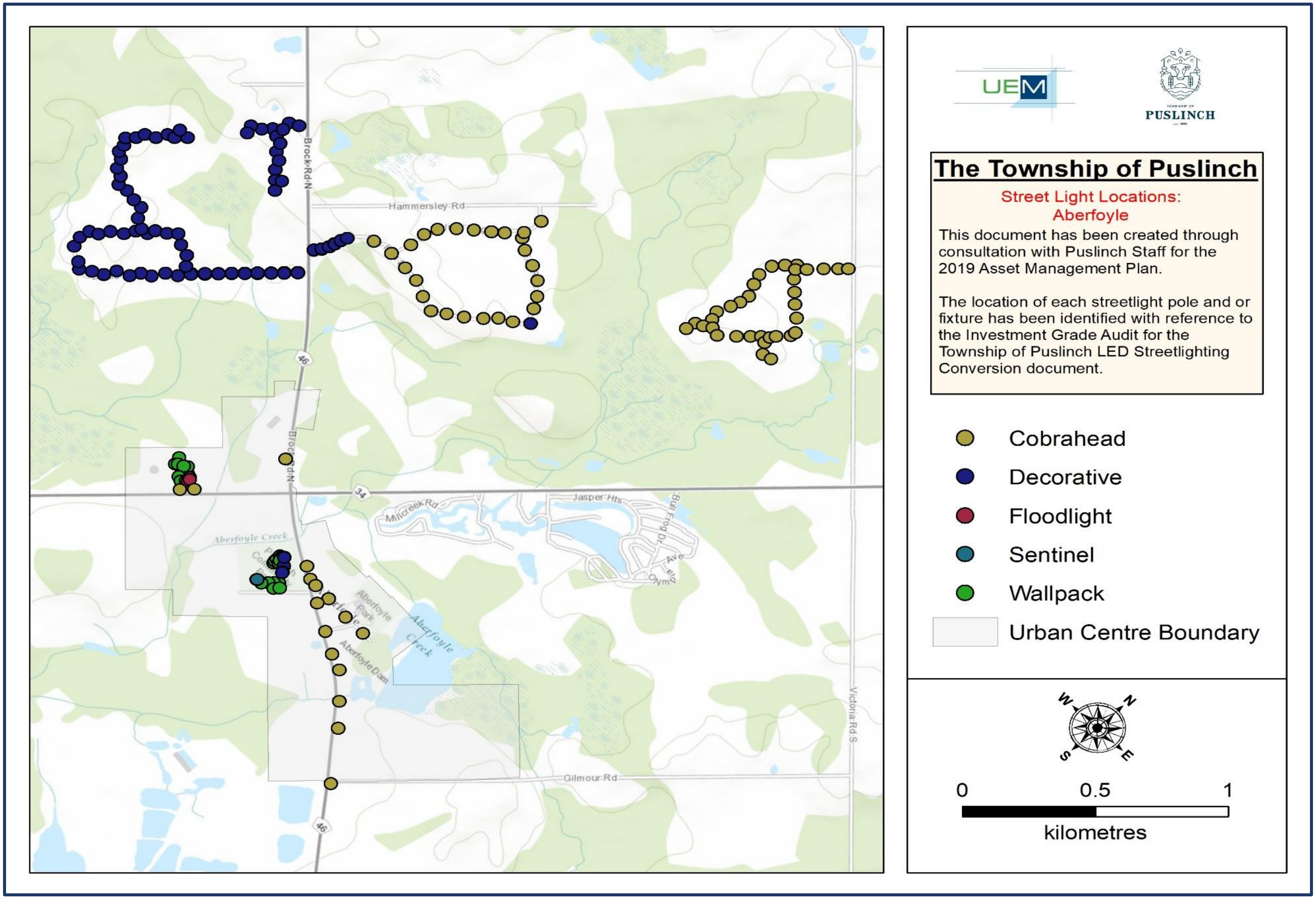
This document has been created through consultation with Puslinch Staff for the 2019 Asset Management Plan.

The location of each streetlight pole and or fixture has been identified with reference to the Investment Grade Audit for the Township of Puslinch LED Streetlighting Conversion document.

7.0 - 13 Street light locations: Arkell



7.0 - 14 Street light Locations: Morriston



The Township of Puslinch

Street Light Locations:
Aberfoyle

This document has been created through consultation with Puslinch Staff for the 2019 Asset Management Plan.

The location of each streetlight pole and or fixture has been identified with reference to the Investment Grade Audit for the Township of Puslinch LED Streetlighting Conversion document.

7.0 - 15 Streetlight Locations: Aberfoyle

7.19 Regulatory/Warnings Signs

Lifecycle Management Methodology:

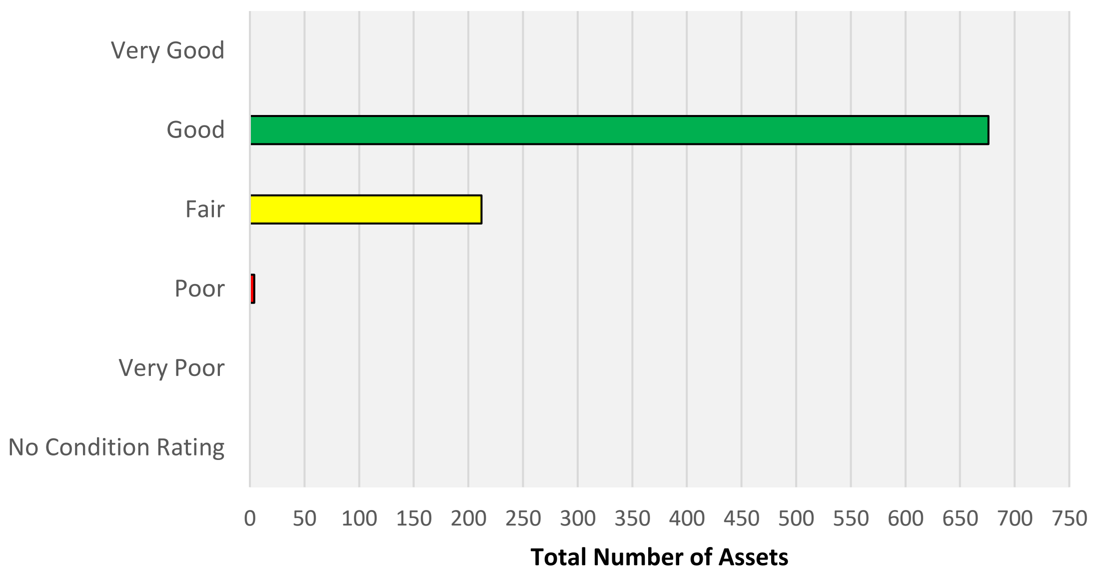
Regulatory & Warnings Sign assets were identified in the asset registry using a linear deterioration rate for each individual asset component. Condition ratings have been provided for each sign based on the last condition assessment of each sign.

Replacement Cost Calculation:

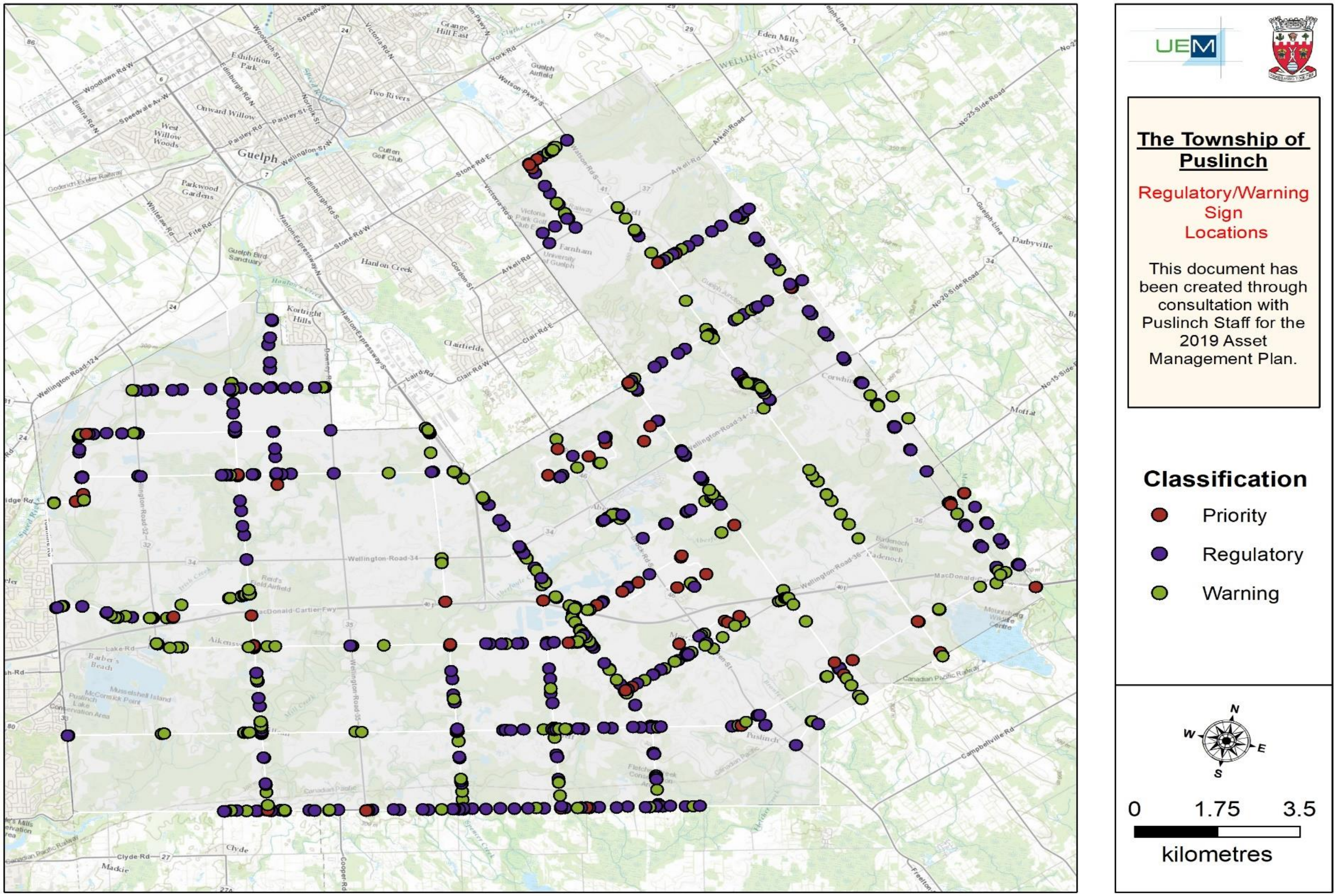
Each Regulatory or Warning Sign has been valued at 150$ per sign based on the recommendations of staff.

Source Documentation

Provided datasets by Township staff



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$-	$600.00	$31,800.00	$101,400.00	$-	$133,800.00



7.0 - 16 Regulatory/Warnings Sign Locations

7.20 Fire Equipment

Lifecycle Management Methodology:

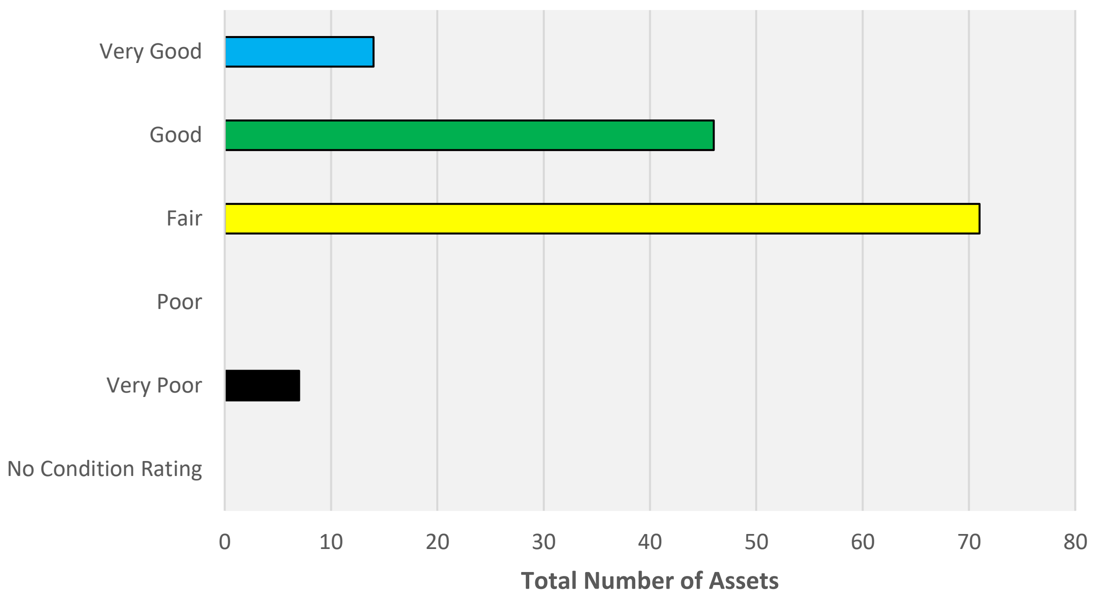
Fire Equipment Assets were identified in the asset registry using the defined lifecycle attributes provided by Puslinch Township staff. Each fire equipment asset was given a condition rating based on the proximity to its defined end of service level or a pre-defined condition rating provided by the Township.

Replacement Cost Calculation:

Replacement cost calculations for fire equipment assets have been sourced from Puslinch Township staff. Each asset has been individually assessed through tender documents in order to ensure reliable cost information.

Source Documentation

Provided Datasets from Township.



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$73,500.00	$-	$196,100.00	$361,350.00	$69,990.00	$700,940.00

7.21 Street Trees

Lifecycle Management Methodology:

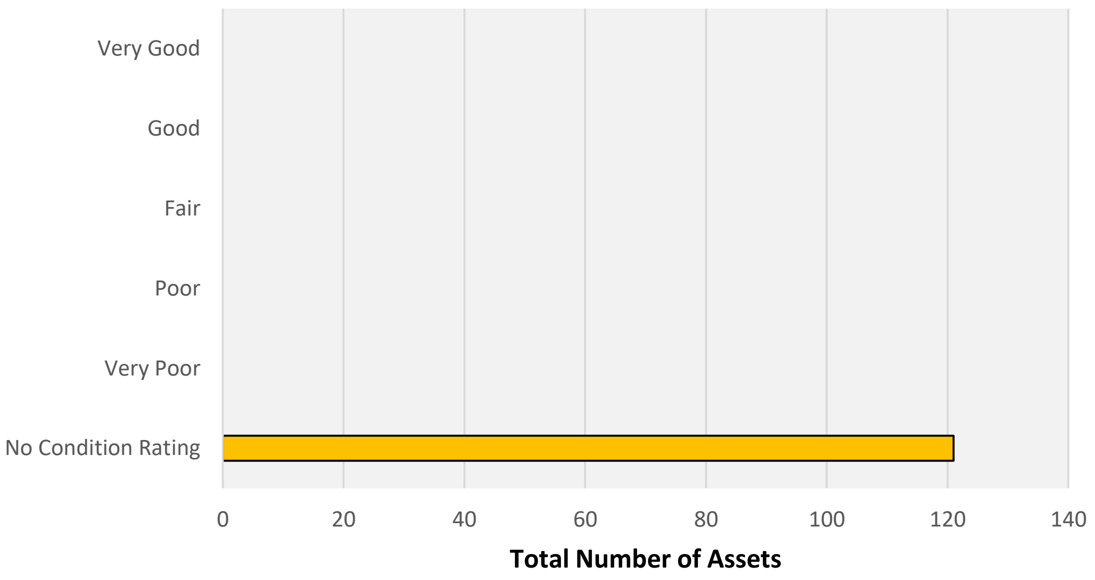
Street Tree assets were identified in the asset registry using a linear deterioration rate for each individual asset component. However, through this asset management plan it has been recognized that the data available for Street Trees is not sufficient for current or future use. For that reason, no condition data was recorded.

Replacement Cost Calculation:

Replacement cost calculations for Street Tree assets have been sourced from Puslinch Township staff. Each asset has been individually assessed through tender documents in order to ensure reliable cost information. The price to replace each tree has been sourced from tender documentation from $300 to $600 depending on the species type.

Source Documentation

Provided datasets by Township staff



Total Replacement Cost					
Very Poor	Poor	Fair	Good	Very Good	Total
$-	$-	$-	$-	$-	$64,325.00

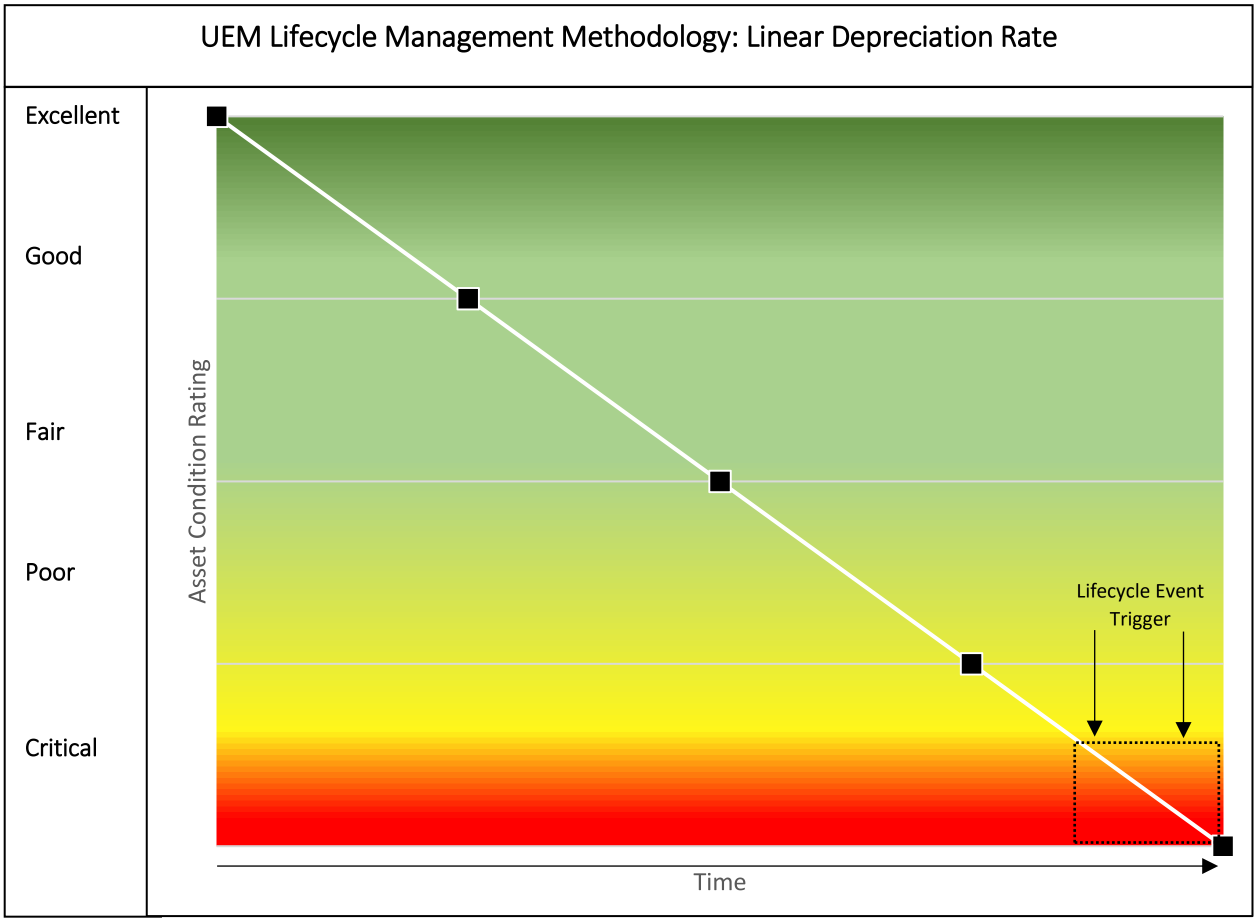
8.0 10 Year Capital Plan

8.1 Capital Plan: Summary

This 10 Year Capital Plan has been developed using the Asset Registry and through referencing documents provided by the Township described in Section 2.

8.2 Capital Plan: Lifecycle Management Methodology

As stated in the State of The Infrastructure section of this report, some asset classes were identified in the Asset Registry with a linear deterioration rate lifecycle management methodology. However, for other assets significant staff input was utilized to determine year of replacement. UEM defines manual asset lifecycle parameterization (staff intervention) as dynamic inputs. For this reason, this 10 Year Capital Plan had been developed to model both static (Linear Depreciation Rate) and dynamic inputs (Staff Intervention) to project capital expenditures for existing infrastructure for the Township of Puslinch.



8.0 - 2 Lifecycle Management Methodology

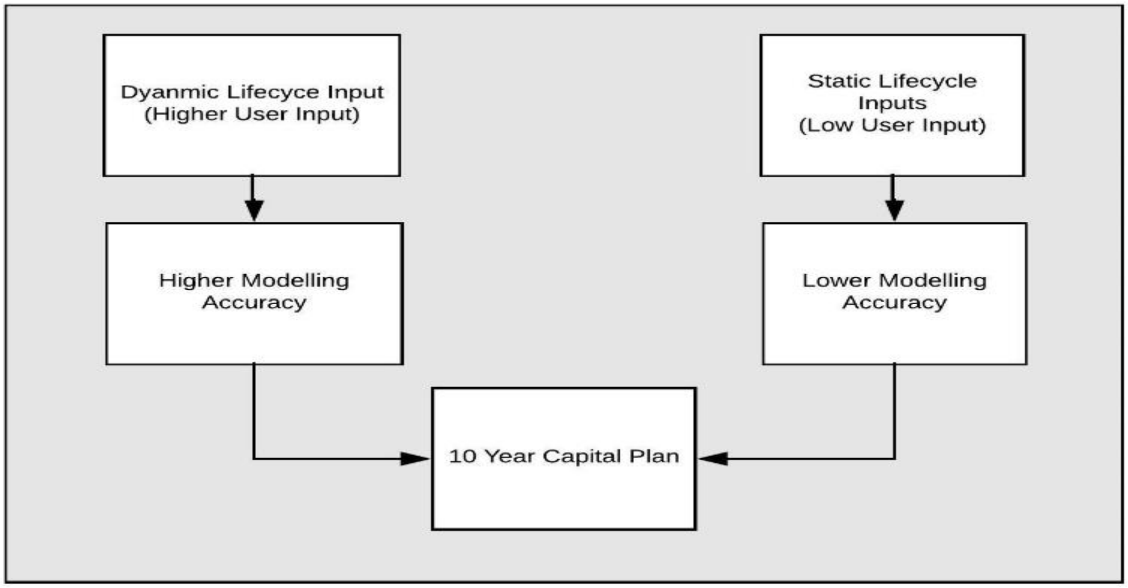
8.3 Static and Dynamic Inputs

Static inputs for this Asset Management Plan are defined as data attributes that have high levels of transferability to models. Furthermore, these inputs are user-defined at one point in time. For some assets, UEM employed a linear deterioration rate that incorporates condition, expected life, remediation costs/replacement costs, and installation date. These variables allow for seamless transferability to different modelling methods and softwares. These variables when loaded into a model create static results and are affixed to one point in time. The output is thus affixed to the inputs point of acquisition and have reduced reliability.

Dynamic inputs allow for the user to manually or systematically alter the attributes of the model's datasets. It can allow for highly accurate modelling outcomes but with high amounts of user intervention into the datasets. However, dynamically modelling may result in conflicting capital planning to the defined lifecycle attributes in the asset registry. Thus, a review of such asset classes that incorporate dynamic inputs have been summarized in the next page.

8.4 Static and Dynamic Inputs: Hard Surface Roads

Hard Surface Roads lifecycle activities follow a static methodology. Based on the proposed service level policy a lifecycle activity is only triggered based on class 4 and 5 roads reaching a PCI level of 60 (static input) and Class 3 roads reaching a PCI level of 65 (static inputs). Recognizing that Puslinch's informal road management policy is a combination of staff input and the known PCI rating; roads would have a combination of both staff input and the PCI rating (dynamic inputs). However, for this asset management plan only the proposed service level policy (Static) was considered for capital planning.



8.0 - 3 Capital Plan Modelling Logic

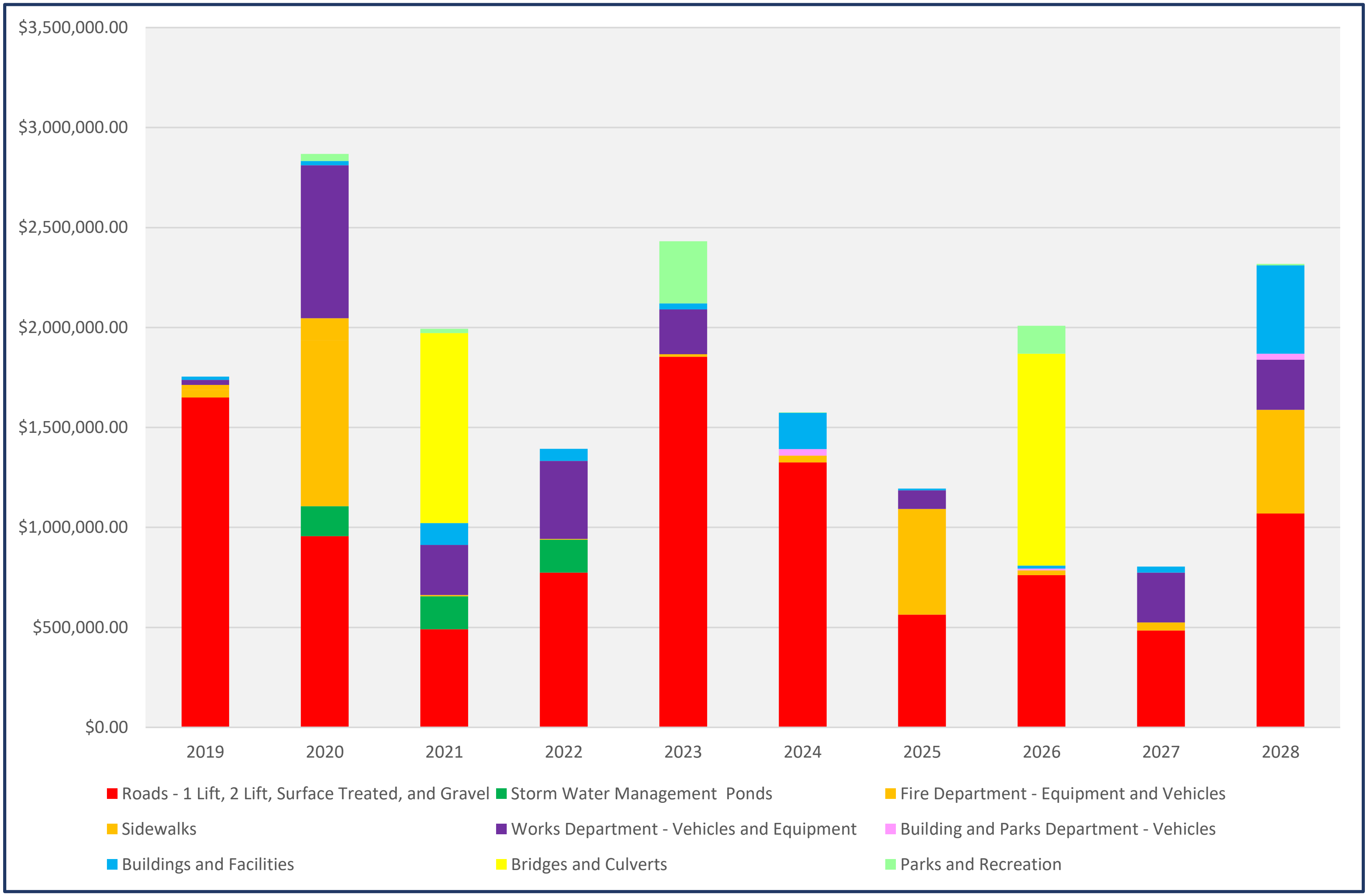
8.5 Input Mapping: 10 Year Capital Plan

The below chart summarizes the methodology (Static or Dynamic) for capital planning and forecasting of lifecycle events for all asset classes in the Township of Puslinch. Generally speaking, the majority of the assets incorporate static inputs and have reliable modelling outputs. However, there are some assets that do not have static inputs such as Fire Equipment, Storm Water Management Ponds and Fleet Assets. These asset classes either have lifecycle activities planned with no lifecycle attributes or through reference to a remediation schedule.

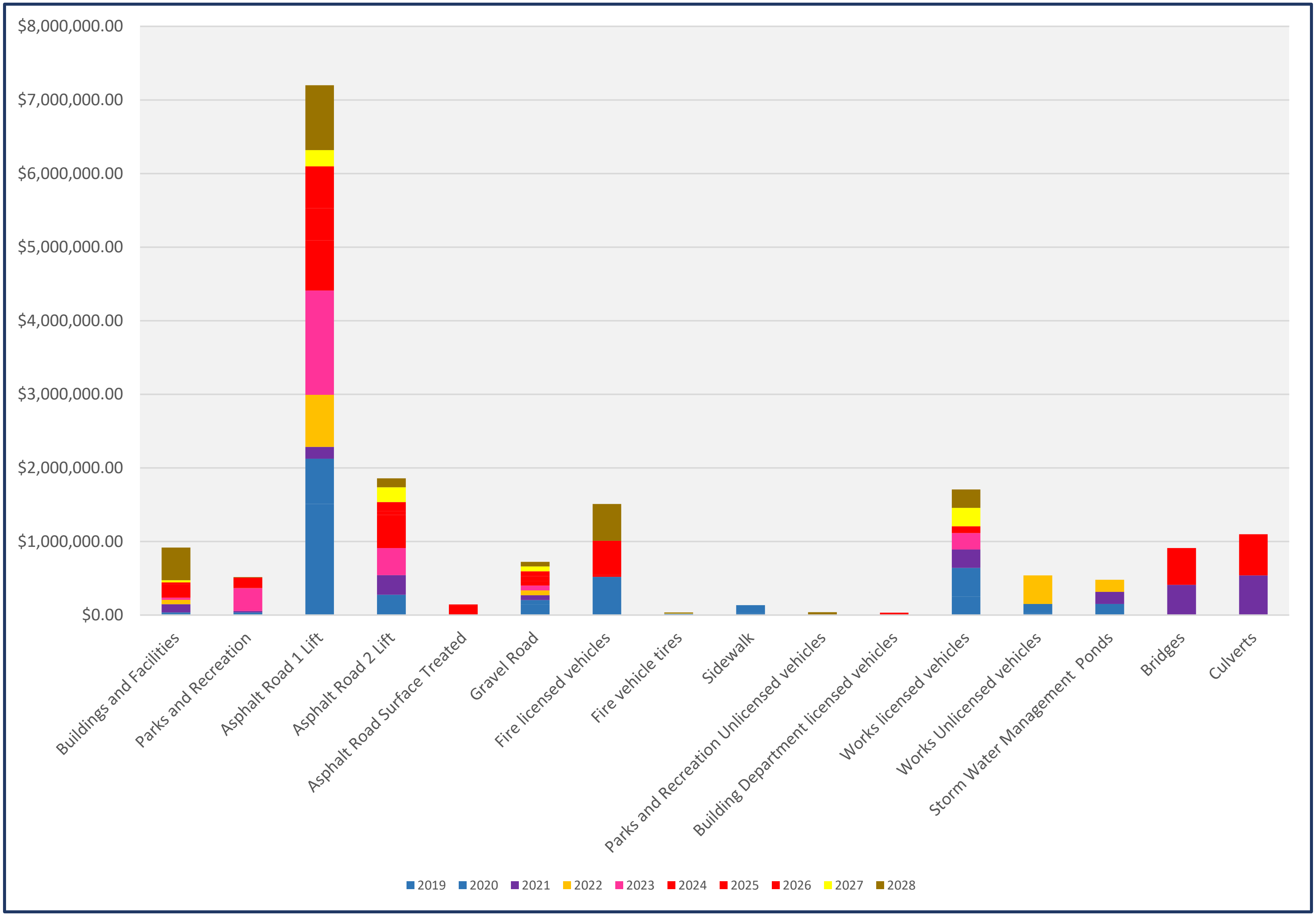
Asset Class	Static	Dynamic	Combination of Both
Bridges		✓	
Culverts		✓	
Buildings and Facilities		✓	
Fire Equipment			✓
Parks and Recreation		✓	
Asphalt Roads 1 Lift	✓		
Asphalt Roads 2 Lift	✓		
Asphalt Roads Surface Treated	✓		
Gravel Roads	✓		
Storm Water Management Ponds		✓	
Fire Licensed Vehicles			✓
Fire Vehicle Tires			✓
Works Licensed Vehicles	✓		
Works Unlicensed Vehicles			✓
Parks and Recreation Unlicensed Vehicles & Building Department Licensed Vehicles			✓
Storm Sewers	✓		
Signs	✓		
Trees	✓		
Fire Reservoirs	✓		
Sidewalks			✓

8.0 - 4 Capital Plan Modelling Logic: Puslinch Asset Classes

9.0 All Existing Infrastructure Included in 10 Year Capital Plan



9.0 - 1 All Existing Infrastructure Included in 10 Year Capital Plan Year Over Year



9.0 - 2 All Existing Infrastructure Included in 10 Year Capital Plan Asset Class Year over Year

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Bridges			$410,000.00					$500,000.00			$910,000.00
Culverts			$540,000.00					$560,000.00			$1,100,000.00
Buildings and Facilities	$15,750.00	$22,000.00	$110,000.00	$60,000.00	$30,000.00	$181,250.00	$10,000.00	$15,000.00	$30,000.00	$442,087.00	$916,087.00
Fire Equipment	$21,000.00	$308,650.00	$6,000.00		$12,000.00	$9,000.00	$61,500.00	$24,000.00	$37,000.00	$12,000.00	$491,150.00
Parks and Recreation		$34,668.00	$22,000.00		$310,000.00	$1,800.00		$139,828.00		$7,740.00	$516,036.00
Asphalt Road 1 Lift	$1,509,345.84	$614,689.29	$161,136.66	$708,589.46	$1,417,522.40	$679,928.37	$437,028.21	$569,296.01	$219,975.00	$882,983.79	$7,200,495.03
Asphalt Road 2 Lift		$276,397.81	$264,844.32		$371,396.70	$450,397.48	$46,560.00	$127,550.47	$199,107.66	$121,118.06	$1,857,372.49
Asphalt Road Surface Treated						$130,291.97	$14,849.14				$145,141.11
Gravel Road	$140,000.00	$65,000.00	$65,000.00	$65,000.00	$65,000.00	$65,000.00	$65,000.00	$65,000.00	$65,000.00	$65,000.00	$725,000.00
Storm Water Management Ponds		$150,000.00	$165,000.00	$165,000.00							$480,000.00
Fire Licensed vehicles		$520,000.00				$23,000.00	$468,000.00			$500,000.00	$1,511,000.00
Fire Vehicle Tires	$17,146.00	$1,650.00		$4,116.00		$1,650.00			$3,300.00	$7,188.00	$35,050.00
Sidewalks	$25,000.00	$110,000.00									$135,000.00
Works licensed vehicles		$640,000.00	$250,000.00		$225,000.00		$92,000.00		$250,000.00	$250,000.00	$1,707,000.00
Works Unlicensed vehicles	$26,000.00	$125,000.00		$390,000.00							$541,000.00
Building Department Licensed Vehicles						$33,000.00					$33,000.00
Parks and Recreation Unlicensed Vehicles								$8,000.00		$30,000.00	$38,000.00
Regulatory/Warning Signs											$0
Street Lights											$0
Street Trees											$0
Storm Sewers											$0
Fire Reservoirs											$0
Total	$1,754,241.84	$2,868,055.09	$1,993,980.98	$1,392,705.46	$2,430,919.10	$1,575,317.82	$1,194,937.35	$2,008,674.48	$804,382.66	$2,318,116.85	$18,341,331.63

9.0 - 3 Capital Plan Detailed Breakdown by Asset Classes

9.1 Existing Infrastructure not included in the 10 Year Capital Plan

As stated previously in Section 8 of this report - all asset classes that were included into the 10-year capital plan fell into one of three input categories for capital planning: Static, Dynamic or a Combination of Static and Dynamic Inputs. The Assets that are not included in the 10-year capital plan, though defined with either one of the three categories, did not meet the thresholds loaded in their lifecycle OR inspected condition is “Good” and therefore over-steps the defined lifecycle loaded into the asset registry.

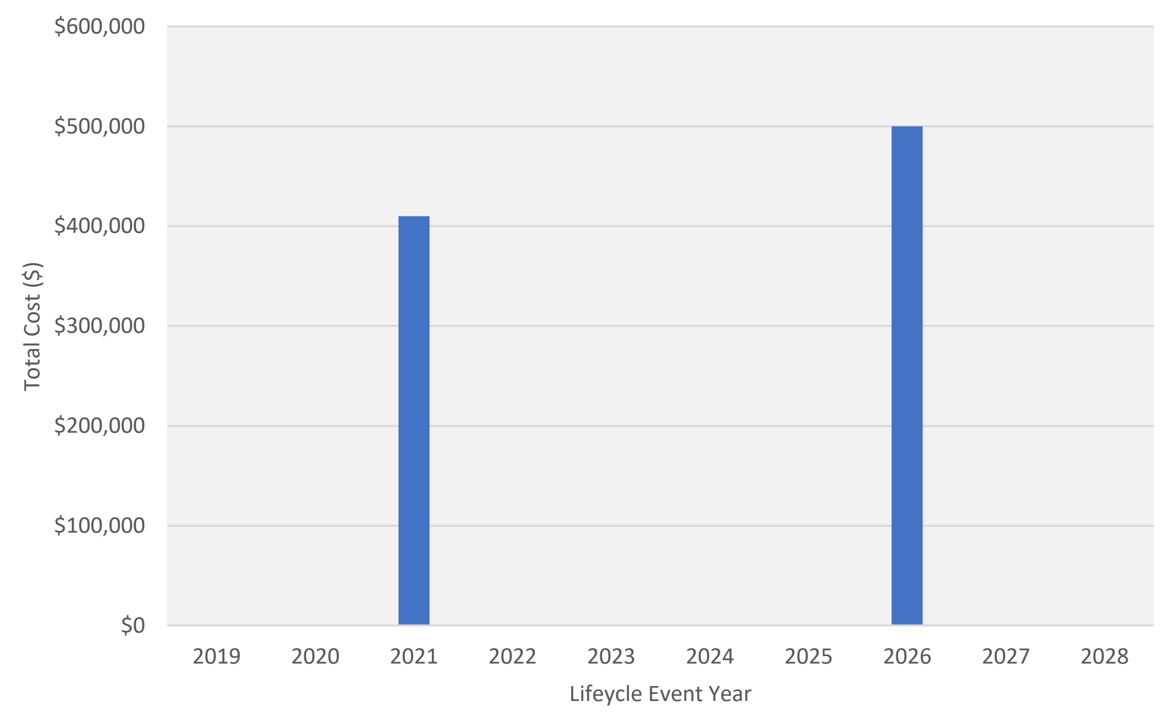
For example, all Fire Reservoir assets have been loaded with an expected life of 50 Years. Based on their construction date all of the Fire Reservoirs have a remaining life in excess of 10 years. Therefore, Fire Reservoirs are not included in the 10-year capital plan. If the asset management plan covered a period of 30 years, the majority of the fire reservoirs would be included in capital planning since the majority would be reaching their end of life This logic is consistent for all assets that have been not included into the 10-year capital plan.

Note: The following tables included in the capital plan Life Expectancy (L.E) has been described as L.E in order to reduce the size of the column.

9.2 Bridges

Capital Plan Summary

As Stated in the State of The Infrastructure section of this report, Bridges do not follow a linear deterioration rate for lifecycle events. Instead, they follow the schedule of the qualified engineer upon inspection of the Bridge. As of 2017, The Township of Puslinch employed an engineering consulting firm to do such inspections. The graph and table reflect the recommendations set out by the firm.



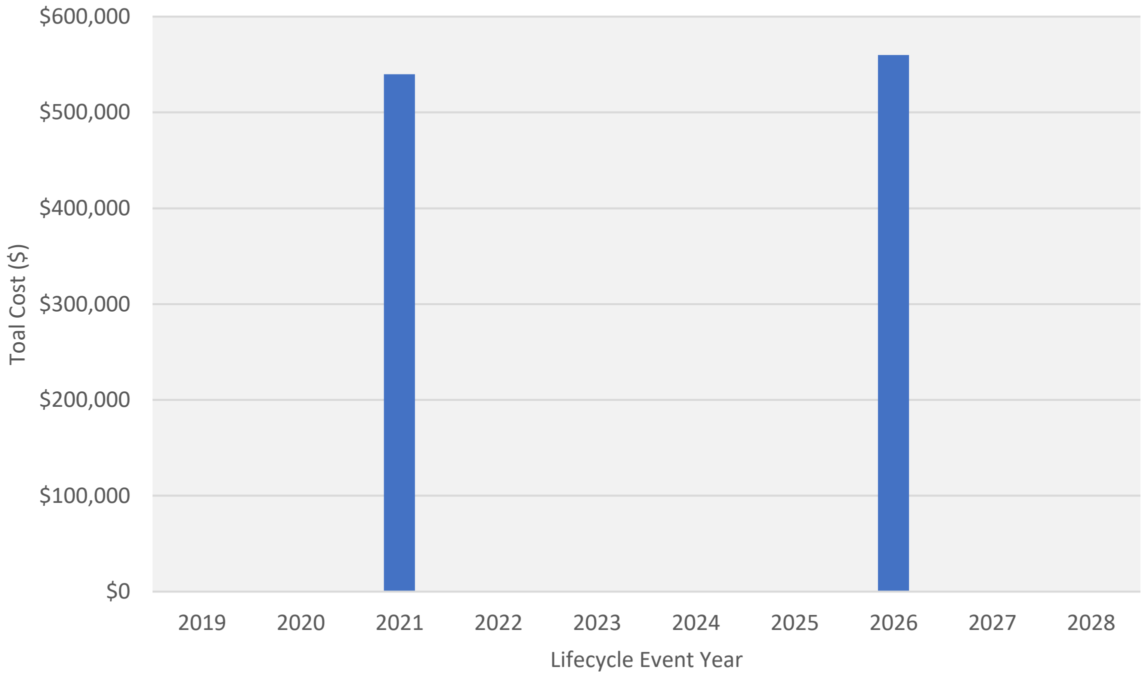
Total Capital Expenditure: $910,000.00

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Years	Total Capital Costs	Condition (BCI)	Risk
1003	Bridge	Little's Bridge	50	2021	$240,000.00	22	Very High
1008	Bridge	Galt Creek Bridge Gore Road Lot 2	50	2021	$170,000.00	60	Very High
1004	Bridge	Moyer's Bridge	50	2026	$500,000.00	63	Very High

9.3 Culverts

Capital Plan Summary

As Stated in the State of The Infrastructure section of this report, Culverts do not follow a linear deterioration rate for lifecycle events. Instead, they follow the schedule of the qualified engineer upon inspection of the Culvert. As of 2017, The Township of Puslinch employed an engineering consulting firm to do such inspections. The graph and table reflect the recommendations set out by the firm.



Total Capital Expenditure: $1,100,000.00

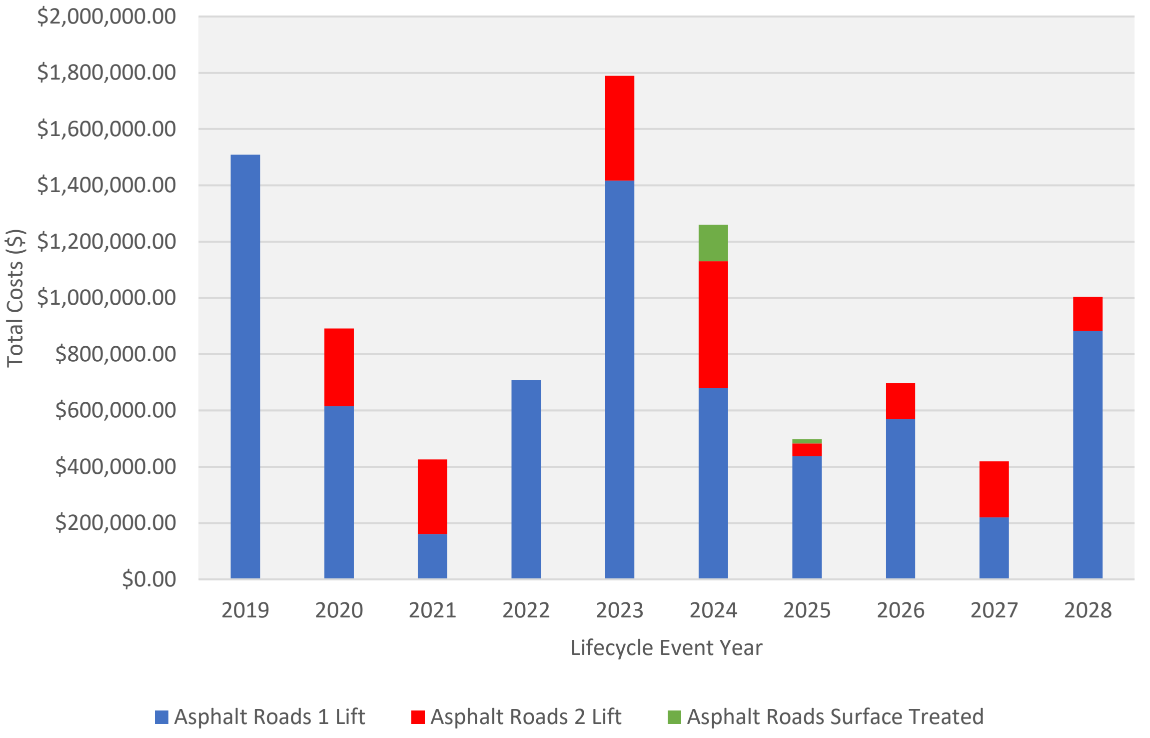
Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Years	Total Capital Costs	Condition (BCI)	Risk
2009	Culvert	Gilmour Rd Culvert Over Aberfoyle Creek	50	2021	$540,000.00	50	Very High
2006	Culvert	Victoria Road Culvert Over Galt Creek	50	2026	$65,000.00	72	Very High
2007	Culvert	Irish Creek Culvert on Townline Road	50	2026	$180,000.00	57	Very High
2010	Culvert	Ellis Road Culvert Over Puslinch Lake Irish Creek	50	2026	$250,000.00	43	Very High
2013	Culvert	Victoria Road Culvert North of Leslie	50	2026	$65,000.00	70	Very High

9.4 Hard Surface Roads – 1 Lift, 2 Lift, and Surface Treated

Capital Plan Summary

As stated in the State of The State of the Infrastructure section of this report, Hard Surface Roads follow a linear deterioration rate for lifecycle events. The rate of deterioration is 2 PCI points per year where 100 is "Excellent" and "Critical" is 60. For this capital plan, class 3 roads remediation PCI are 65, class 4 and 5 roads are 60.

Surface Treated roadways were as well modelled to deteriorate 6 points per year. This works out to lifecycle events being triggered every 7 years.



Total Capital Expenditure: $9,203,008.63

Capital Plan Summary Static and Dynamic Inputs

The Township has recognized that a linear deterioration rate for road assets is not the best lifecycle management methodology due to variable road conditions, traffic volumes, and weather. Further, a static input such as a PCI gives lower quality data confidence when modelling for longer term trends. Thus, the Township through its own management practices has optimized its decisions making methodology through the implementation of the dynamic inputs through regular visual inspections to verify the condition of the paved surface and plan for capital expenditures accordingly.

Note: The condition Data (PCI) described in the following table is as of the year 2018.

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Road Class	Condition Index (2018)	Risk
137	Asphalt Road 1 Lift	Watson Road South Resurfacing	25	2019	$435,057	3	64	Very High
133	Asphalt Road 1 Lift	Watson Road South Resurfacing	25	2019	$103,795	3	65	Very High
139	Asphalt Road 1 Lift	Watson Road South Resurfacing	25	2019	$214,310	3	66	Very High
124	Asphalt Road 1 Lift	Victoria Road South Resurfacing	25	2019	$304,917	3	62	Very High
125A	Asphalt Road 1 Lift	Victoria Road South Resurfacing	25	2019	$63,753	3	62	Very High
134	Asphalt Road 1 Lift	Watson Road South Resurfacing	25	2019	$64,906	3	66	Very High
135	Asphalt Road 1 Lift	Watson Road South Resurfacing	25	2019	$60,251	3	66	Very High
136	Asphalt Road 1 Lift	Watson Road South Resurfacing	25	2019	$89,556	3	66	Very High
140	Asphalt Road 1 Lift	Watson Road South Resurfacing	25	2019	$172,801	3	66	Very High
58	Asphalt Road 1 Lift	Concession 4 Resurfacing	25	2020	$129,704	4	64	Very High
56	Asphalt Road 1 Lift	Concession 4 Resurfacing	25	2020	$217,480	4	64	Very High
6	Asphalt Road 1 Lift	Gore Road Resurfacing	25	2020	$50,337	4	64	Very High
40_SURFACE	Asphalt Road 2 Lift	McLean Road West Resurfacing	25	2020	$276,398	3	68	Very High
1	Asphalt Road 1 Lift	Gore Road Resurfacing	25	2020	$217,168	4	64	Very High

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Road Class	Condition Index (2018)	Risk
52	Asphalt Road 1 Lift	Maple Leaf Lane Resurfacing	25	2021	$74,719	5	65	Very High
57	Asphalt Road 1 Lift	Concession 4 Resurfacing	25	2021	$86,417	4	65	Very High
165_SURFACE	Asphalt Road 2 Lift	McLean Road/Concession 7 Resurfacing	25	2021	$115,798	3	72	Very High
164_SURFACE	Asphalt Road 2 Lift	McLean Road/Concession 7 Resurfacing	25	2021	$149,046	3	72	Very High
15	Asphalt Road 1 Lift	Concession 1 Resurfacing	25	2022	$217,671	4	67	Very High
121B	Asphalt Road 1 Lift	Maddaugh Road Resurfacing	25	2022	$26,658	4	67	Very High
121A	Asphalt Road 1 Lift	Maddaugh Road Resurfacing	25	2022	$25,594	4	67	Very High
59	Asphalt Road 1 Lift	Concession 4 Resurfacing	25	2022	$217,097	4	67	Very High
88	Asphalt Road 1 Lift	Townline Road Resurfacing	25	2022	$153,119	4	68	Very High
158	Asphalt Road 1 Lift	McLean Road East Resurfacing	25	2022	$68,451	4	67	Very High
148	Asphalt Road 1 Lift	Puslinch-Flamborough Townline Resurfacing	25	2023	$31,635	5	69	Very High
90	Asphalt Road 1 Lift	Roszell Road Resurfacing	25	2023	$104,314	4	68	Very High
63B	Asphalt Road 1 Lift	Maltby Road East Resurfacing	25	2023	$106,047	4	70	Very High

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Road Class	Condition Index (2018)	Risk
54A	Asphalt Road 1 Lift	Roszell Road 2013 Resurfacing	25	2023	$138,648	4	68	Very High
25	Asphalt Road 1 Lift	Leslie Road West Resurfacing	25	2023	$106,699	4	69	Very High
23	Asphalt Road 1 Lift	Leslie Road West Resurfacing	25	2023	$128,411	4	69	Very High
22	Asphalt Road 1 Lift	Leslie Road West Resurfacing	25	2023	$56,595	4	69	Very High
115	Asphalt Road 2 Lift	Concession 7 Resurfacing	25	2023	$59,774	3	76	High
116	Asphalt Road 2 Lift	Concession 7 Resurfacing	25	2023	$43,396	3	76	High
97	Asphalt Road 1 Lift	Sideroad 10 North Resurfacing	25	2023	$108,921	4	69	Very High
17	Asphalt Road 1 Lift	Concession 1 Resurfacing	25	2023	$216,762	4	69	Very High
204_SURFACE	Asphalt Road 2 Lift	Bridle Path Resurfacing	25	2023	$155,794	5	70	Very High
63A	Asphalt Road 1 Lift	Maltby Road East Resurfacing	25	2023	$106,960	4	70	Very High
185_SURFACE	Asphalt Road 2 Lift	Bridle Path Resurfacing	25	2023	$62,266	5	70	Very High
212B_SURFACE	Asphalt Road 2 Lift	Winer Road Resurfacing	25	2023	$50,167	4	70	Very High
212A	Asphalt Road 1 Lift	Winer Road Resurfacing	25	2023	$62,387	4	70	Very High
108	Asphalt Road 1 Lift	Sideroad 20 North Resurfacing	25	2023	$214,744	4	69	Very High

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Road Class	Condition Index (2018)	Risk
132	Asphalt Road 1 Lift	McRae Station Road Resurfacing	25	2023	$35,397	3	74	Very High
71	Asphalt Road 1 Lift	Laird Road West Resurfacing	25	2024	$42,000	4	70	Very High
18	Asphalt Road 1 Lift	Concession 1/Leslie Rd W Resurfacing	25	2024	$255,663	4	72	Very High
19	Asphalt Road 1 Lift	Concession 1 Resurfacing	25	2024	$48,441	4	72	Very High
4	Asphalt Road 1 Lift	Gore Road Resurfacing	25	2024	$136,801	4	71	Very High
28_SURFACE	Asphalt Road 2 Lift	Victoria Street And Church Street Resurfacing	25	2024	$39,461	5	71	Very High
5	Asphalt Road 1 Lift	Gore Road Resurfacing	25	2024	$80,119	4	70	Very High
153	Asphalt Road Surface Treated	Nassagaweya-Puslinch Townline Resurfacing	7	2024	$54,921	4	98	Medium
154	Asphalt Road Surface Treated	Nassagaweya-Puslinch Townline Resurfacing	7	2024	$28,974	4	98	Medium
120	Asphalt Road Surface Treated	Maddaugh Road Resurfacing	7	2024	$24,785	4	67	Very High
36	Asphalt Road 2 Lift	Concession 2/2A Resurfacing	25	2024	$124,716	3	77	High
35	Asphalt Road 2 Lift	Concession 2 Resurfacing	25	2024	$286,221	3	77	High
166	Asphalt Road 1 Lift	Sideroad 20 North Resurfacing	25	2024	$116,905	4	72	Very High

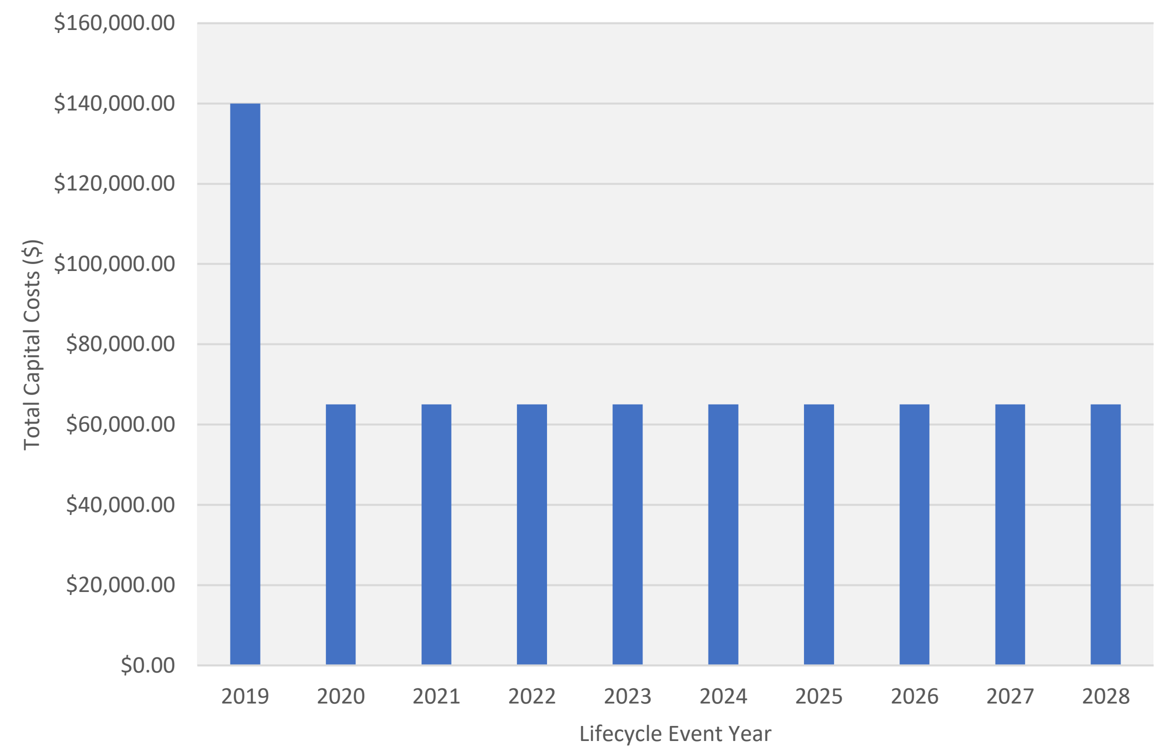
Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Road Class	Condition Index (2018)	Risk
155	Asphalt Road Surface Treated	Nassagaweya-Puslinch Townline Resurfacing	7	2024	$21,613	4	98	Medium
16	Asphalt Road 1 Lift	Concession 1 Resurfacing	25	2025	$216,474	4	73	Very High
51_SURFACE	Asphalt Road 2 Lift	Old Brock Road Resurfacing	25	2025	$46,560	5	73	Very High
7	Asphalt Road Surface Treated	Gore Road Resurfacing	7	2025	$14,849	4	64	Very High
32	Asphalt Road 1 Lift	Concession 2 Resurfacing	25	2025	$220,555	4	74	Very High
195	Asphalt Road 2 Lift	Deer View Ridge Resurfacing	25	2026	$92,917	5	76	High
48	Asphalt Road 1 Lift	Smith Road Resurfacing	25	2026	$34,843	5	76	High
21	Asphalt Road 1 Lift	Leslie Road West Resurfacing	25	2026	$211,570	4	76	High
14	Asphalt Road 1 Lift	Concession 1 Resurfacing	25	2026	$217,139	4	75	High
46_SURFACE	Asphalt Road 2 Lift	Gilmour Road Resurfacing	25	2026	$34,634	4	75	Very High
160	Asphalt Road 1 Lift	Concession 4 Resurfacing	25	2026	$46,904	4	75	Very High
161	Asphalt Road 1 Lift	Concession 4 Resurfacing	25	2026	$35,472	4	75	Very High
38	Asphalt Road 1 Lift	Mason Road Resurfacing	25	2026	$23,369	5	74	Very High
205	Asphalt Road 2 Lift	Fox Run Drive Resurfacing	25	2027	$32,823	5	77	High

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Road Class	Condition Index (2018)	Risk
196	Asphalt Road 2 Lift	Fox Run Drive Resurfacing	25	2027	$57,549	5	77	High
206	Asphalt Road 2 Lift	Fox Run Drive Resurfacing	25	2027	$17,412	5	77	High
34	Asphalt Road 1 Lift	Concession 2 Resurfacing	25	2027	$219,975	4	77	High
207	Asphalt Road 2 Lift	Fox Run Drive Resurfacing	25	2027	$91,324	5	77	High
30	Asphalt Road 1 Lift	Main St And Back Resurfacing	25	2028	$36,264	5	80	High
190	Asphalt Road 2 Lift	Telfer Glen Resurfacing	25	2028	$97,421	5	80	High
9	Asphalt Road 1 Lift	Puslinch-Flamborough Townline Resurfacing	25	2028	$56,748	4	79	High
10	Asphalt Road 1 Lift	Puslinch-Flamborough Townline Resurfacing	25	2028	$69,805	4	79	High
214	Asphalt Road 2 Lift	Beiber Road Resurfacing	25	2028	$23,697	5	79	High
13A	Asphalt Road 1 Lift	Concession 1 Resurfacing	25	2028	$333,716	4	79	High
96	Asphalt Road 1 Lift	Sideroad 10 North Resurfacing	25	2028	$105,000	4	78	High
78	Asphalt Road 1 Lift	Niska Road Resurfacing	25	2028	$63,744	3	85	High
126	Asphalt Road 1 Lift	Victoria Road South Resurfacing	25	2028	$217,705	3	85	High

9.5 Gravel Roads

Capital Plan Summary

Gravel Road surfaces have been assumed to require $65,000 of maintenance expenditures annually. This cost is consistent despite weather or traffic volumes. The graph illustrates this linear expenditure over the next 10-year period amounting to $650,000. Additionally, in 2019, the Township has approved a gravel road conversion project and a gravel road study which amounts to 75,000$.



Total Capital Expenditure: $725,000

Capital Plan Summary Static and Dynamic Inputs

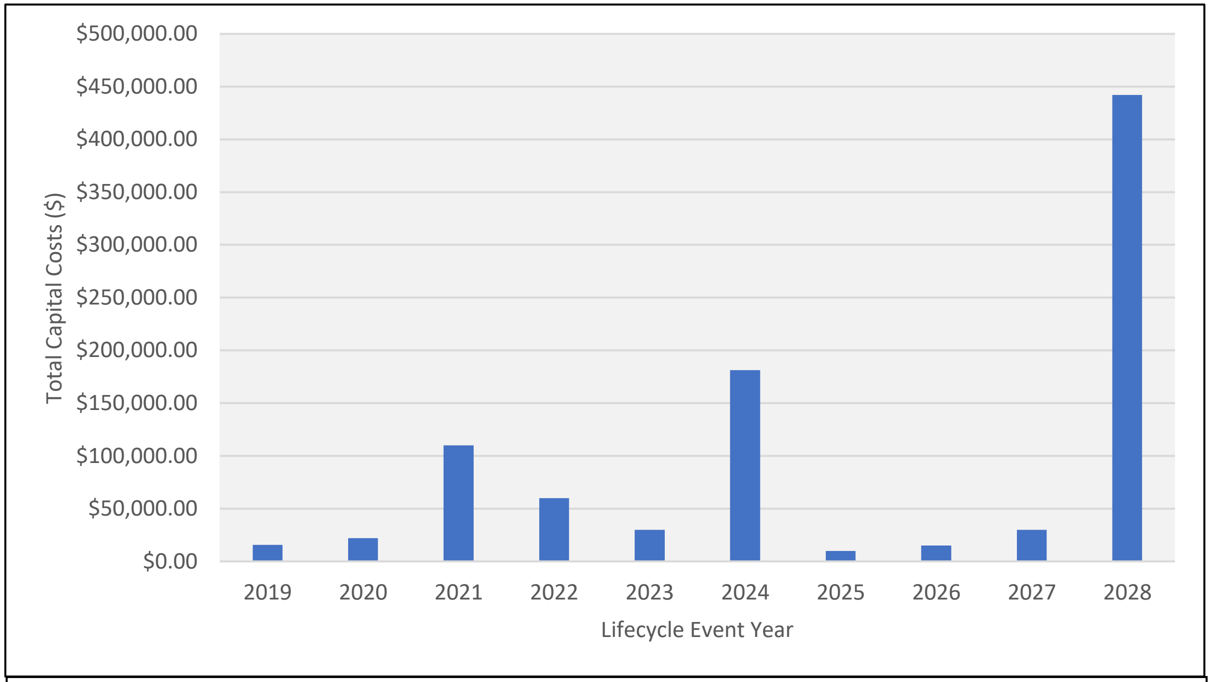
This capital expenditures for gravel roads are static inputs as they do not incorporate expected costs from increased or decreased volumes, or volatile weather conditions. UEM has assumed that the Township manages each gravel road equally and repairs each according to staff understood deterioration triggers such as grading events and dust control events. As stated in the service level policy for gravel roads each road segment should be monitored more closely to acquire a greater detail of rate of decay of each segment and as well attempt to quantify the maintenance expenditures associated with each segments' lifecycle management.

Asset #	Asset Class	Lifecycle Event Description	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
GRM	Gravel Road	Gravel Road Study	2019	$25,000		Medium
144	Gravel Road	Drainage and Repave of Road Surface (Conversion Project)	2019	$50,000	90	High
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2019	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2020	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2021	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2022	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2023	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2024	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2025	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2026	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2027	$65,000		Medium
GRM	Gravel Road	Gravel Road Maintenance - no asset # to reference	2028	$65,000		Medium

9.6 Buildings and Facilities

Capital Plan Summary

As Stated in the State of The Infrastructure section of this report, Buildings and Facilities do not follow a linear deterioration rate for lifecycle events. Instead, Buildings and Facilities follow the schedule of the qualified engineer upon inspection of the Building or Facility. As of 2014, The Township employed an engineering consulting firm to do such inspections, the graph and table reflects the recommended remediation schedule set out by the firm.



Total Capital Expenditure: $916,087

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
4002	Buildings and Facilities	Computer Replacement	5	2019	$10,000.00	5	Low
26PCC	Buildings and Facilities	Replacement of Exterior Lighting c/w wiring	40	2019	$5,000.00	5	Low
59MC	Buildings and Facilities	Replacement of Roads Department Circulating Fans.	40	2019	$750.00	5	Low
59MC	Buildings and Facilities	Replacement of Hot Water Tank	40	2020	$5,000.00	5	Low
59MC	Buildings and Facilities	Replacement of condenser units CU-3, CU-4 - Fire area	40	2020	$7,000.00	5	Low

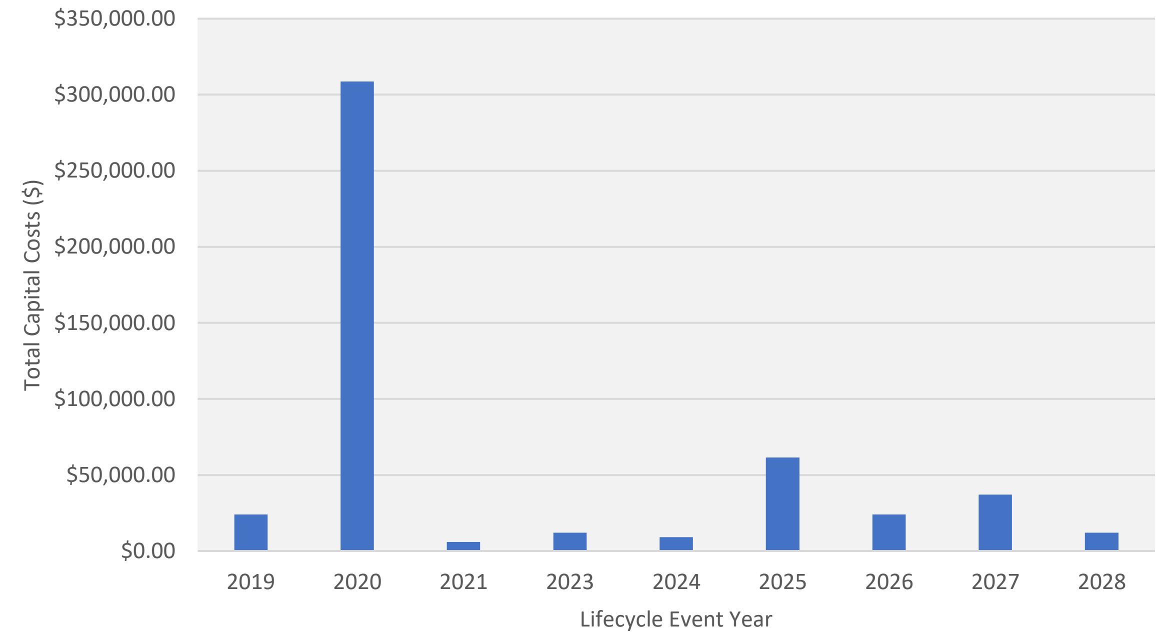
Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
4002	Buildings and Facilities	Computer Replacement	5	2020	$10,000.00	5	Low
46PCC	Buildings and Facilities	New cabinets, dishwasher replacement, fridge replacement, flooring, bar door, bar counter, and kitchen washroom.	40	2021	$100,000.00	5	Low
4002	Buildings and Facilities	Computer Replacement	5	2021	$10,000.00	5	Low
4002	Buildings and Facilities	Computer Replacement	5	2022	$10,000.00	5	Low
59MC	Buildings and Facilities	Replacement of HRV Unit	40	2022	$5,000.00	5	Low
4004	Buildings and Facilities	Microsoft Office License Upgrades	5	2022	$15,000.00	5	Low
59MC	Buildings and Facilities	Condenser Units FU-1, FU-2, CU-1, CU2	40	2022	$20,000.00	5	Low
59MC	Buildings and Facilities	Replacement of Municipal Offices Damper Control System	40	2022	$10,000.00	5	Low
4002	Buildings and Facilities	Computer Replacement	5	2023	$10,000.00	5	Low
21MC	Buildings and Facilities	Power Distribution Equipment (feeders, panels, main disconnect switch)	40	2023	$20,000.00	5	Low
93PCC	Buildings and Facilities	Replacement of sanitary pumps and control system	40	2024	$5,000.00	5	Low
59MC	Buildings and Facilities	Replacement of Roads Department Gas Fired Infra-Red Heaters	40	2024	$6,000.00	5	Low
59MC	Buildings and Facilities	Replacement of UV Water Treatment System	40	2024	$10,000.00	5	Low
40PCC	Buildings and Facilities	Fire extinguishers	40	2024	$750.00	5	Low
93PCC	Buildings and Facilities	Replacement of Water Treatment Equipment	40	2024	$7,500.00	5	Low
46MC	Buildings and Facilities	Window and door replacement	20	2024	$100,000.00	4	Medium
4001	Buildings and Facilities	Server Replacement	5	2024	$42,000.00	5	Low
4002	Buildings and Facilities	Computer Replacement	5	2024	$10,000.00	5	Low

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
4002	Buildings and Facilities	Computer Replacement	5	2025	$10,000.00	5	Low
93PCC	Buildings and Facilities	Replacement of Existing Commercial Hot Water Tank (Rheem)	40	2026	$5,000.00	5	Low
4002	Buildings and Facilities	Computer Replacement	5	2026	$10,000.00	5	Low
4004	Buildings and Facilities	Microsoft Office License Upgrades	5	2027	$15,000.00	5	Low
4002	Buildings and Facilities	Computer Replacement	5	2027	$10,000.00	5	Low
93PCC	Buildings and Facilities	Rebalancing of the HVAC System	40	2027	$5,000.00	5	Low
56MC	Buildings and Facilities	Replace metal roofing panels	40	2028	$125,000.00	5	Low
71BSBBPCC	Buildings and Facilities	Blue Storage Building Behind PCC Roof Rehabilitation	40	2028	$30,000.00	3	Medium
67PCC	Buildings and Facilities	Replace metal roofing panels	40	2028	$100,000.00	5	Low
15002	Buildings and Facilities	Municipal Complex: Parking Lot Municipal Complex	25	2028	$162,750.00	2	Medium
4002	Buildings and Facilities	Computer Replacement	5	2028	$10,000.00	5	Low
95RSB	Buildings and Facilities	Roads Storage Building Roof Rehabilitation	40	2028	$14,337.00	4	Medium

9.7 Fire Equipment

Capital Plan Summary

The Township of Puslinch through its internal resources created a remediation schedule for all known Fire Equipment assets. For the majority of the assets the replacement year is triggered by its end of life (linear deterioration rate). However, for some assets staff intervention dynamic inputs were applied to the replacement date and have been incorporated into the model.



Total Capital Expenditure: $491.150.00

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition (2018)	Risk
67_60FE	Fire Equipment	Bunker Gear #395 1307006351 1104007407	10	2019	$3,000.00	1	Very High
8_93FE	Fire Equipment	Thermal Imaging Camera	10	2019	$6,000.00	1	Very High
66_21FE	Fire Equipment	Bunker Gear #317 907001148 907001150	10	2019	$3,000.00	1	Very High
68_80FE	Fire Equipment	Bunker Gear #376 1104007399 3707960	10	2019	$3,000.00	1	Very High
69_51FE	Fire Equipment	Bunker Gear #386 1104007401 907001149	10	2019	$3,000.00	1	Very High
FE_122_1	Fire Equipment	Bunker Gear #351	10	2019	$3,000.00	1	Very High

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition (2018)	Risk
52_95FE	Fire Equipment	Air Cylinder:347	15	2020	$1,500.00	3	High
65_29FVT	Fire Equipment	Fire Hawk M7	15	2020	$7,450.00	4	Medium
40_31FE	Fire Equipment	Air Cylinder:334	15	2020	$1,500.00	3	High
41_37FE	Fire Equipment	Air Cylinder:335	15	2020	$1,500.00	3	High
42_79FE	Fire Equipment	Air Cylinder:336	15	2020	$1,500.00	3	High
43_107FE	Fire Equipment	Air Cylinder:337	15	2020	$1,500.00	3	High
44_55FE	Fire Equipment	Air Cylinder:339	15	2020	$1,500.00	3	High
45_27FE	Fire Equipment	Air Cylinder:340	15	2020	$1,500.00	3	High
46_91FE	Fire Equipment	Air Cylinder:341	15	2020	$1,500.00	3	High
47_55FE	Fire Equipment	Air Cylinder:342	15	2020	$1,500.00	3	High
48_109FE	Fire Equipment	Air Cylinder:343	15	2020	$1,500.00	3	High
49_104FE	Fire Equipment	Air Cylinder:344	15	2020	$1,500.00	3	High
38_15FE	Fire Equipment	Air Cylinder:320	15	2020	$1,500.00	3	High
51_94FE	Fire Equipment	Air Cylinder:346	15	2020	$1,500.00	3	High
37_107FE	Fire Equipment	Air Cylinder:319	15	2020	$1,500.00	3	High
53_40FE	Fire Equipment	Air Cylinder:348	15	2020	$1,500.00	3	High
54_31FE	Fire Equipment	Air Cylinder:349	15	2020	$1,500.00	3	High
55_41FE	Fire Equipment	Air Cylinder:350	15	2020	$1,500.00	3	High
56_58FE	Fire Equipment	Air Cylinder:351	15	2020	$1,500.00	3	High
57_105FE	Fire Equipment	Air Cylinder:352	15	2020	$1,500.00	3	High
58_88FE	Fire Equipment	Air Cylinder:353	15	2020	$1,500.00	3	High
59_35FE	Fire Equipment	Air Cylinder:354	15	2020	$1,500.00	3	High
60_57FE	Fire Equipment	Air Cylinder:355	15	2020	$1,500.00	3	High
61_17FE	Fire Equipment	Air Cylinder:356	15	2020	$1,500.00	3	High
65_4FE	Fire Equipment	Air Cylinder:360	15	2020	$1,500.00	3	High
63_48FE	Fire Equipment	Air Cylinder:358	15	2020	$1,500.00	3	High
72_79FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
50_57FE	Fire Equipment	Air Cylinder:345	15	2020	$1,500.00	3	High
24_94FE	Fire Equipment	Air Cylinder:106	15	2020	$1,500.00	3	High
6_70FE	Fire Equipment	Power Hydraulic Tool set	20	2020	$52,500.00	1	Very High
66_17FVT	Fire Equipment	Fire Hawk M7	15	2020	$7,450.00	4	Medium

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition (2018)	Risk
11_103FE	Fire Equipment	Rapid Deployment Water Craft	10	2020	$6,000.00	4	Medium
14_25FE	Fire Equipment	Air Cylinder:84	15	2020	$1,500.00	3	High
15_87FE	Fire Equipment	Air Cylinder:85	15	2020	$1,500.00	3	High
16_87FE	Fire Equipment	Air Cylinder:87	15	2020	$1,500.00	3	High
17_76FE	Fire Equipment	Air Cylinder:88	15	2020	$1,500.00	3	High
18_90FE	Fire Equipment	Air Cylinder:100	15	2020	$1,500.00	3	High
19_90FE	Fire Equipment	Air Cylinder:101	15	2020	$1,500.00	3	High
20_85FE	Fire Equipment	Air Cylinder:102	15	2020	$1,500.00	3	High
21_85FE	Fire Equipment	Air Cylinder:103	15	2020	$1,500.00	3	High
39_99FE	Fire Equipment	Air Cylinder:323	15	2020	$1,500.00	3	High
23_42FE	Fire Equipment	Air Cylinder:105	15	2020	$1,500.00	3	High
64_106FE	Fire Equipment	Air Cylinder:359	15	2020	$1,500.00	3	High
25_35FE	Fire Equipment	Air Cylinder:107	15	2020	$1,500.00	3	High
26_23FE	Fire Equipment	Air Cylinder:108	15	2020	$1,500.00	3	High
27_67FE	Fire Equipment	Air Cylinder:109	15	2020	$1,500.00	3	High
28_48FE	Fire Equipment	Air Cylinder:310	15	2020	$1,500.00	3	High
29_64FE	Fire Equipment	Air Cylinder:311	15	2020	$1,500.00	3	High
30_89FE	Fire Equipment	Air Cylinder:312	15	2020	$1,500.00	3	High
31_89FE	Fire Equipment	Air Cylinder:313	15	2020	$1,500.00	3	High
32_104FE	Fire Equipment	Air Cylinder:314	15	2020	$1,500.00	3	High
33_34FE	Fire Equipment	Air Cylinder:315	15	2020	$1,500.00	3	High
34_30FE	Fire Equipment	Air Cylinder:316	15	2020	$1,500.00	3	High
35_104FE	Fire Equipment	Air Cylinder:317	15	2020	$1,500.00	3	High
36_48FE	Fire Equipment	Air Cylinder:318	15	2020	$1,500.00	3	High
22_9FE	Fire Equipment	Air Cylinder:104	15	2020	$1,500.00	3	High
62_23FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
70_84FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
67_17FVT	Fire Equipment	SCBA Masks	15	2020	$8,250.00	4	Medium
68_20FVT	Fire Equipment	Ultralight MMR 2000	15	2020	$7,450.00	4	Medium
61_92FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
73_30FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium

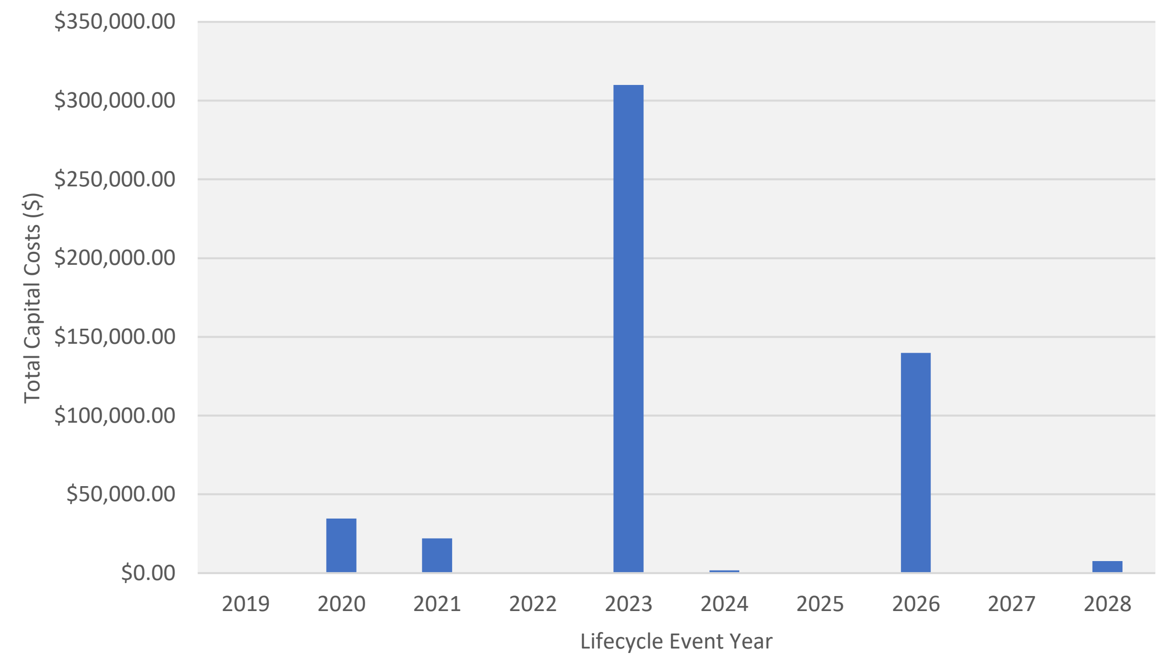
Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition (2018)	Risk
77_9FVT	Fire Equipment	Ultralight MMR 2000	15	2020	$7,450.00	3	High
78_16FVT	Fire Equipment	Ultralight MMR 2000	15	2020	$7,450.00	3	High
79_57FVT	Fire Equipment	Ultralight MMR 2000	15	2020	$7,450.00	3	High
80_30FVT	Fire Equipment	Ultralight MMR 2000	15	2020	$7,450.00	3	High
69_41FVT	Fire Equipment	Ultralight MMR 2000	15	2020	$7,450.00	4	Medium
74_27FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
75_43FVT	Fire Equipment	Ultralight MMR 2000	15	2020	$7,450.00	4	Medium
62_96FE	Fire Equipment	Air Cylinder:357	15	2020	$1,500.00	3	High
59_56FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
67_99FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
60_51FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
71_45FVT	Fire Equipment	Fire Hawk 2002	15	2020	$7,450.00	4	Medium
64_69FVT	Fire Equipment	Fire Hawk M7	15	2020	$7,450.00	4	Medium
63_86FVT	Fire Equipment	Fire Hawk M7	15	2020	$7,450.00	4	Medium
76_67FVT	Fire Equipment	Ultralight MMR 2000	15	2020	$7,450.00	4	Medium
72_58FE	Fire Equipment	Bunker Gear #378 1104007403 1104007408	10	2021	$3,000.00	3	High
71_102FE	Fire Equipment	Bunker Gear #308	10	2021	$3,000.00	3	High
74_22FE	Fire Equipment	Bunker Gear #336 1301002757 1301002762	10	2023	$3,000.00	3	High
75_67FE	Fire Equipment	Bunker Gear #392 1301002758 1301002763	10	2023	$3,000.00	4	Medium
76_55FE	Fire Equipment	Bunker Gear #337 1301002760 1301002765	10	2023	$3,000.00	4	Medium
73_67FE	Fire Equipment	Bunker Gear #301 1301002761 1301002766	10	2023	$3,000.00	3	High
77_100FE	Fire Equipment	Bunker Gear #388 4748801 4749620	10	2024	$3,000.00	4	Medium
78_9FE	Fire Equipment	Bunker Gear #318	10	2024	$3,000.00	4	Medium
79_75FE	Fire Equipment	Bunker Gear #310 4748800 4749619	10	2024	$3,000.00	4	Medium
93_73FE	Fire Equipment	Bunker Gear #320 4924094 4924087	10	2025	$3,000.00	4	Medium
1212_41FE	Fire Equipment	Defibrillators - Municipal Buildings	8	2025	$4,500.00	5	Medium

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition (2018)	Risk
12_41FE	Fire Equipment	Defibrillators Fire & Rescue Service Trucks	8	2025	$15,000.00	3	High
90_29FE	Fire Equipment	Bunker Gear #380 4992303 4992306	10	2025	$3,000.00	4	Medium
80_57FE	Fire Equipment	Bunker Gear #333 4924090 4924085	10	2025	$3,000.00	4	Medium
81_37FE	Fire Equipment	Bunker Gear #387 4924092 4924080	10	2025	$3,000.00	4	Medium
83_94FE	Fire Equipment	Bunker Gear #326 4924091 4924082	10	2025	$3,000.00	4	Medium
84_89FE	Fire Equipment	Bunker Gear #321 4992302 4924081	10	2025	$3,000.00	4	Medium
85_11FE	Fire Equipment	Bunker Gear #370 4924095 4924083	10	2025	$3,000.00	4	Medium
86_72FE	Fire Equipment	Bunker Gear #381 4924093 4924086	10	2025	$3,000.00	4	Medium
87_51FE	Fire Equipment	Bunker Gear #306 4992301 4992304	10	2025	$3,000.00	4	Medium
89_97FE	Fire Equipment	Bunker Gear #307 4924089 4924079	10	2025	$3,000.00	4	Medium
91_44FE	Fire Equipment	Bunker Gear #375 4924077 4992305	10	2025	$3,000.00	4	Medium
92_20FE	Fire Equipment	Bunker Gear #303 5017234 5017235	10	2025	$3,000.00	4	Medium
94_89FE	Fire Equipment	Bunker Gear #355 4924088 4924078	10	2025	$3,000.00	4	Medium
88_35FE	Fire Equipment	Bunker Gear #309 4924096 4924084	10	2025	$3,000.00	4	Medium
95_47FE	Fire Equipment	Bunker Gear #315 5085806 5085940	10	2026	$3,000.00	5	Medium
13_89FE	Fire Equipment	Portable Pumps	20	2026	$15,000.00	4	Medium
96_14FE	Fire Equipment	Bunker Gear #319 5122954 5085938	10	2026	$3,000.00	5	Medium
97_58FE	Fire Equipment	Bunker Gear #391 5085805 5085939	10	2026	$3,000.00	5	Medium
9_104FE	Fire Equipment	Washer/Extractor	10	2027	$10,000.00	4	Medium
98_23FE	Fire Equipment	Bunker Gear #379 5312492 5312493	10	2027	$3,000.00	5	Medium
10_2FE	Fire Equipment	Gear Dryer	10	2027	$6,000.00	4	Medium
102_20FE	Fire Equipment	Bunker Gear #322 5310556 5310561	10	2027	$3,000.00	5	Medium
101_49FE	Fire Equipment	Bunker Gear #385 5310557 5310562	10	2027	$3,000.00	5	Medium
99_1FE	Fire Equipment	Bunker Gear #382 5310558 5310560	10	2027	$3,000.00	5	Medium
8_94FE	Fire Equipment	Thermal Imaging Camera Replacement	10	2027	$6,000.00	3	High
100_87FE	Fire Equipment	Bunker Gear #323 5310555 5310559	10	2027	$3,000.00	5	Medium
106_92FE	Fire Equipment	Bunker Gear #305 5483613 5483618	10	2028	$3,000.00	5	Medium
105_24FE	Fire Equipment	Bunker Gear #302 5483614 5483619	10	2028	$3,000.00	5	Medium
104_60FE	Fire Equipment	Bunker Gear #335 5483615 5483621	10	2028	$3,000.00	5	Medium
103_101FE	Fire Equipment	Bunker Gear #350 5483616 5483622	10	2028	$3,000.00	5	Medium

9.8 Parks and Recreation

Capital Plan Summary

Parks and Recreation assets lifecycle activity schedule has been developed exclusively from their modelled end of expected life. Thus, the illustrated capital plan in the chart and table has been developed exclusively from the defined static conditions in the asset registry and as well life expectancy.



Total Capital Expenditure: $516,036

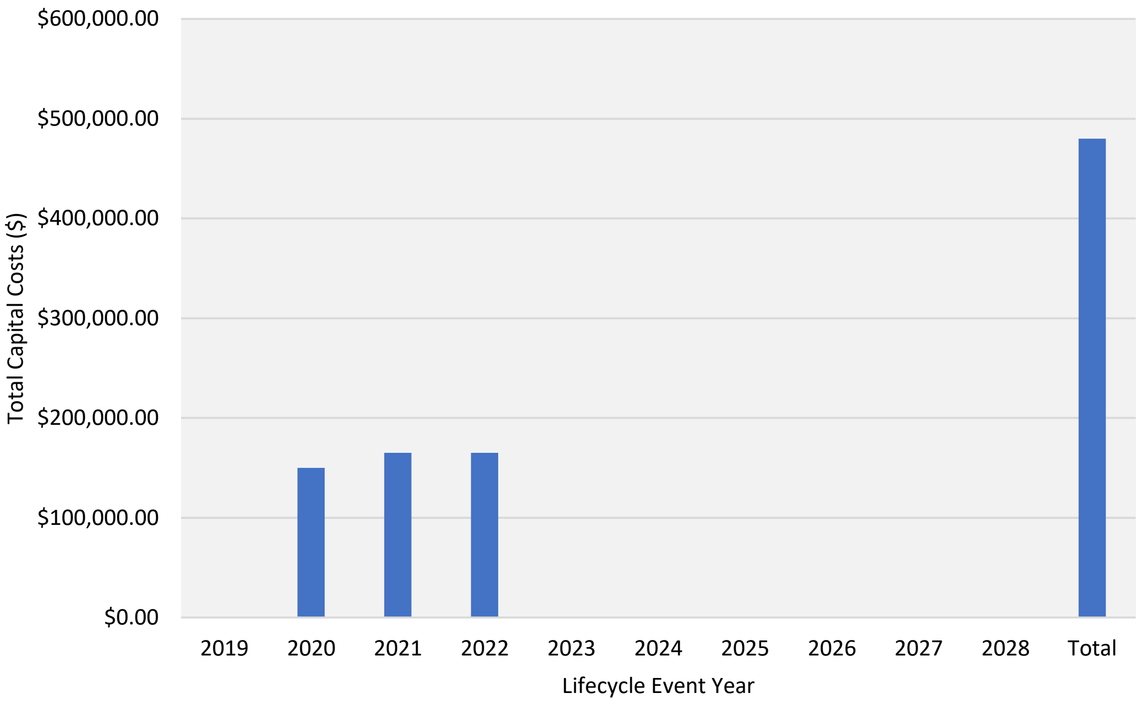
Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Lifecycle Event Cost	Condition Index (2018)	Risk
3047	Parks and Recreation	Morriston Meadows: Benches Replacement	20	2020	$1,000.00	1	High
3036	Parks and Recreation	Community Centre Complex: Horse Paddock Bleachers Replacement	20	2020	$30,000.00	1	High
3059	Parks and Recreation	Old Morriston: Fencing Backstop Replacement	20	2020	$3,668.00	1	High

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Lifecycle Event Cost	Condition Index (2018)	Risk
3053	Parks and Recreation	Morriston Meadows: 6 Seat High Bleachers Replacement	25	2021	$5,000.00	1	High
3052	Parks and Recreation	Morriston Meadows: 6 Seat High Bleachers Replacement	25	2021	$5,000.00	1	High
3068	Parks and Recreation	Badenoch Soccer Field: 3 Seat Bleacher Replacement	25	2021	$2,000.00	1	High
3046	Parks and Recreation	Morriston Meadows: Bleachers Replacement	25	2021	$10,000.00	1	High
3060	Parks and Recreation	Old Morriston: 6 seat Concrete Bleachers Replacement	50	2023	$10,000.00	1	High
3082	Parks and Recreation	Parking Lot & Associated Enhancements (curbing, entrance, and additional lighting)	25	2023	$300,000.00	2	High
3025	Parks and Recreation	Community Centre Complex: Wooden Fences Beside Batting Cages Replacement	15	2024	$1,800.00	2	High
3070	Parks and Recreation	Badenoch Soccer Field: Fencing (East Side) Replacement	20	2026	$14,934.00	2	High
3075	Parks and Recreation	Modernizing the playground at Boreham Park with creative play equipment	25	2026	$100,000.00	5	Medium
14003	Parks and Recreation	Community Centre Complex Tennis Court Fencing: installation of wind and noise screening) and to convert the third court (furthest from the road) into a public court	40	2026	$10,000.00	5	Medium
3029	Parks and Recreation	Community Centre Complex: Fencing Replacement	20	2026	$9,694.00	2	High
3028	Parks and Recreation	Community Centre Complex: Light Poles Replacement	20	2026	$5,200.00	2	High
3056	Parks and Recreation	Old Morriston: Gravel Road Rehabilitation	25	2028	$7,740.00	2	High

9.9 Storm Water Management Ponds

Capital Plan Summary

As stated in the State of The Infrastructure section of this report, Storm Water Management Ponds do not follow a linear deterioration rate for lifecycle events. Instead, they follow the schedule of the qualified engineer upon inspection of the pond. As of 2017, The Township of Puslinch employed a consultant to do such inspections. The graph and table reflects the recommendations set out by the firm.



Total Capital Expenditure: $480,000.00

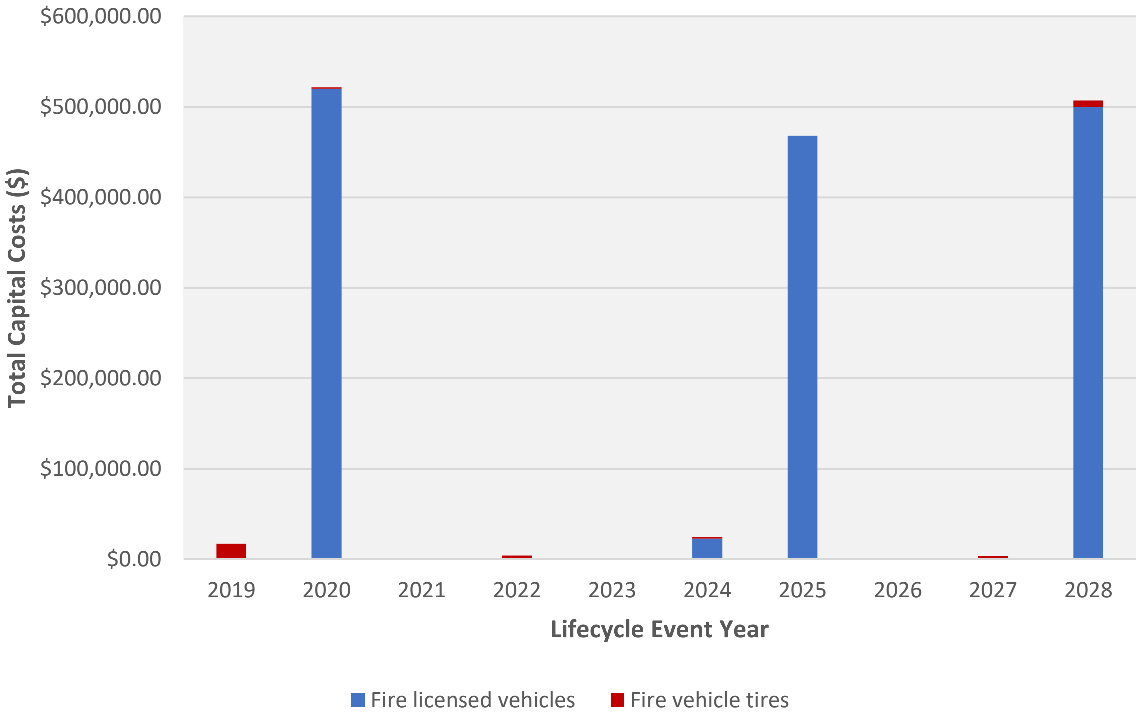
Capital Plan Summary Cont'd

The Capital costs for remediation works over the next 10 years are for three different Storm Water Management Ponds. The first, being Kerr Crescent SWM Facility at cost of $150,000, the second for Fox Run Drive Storm Water Management Pond 1 at a cost of $165,000 and the third at Carriage Lane Storm Water Management Pond at a cost of $165,000.

9.10 Fire Vehicles – Licensed Vehicles & Tires

Capital Plan Summary

As stated in the State of the Infrastructure section of this report all Fire Vehicle assets have been loaded into the asset registry with high level of dynamic input. The expected remediation schedule set out for fire vehicle's lifecycle attributes has not been applied. The schedule that is visualized in the graph and chart has been formulated from staff and recommendations from the 2017 Fleet Management Report.



Total Capital Expenditure: $1,546,050

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
15_73FVT	Fire vehicle tires	Tire Replacement	8	2019	$825.00	3	Medium
31_1FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
30_35FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
29_40FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
28_4FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
27_69FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
32_77FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High

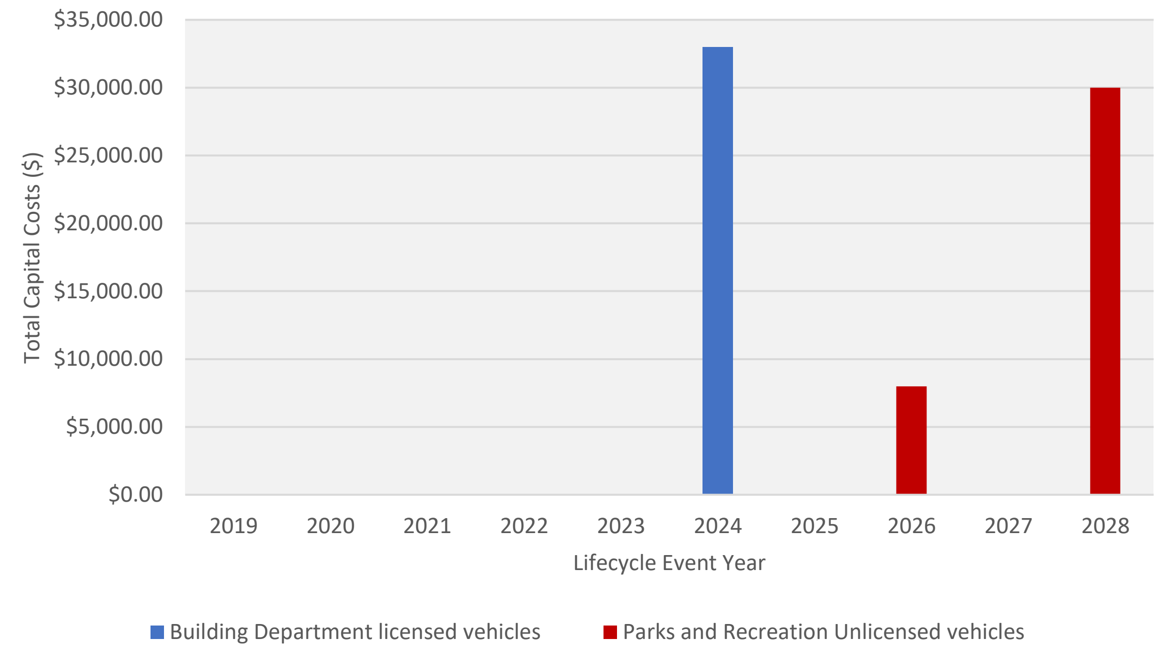
Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
16_16FVT	Fire vehicle tires	Tire Replacement	8	2019	$825.00	3	Medium
18_76FVT	Fire vehicle tires	Tire Replacement	8	2019	$825.00	3	Medium
6_77FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
5_81FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
4_96FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
3_3FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
2_11FVT	Fire vehicle tires	Tire Replacement	10	2019	$648.00	1	High
1_66FVT	Fire vehicle tires	Tire Replacement	10	2019	$648.00	1	High
17_74FVT	Fire vehicle tires	Tire Replacement	8	2019	$825.00	3	Medium
45_1FVT	Fire vehicle tires	Tire Replacement	10	2019	$250.00	1	High
46_31FVT	Fire vehicle tires	Tire Replacement	10	2019	$250.00	1	High
47_71FVT	Fire vehicle tires	Tire Replacement	10	2019	$250.00	1	High
48_70FVT	Fire vehicle tires	Tire Replacement	10	2019	$250.00	1	High
34_59FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
41_1FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
40_1FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
33_70FVT	Fire vehicle tires	Tire Replacement	10	2019	$825.00	1	High
14_38FVT	Fire vehicle tires	Tire Replacement	8	2020	$825.00	3	Medium
5035	Fire licensed vehicles	Rescue Truck 35 Replacement	20	2020	$520,000.00	3	Medium
13_63FVT	Fire vehicle tires	Tire Replacement	8	2020	$825.00	3	Medium
10_14FVT	Fire vehicle tires	Tire Replacement	10	2022	$686.00	3	Medium
7_64FVT	Fire vehicle tires	Tire Replacement	10	2022	$686.00	3	Medium
9_22FVT	Fire vehicle tires	Tire Replacement	10	2022	$686.00	3	Medium
11_90FVT	Fire vehicle tires	Tire Replacement	10	2022	$686.00	3	Medium
12_46FVT	Fire vehicle tires	Tire Replacement	10	2022	$686.00	3	Medium
8_19FVT	Fire vehicle tires	Tire Replacement	10	2022	$686.00	3	Medium
26_100FVT	Fire vehicle tires	Tire Replacement	10	2024	$825.00	4	Medium
7005A	Fire licensed vehicles	2013 Vehicle For Fire & Rescue Replacement	7	2024	$23,000.00	4	Medium

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
25_57FVT	Fire vehicle tires	Tire Replacement	10	2024	$825.00	4	Medium
5031	Fire licensed vehicles	Fire Pumper 31 Replacement	20	2025	$468,000.00	3	Medium
16_16FVT	Fire vehicle tires	Tire Replacement	8	2027	$825.00	3	Medium
17_74FVT	Fire vehicle tires	Tire Replacement	8	2027	$825.00	3	Medium
15_73FVT	Fire vehicle tires	Tire Replacement	8	2027	$825.00	3	Medium
18_76FVT	Fire vehicle tires	Tire Replacement	8	2027	$825.00	3	Medium
43_24FVT	Fire vehicle tires	Tire Replacement	10	2028	$648.00	1	High
42_14FVT	Fire vehicle tires	Tire Replacement	10	2028	$648.00	1	High
38_76FVT	Fire vehicle tires	Tire Replacement	10	2028	$648.00	1	High
14_38FVT	Fire vehicle tires	Tire Replacement	8	2028	$825.00	3	Medium
13_63FVT	Fire vehicle tires	Tire Replacement	8	2028	$825.00	3	Medium
36_27FVT	Fire vehicle tires	Tire Replacement	10	2028	$825.00	1	High
5033	Fire licensed vehicles	Quint Truck Replacement	25	2028	$500,000.00	3	Medium
37_60FVT	Fire vehicle tires	Tire Replacement	10	2028	$648.00	1	High
44_8FVT	Fire vehicle tires	Tire Replacement	10	2028	$648.00	1	High
35_18FVT	Fire vehicle tires	Tire Replacement	10	2028	$825.00	1	High
39_53FVT	Fire vehicle tires	Tire Replacement	10	2028	$648.00	1	High

9.11 Parks and Recreation and Building Department Vehicles

Capital Plan Summary

As stated in the State of the Infrastructure section of this report all Parks and Recreation and Building Department Vehicle assets were loaded into the asset registry with high level of dynamic input. The schedule that is visualized in the graph and chart has been formulated exclusively from staff and recommendations from the 2017 Fleet Management Report.



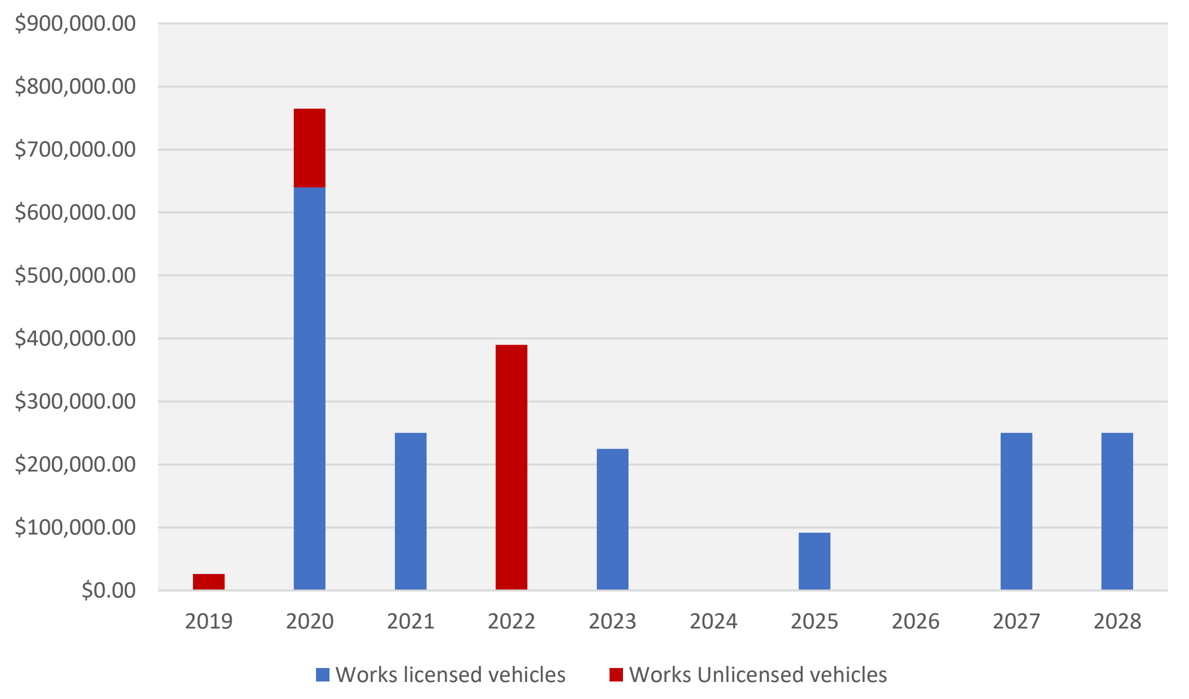
Total Capital Expenditure: $71,000.00

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
7005B	Building Department licensed vehicles	2016 Mid-Size Pickup	7	2024	$33,000.00	3	Medium
4060	Parks and Recreation Unlicensed vehicles	Floor Scrubber	10	2026	$8,000.00	4	Medium
7007	Parks and Recreation Unlicensed vehicles	Lawn Tractor	10	2028	$30,000.00	4	Medium

9.12 Works Department – Licensed and Unlicensed Vehicles and Equipment

Capital Plan Summary

As stated in the State of the Infrastructure section of this report all Works Vehicle assets were loaded into the asset registry with high level of dynamic input. The schedule that is visualized in the graph and chart has been formulated exclusively from staff and recommendations from the 2017 Fleet Management Report



Total Capital Expenditure: $2,248,000.00

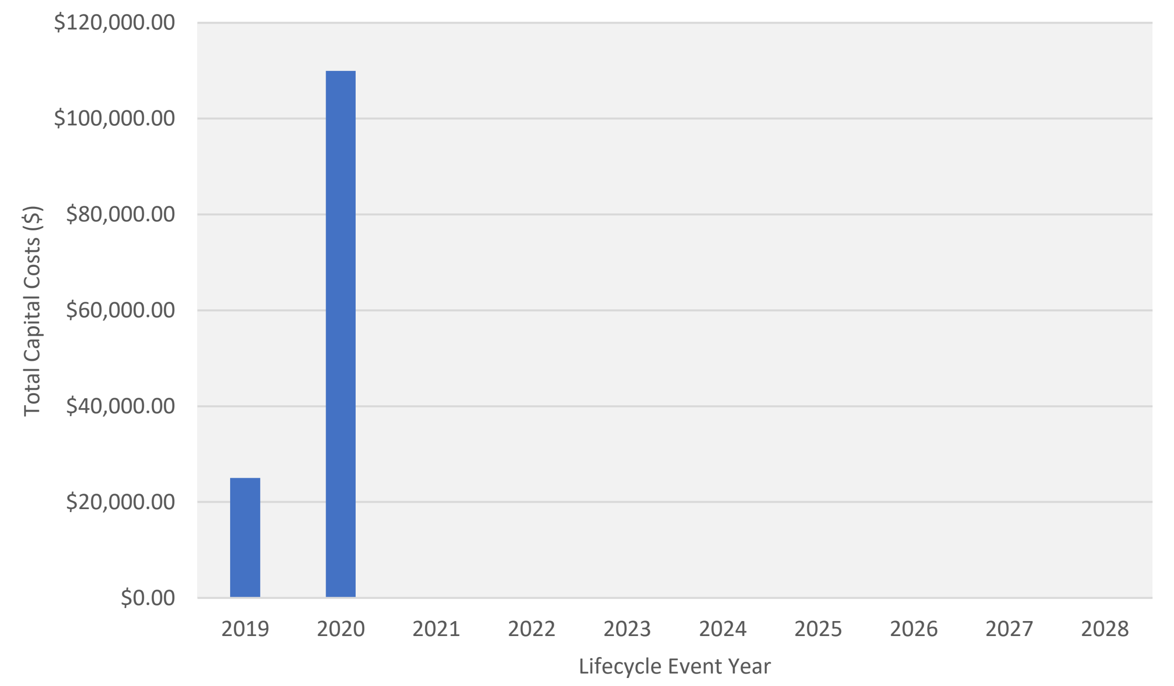
Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
8002	Works Unlicensed vehicles	Gravel Packer – New Equipment for Grader	25	2019	$26,000.00	2	Medium
8019	Works licensed vehicles	2015 GMC Sierra 1500 Replacement	5	2020	$40,000.00	3	Medium
7003	Works licensed vehicles	1 Ton Dump/Plow 305 Replacement	12	2020	$100,000.00	2	Medium
8013	Works licensed vehicles	2011 Single Axle Truck 304 Replacement	8	2020	$250,000.00	1	High

Asset #	Asset Class	Lifecycle Event Description	L.E	Replacement Year	Total Capital Costs	Condition Index (2018)	Risk
8014	Works licensed vehicles	2012 Dump/Plow 302 Replacement	8	2020	$250,000.00	2	Medium
8001	Works Unlicensed vehicles	JCB Backhoe 6 Replacement	12	2020	$125,000.00	2	Medium
8016	Works licensed vehicles	2013 International Plow Truck 301 Replacement	8	2021	$250,000.00	2	Medium
8018	Works Unlicensed vehicles	Brush Chipper Replacement	10	2022	$40,000.00	5	Medium
8002	Works Unlicensed vehicles	Road Grader G740 501 Replacement	25	2022	$350,000.00	2	Medium
8017	Works licensed vehicles	2015 International Plow Truck - 303 Replacement	8	2023	$225,000.00	2	Medium
7009	Works licensed vehicles	2017 Pickup Truck - Staff - 3/4 Ton Replacement	8	2025	$52,000.00	3	Medium
8019	Works licensed vehicles	2015 GMC Sierra 1500 Replacement	5	2025	$40,000.00	3	Medium
8013	Works licensed vehicles	2011 Single Axle Truck 304 Replacement	8	2027	$250,000.00	1	High
8014	Works licensed vehicles	2012 Dump/Plow 302 Replacement	8	2028	$250,000.00	2	Medium

9.13 Sidewalks

Capital Plan Summary

Sidewalk assets lifecycle activity schedule has been developed in the asset registry from their modelled end of expected life. However, the capital expenditure illustrated in the included graph and chart has been generated exclusively from the recommended remediation schedule provided by staff.



Total Capital Expenditure: $135,000.00

Asset #	Asset Class	Lifecycle Event Description	L.E	Lifecycle Event Year	Lifecycle Event Cost	Condition Index (2018)	Risk
304	Sidewalk	Brock Road Sidewalk Remediation for AODA Compliance (Phase 1)	20	2019	$25,000.00	4	Medium
304	Sidewalk	Brock Road Sidewalk Remediation for AODA Compliance (Phase 2)	20	2020	$110,000.00	4	Medium

10.0 Risk

The asset management strategy & framework for this asset management plan takes a risk-centric approach. Risk is an important measure in asset management. Besides cost, risk is one of the few measures that can be compared across asset classes. The comparison of risk across asset classes is only appropriate if risk is calculated using an appropriate methodology. The methodology for assessing asset risk utilized in the Township's Asset Management Strategy and Framework developed as part of this project allows for the comparison of assets across asset classes, categories, and even programs.

Risk is the combination of the Consequence of Failure (CoF) and the Probability of Failure (POF) of an asset as shown in Figure 10.0 - 1. The PoF of an asset is determined using the estimated service life of the asset, the age of the asset, and the assessed condition of the asset. CoF is determined for each asset class based on five weighted consequence of failure factors such as Health and Safety, Financial, Environmental, Legal & Regulatory, Operational and Internal Demand.

Workshops were held with the departments responsible for maintaining assets to determine the CoF for each asset class. The PoF and CoF were combined into a risk matrix, as shown in Figure 1, to determine an asset's Risk Level which determined it's priority for replacement. Risk levels were based on a five-point scale: Very High, High, Moderate, Low, and Very Low. The risk matrix shows the highest risk in the top right and the lowest risk in the bottom left.

Risk Matrix		**Consequence of Failure (CoF)**				
		Insignificant	Low	Medium	High	Severe
Probability of Failure (PoF)	Almost Certain	High	High	Very High	Very High	Very High
	Highly Likely	Moderate	Moderate	High	High	Very High
	Likely	Low	Low	Moderate	High	High
	Unlikely	Very Low	Low	Low	Moderate	Moderate
	Almost Certainly Not	Very Low	Very Low	Very Low	Low	Low

10.0 - 1 Risk Matrix

10.1 Probability of Failure

The probability of failure is the first of two variables required to calculate risk. Probability of failure is the likelihood that an asset will not achieve a desired level of service. Levels of service can be based on the condition of the asset or the performance of the asset.

While asset performance is often tied directly to the condition of the asset, there are performance measures that do not relate to the condition of an asset. These measures can include:

- The appropriateness/size of an asset
- The available of backups for critical assets
- The ability to meet legislated requirements

The Township of Puslinch does not currently collect the data required to assess assets based on performance. For the purpose of this project probability of failure is based solely on condition and serviceable life.

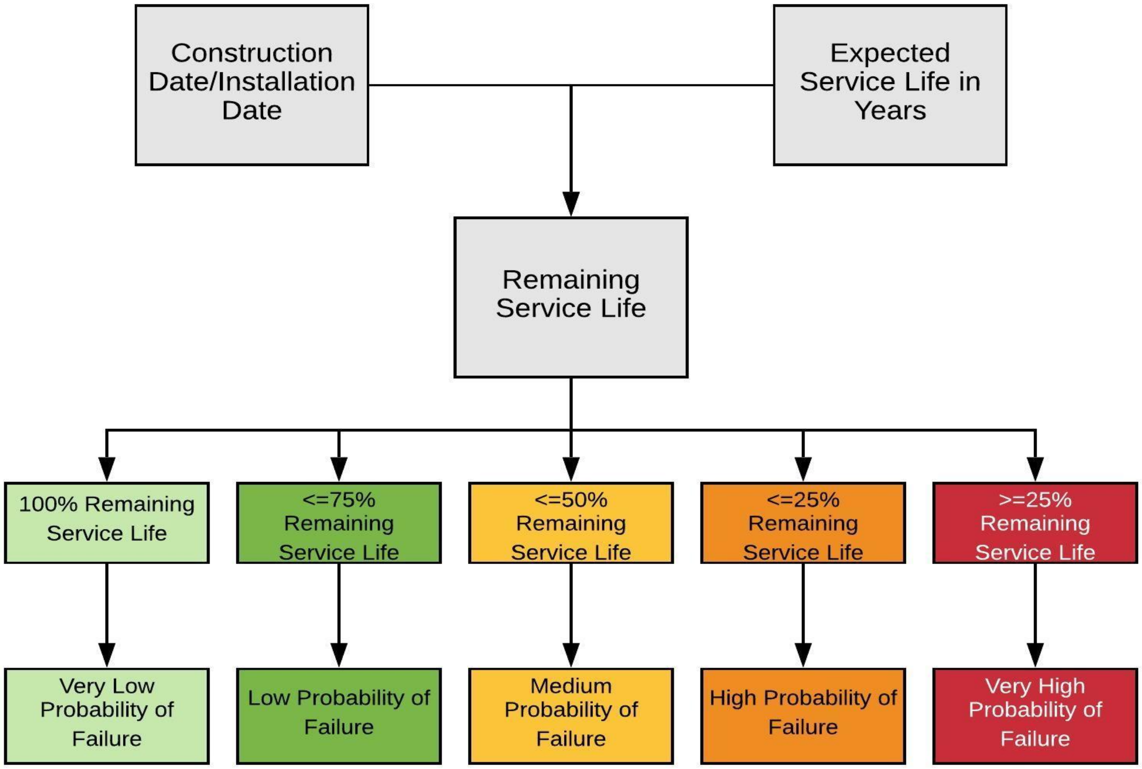
For this asset management plan, condition and remaining serviceable life were the sole determinants of Probability of Failure. For example, an asset with a condition rating of “1” would have a “Very High” probability of failure, while an asset with a condition rating of “5” would have a “Very Low” probability of failure. For this asset management plan, the thresholds for probability of failure were scaled based on the technical levels of service for the asset class. For all asset classes except for Hard Surface Roads and Bridges and Culverts, the probability of failure calculation was the inverse of the condition rating.

Further, when condition data was not available an assets risk was calculated based on the remaining service life of the asset. For example, for many of the vehicles in the asset registry condition data was not available. Thus, in order to create a risk profile for the asset the remaining service life of the asset was used. Both of the above processes to calculate Probability of Failure are illustrated in Sections 10.3 (Calculating Probability of Failure Based on Remaining Service Life) and 10.4 (Calculating Probability of Failure Based on Condition).

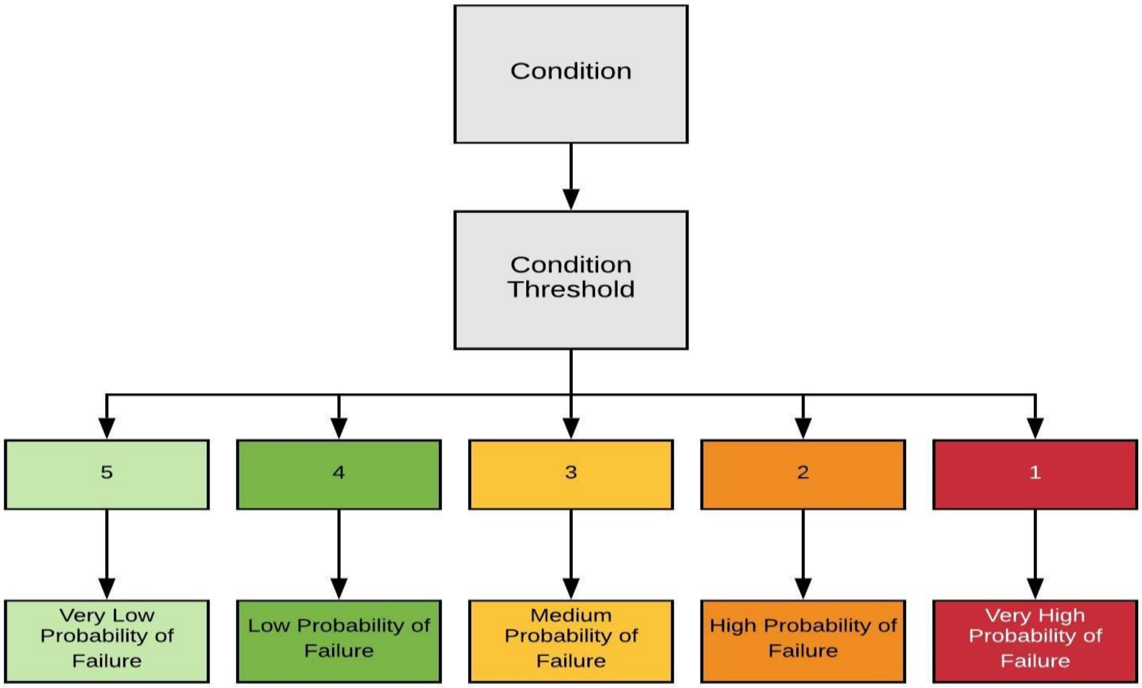
10.2 Consequence of Failure

The Consequence of Failure is determined for each asset class based on five weighted consequence of failure factors: *Health and Safety, Operational & Internal Demand, Environmental, Financial, and Legal & Regulatory Compliance*

10.3 Calculating Probability of Failure Based on Remaining Service Life



10.4 Calculating Probability of Failure Based on Condition



10.5 Consequence of Failure Factors

Health and Safety: Considers impacts to Public and Employee health and safety of asset failure

Operational & Internal Demand: Considers losses or interruptions to internal operations and services provided both internally and externally as a result of asset failure

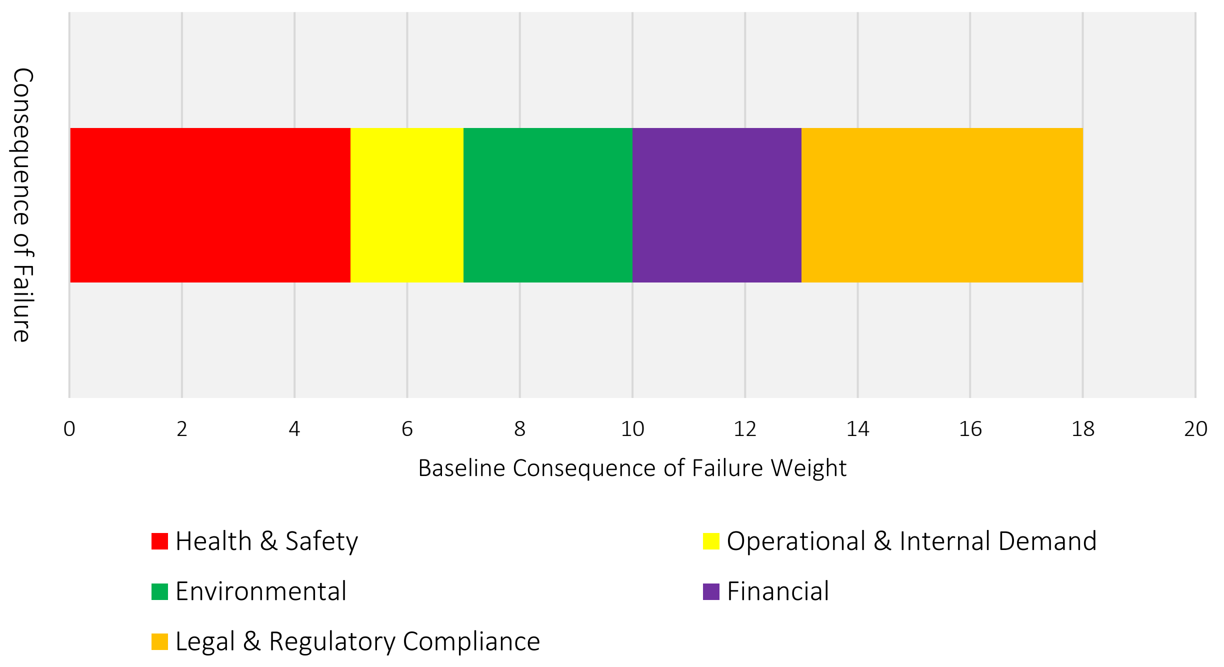
Environmental: Considers direct impacts to the natural environment as the result of asset failure

Financial: Considers financial impacts to the organization as a result of asset failure

Legal & Regulatory Compliance: Considers legal implications and ability to meet regulatory requirements as a result of asset failure

10.6 Consequence of Failure: Establishing Baseline Risk

These factors, when considered collectively were given a baseline weighting factor in order to justify their relative importance against other factors. This weighting factor is a number that would give each asset class a pre-conceived/overall risk weighting. This was necessitated in order to justify each assets baseline risk despite it's condition ratings. To establish this Baseline Risk workshops were held with Staff in order to classify the most important (highest weighted) consequence of failure factors. The results of these workshops are illustrated in Figure 10.0 - 2.



10.0 - 2 Baseline Risk Calculation

10.7 Consequence of Failure: Quantifying the Qualitative Methodology

To further quantify each asset class and create full risk profiles for each of the factors: Health and Safety, Operational & Internal Demand, Environmental, Financial and Legal & Regulatory Compliance. UEM converted the qualitative consequence of failure matrix (charts 10.0 – 3 to 10.0 – 7) into a quantitative format which are illustrated in chart 10.0 – 8. Each respective qualitative category was converted to a number that ranged from 1-10. Where 1 means very low consequence of failure impact and 10 meaning very high consequence of failure impact.

Consequence of Failure		**Health & Safety**
1-2	Insignificant	No obvious potential for injury or affects to health.
3-4	Low	Potential for minor injury or affects to health of an individual. Full recovery is expected.
5-6	Medium	Possibility of serious injuries or affects to health. May affect one or more individuals and/or result in short-term disabilities.
7-8	High	Probable likelihood for serious injury or affects to the health of one or more individuals with a possibility for loss of a life and the possibility of long-term disabilities.
9-10	Severe	Definite certainty for death or multiple deaths with possible permanent disabilities.

10.0 - 3 Qualitative Methodology: Health and Safety

Consequence of Failure		**Operational & Internal Demand**
1-2	Insignificant	Small number of customers experiencing service disruption: Under 10 people affected
3-4	Low	Service disruption at a localized level: 10 - 200 people affected, service interrupted 1 day
5-6	Medium	Significant localized service disruption:200 - 1,000 people affected, Service interrupted 1-5 days
7-8	High	Major localized disruption: 1,000 - 5,000 people affected, Service interrupted 5-30 days
9-10	Severe	Township-wide service disruption: Over 5,000 people affected service interruption over 30 days

10.0 - 4 Qualitative Methodology: Operational & Internal Demand

Consequence of Failure		**Environmental**
1-2	Insignificant	Very negligible impact. Reversible within 1 week.
3-4	Low	Material damage of local importance. Minor, short-term (within 6 months) very isolated damage to the environment.
5-6	Medium	Significant short-term (< 1 year) local damage to the environment.
7-8	High	Significant long-term (> 1 year) widespread damage to the environment.
9-10	Severe	Major long-term (+5 years) or permanent widespread damage to the environment.

10.0 - 5 Qualitative Methodology: Environmental

Consequence of Failure		**Financial**
1-2	Insignificant	Cost of Reactive response and replacement is 100% of the cost of proactive replacement and an increase cost to providing service is negligible
3-4	Low	Cost of Reactive response and replacement is 110% to 120% of proactive replacement and an Increase in cost to providing service is over 5%
5-6	Medium	Cost of Reactive response and replacement is over 110% to 125% of proactive replacement and an Increase in cost to providing service is over 10%
7-8	High	Cost of Reactive response and replacement is over 125% to 200% of proactive replacement and an Increase in cost to providing service is over 25%
9-10	Severe	Cost of Reactive response and replacement is over 200% of proactive replacement and an Increase in cost to providing service is over 50%

10.0 - 6 Qualitative Methodology: Financial

Consequence of Failure		**Legal & Regulatory Compliance**
1-2	Insignificant	No claims or charges
3-4	Low	Potential claims by an individual possible.
5-6	Medium	Possible Claims and charges by interest groups or Government Agencies.
7-8	High	Probable Claims and charges by interest groups or Government Agencies.
9-10	Severe	Definite claims and charges by interest groups or government agencies.

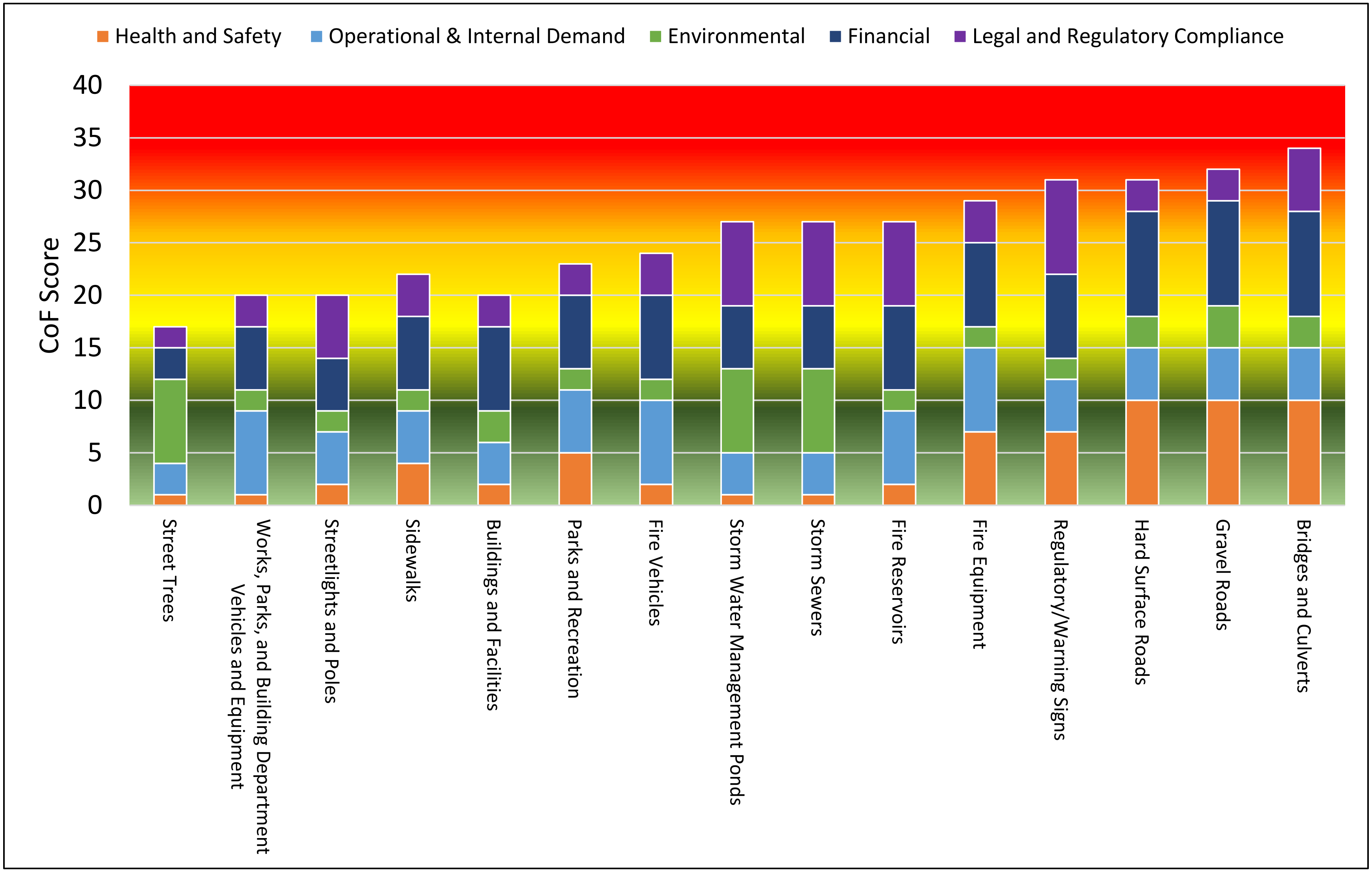
10.0 – 7 Qualitative Methodology: Operational & Internal Demand

Consequence of Failure Score Card

	Baseline Weight	Health and Safety	Internal Demand & Operational	Environmental	Financial	Legal and Regulatory Compliance	Total Consequence of Failure Score
Bridges and Culverts	27	10	5	3	10	6	**61**
Gravel Roads	27	10	5	4	10	3	**59**
Hard Surface Roads	27	10	5	3	10	3	**58**
Regulatory/Warning Signs	27	7	5	2	8	9	**58**
Fire Equipment	27	7	8	2	8	4	**56**
Fire Reservoirs	27	2	7	2	8	8	**54**
Storm Water Management Ponds and Storm Sewers	27	1	4	8	6	8	**54**
Fire Vehicles and Tires	27	2	8	2	8	4	**51**
Parks and Recreation	27	5	6	2	7	3	**50**
Sidewalks	27	4	5	2	7	4	**49**
Buildings and Facilities	27	2	4	3	8	3	**47**
Works, Parks, and Building Department Vehicles and Equipment	27	1	8	2	6	3	**47**
Street lights and Poles	27	2	5	2	5	6	**47**
Trees	27	1	3	8	3	2	**44**

10.0 - 8 Consequence of Failure Scores all Asset Classes

10.8 Consequence of Failure Classifications: Puslinch Asset Classes



10.0 - 9 Consequence of Failure Classification all Asset Classes (Stacked Bar Chart)

10.9 Technical Walkthrough: Calculating Risk & Risk Profiling

Once calculated, Probability of Failure and Consequence of Failure were combined to create a Risk Score. Risk levels were set on a five-point scale: *Very High, High, Moderate, Low,* and *Very Low*.

Probability of Failure (50%) + **Consequence of Failure (50%)** = **Risk Score**

10.0 - 10 Risk Calculation

There are many methods for calculating a risk score, UEM for this asset management plan employed a simple ratio algorithm where a risk score is weighted 50% on its Consequence of Failure and 50% on its Probability of Failure. Figure 10.0 – 10 illustrates that a risk score is devised first from the addition of the Probability of Failure and Consequence of Failure scores and second divided by two to generate a Risk Score.

Table 10.0 – 11 was intentionally designed to illustrate that a high Probability of Failure when joined to a low Consequence of Failure results in a Risk score of 3. The result is the same if there is a high Consequence of Failure and low Probability of Failure, resulting in a Risk score of 3.

Probability of Failure	Addition	Consequence of Failure	Division	Risk Score
5	+	**1**	÷2	3
4	+	**2**	÷2	3
3	+	**3**	÷2	3
2	+	**4**	÷2	3
1	+	**5**	÷2	3

10.0 - 11 Example Risk Calculation

10.10 Risk: Summary of Methods

The methodology for how Consequence of Failure and the Probability of Failure is combined to generate a risk score is as follows:

1. Classification of Probability of Failure
    a. The condition data for each asset was converted from its condition index score (BCI, PCI, Vehicle Kilometers or Condition Rating) 1-5 to a number between 1 and 5. If an asset was in “Critical” condition then it would have a high Probability of Failure or a 5. Further, if an asset was in “Excellent” condition then it would have

a low Probability of Failure or a 1. This classification procedure is summarized below.

   i. Excellent = 1
   ii. Good = 2
   iii. Fair = 3
   iv. Poor = 4
   v. Critical = 5

2. Classification of Consequence of Failure – Based on UEM's experience, the Consequence of Failure for each asset type in the asset registry for the Township of Puslinch was quantified as follows:
   a. Each Asset was given a baseline Consequence of Failure score – which is consistent across all asset types. This is to indicate that Risk is always a factor to an asset. (Reference to 10.6)
   b. Subsequently, each of the Consequence of Failure factors was given a score on a scale between 1 to 10 and then summed to give a total Consequence of Failure score.
      i. A score of 1 means that the Consequence of Failure impact of that factor would be low on that asset class.
      ii. A score of 10 means that the Consequence of Failure impact of that factor would be high on that asset class.
   c. Standardization of the Consequence of Failure Score
      i. The next step was to standardize the Consequence of Failure score to the same maximum and minimum values as the Probability of Failure score.

Standardizing Consequence of Failure Scores		
Hard Surface Roads COF Score: 31 -> 5	Gravel Roads COF Score: 32 -> 5	Bridges and Culverts COF Score: 34 -> 5
Buildings and Facilities COF Score: 20 -> 3	Works, Parks, and Building Department Vehicles and Equipment COF Score: 20 -> 2	Fire Vehicles COF Score: 20 -> 3
Parks and Recreation COF Score: 24 -> 3	Fire Reservoirs COF Score: 23 -> 4	Street lights and Poles COF Score: 20 ->2
Sidewalks COF Score: 22 -> 2	Fire Equipment COF Score: 29 -> 4	Regulatory/Warning Signs COF Score: 31 -> 4
Storm Water Management Ponds COF Score: Ponds 27 -> 3	Storm Sewers COF Score: 27 -> 3	Street Trees COF Score: 17-> 1

10.0 - 12 Standardization of Consequence of Failure Scores

10.11 10 Year Capital Plan Risk Matrix

The following table 10.0 – 13 illustrates the relative risk across all asset classes included in the 10-year capital plan. The table below encompasses the spread of risk in a risk matrix in order to map the relative risk incurred by the Township should they defer the projects proposed in the capital plan.

Risk Matrix: 10 Year Capital Plan Total Costs

		(POF)				
All Assets Consequence of Failure	(COF)	$-	$-	$-	$-	$7,587,241.38
		$-	$-	$-	$5,189,979.85	$-
		$-	$-	$4,328,123.40	$-	$-
		$-	$609,000.00	$626,987.00	$-	$-
		$-	$-	$-	$-	$-

10.0 -13 10 Year Capital Plan Total Expenditure

11.0 Asset Class Risk Summaries

This section summarizes each asset class in the asset registry using the logic and procedures necessary for risk profiling each asset class. These logics have already been stated in Section 10.7 Quantifying the Qualitative Methodology. The financial figures included in each summary page represent the outputs from the 10-year capital plan. Thus, for all asset classes that are not included in the capital plan, there will be a “No Data” in the title header.

11.1 Bridges

Consequence of Failure Descriptions

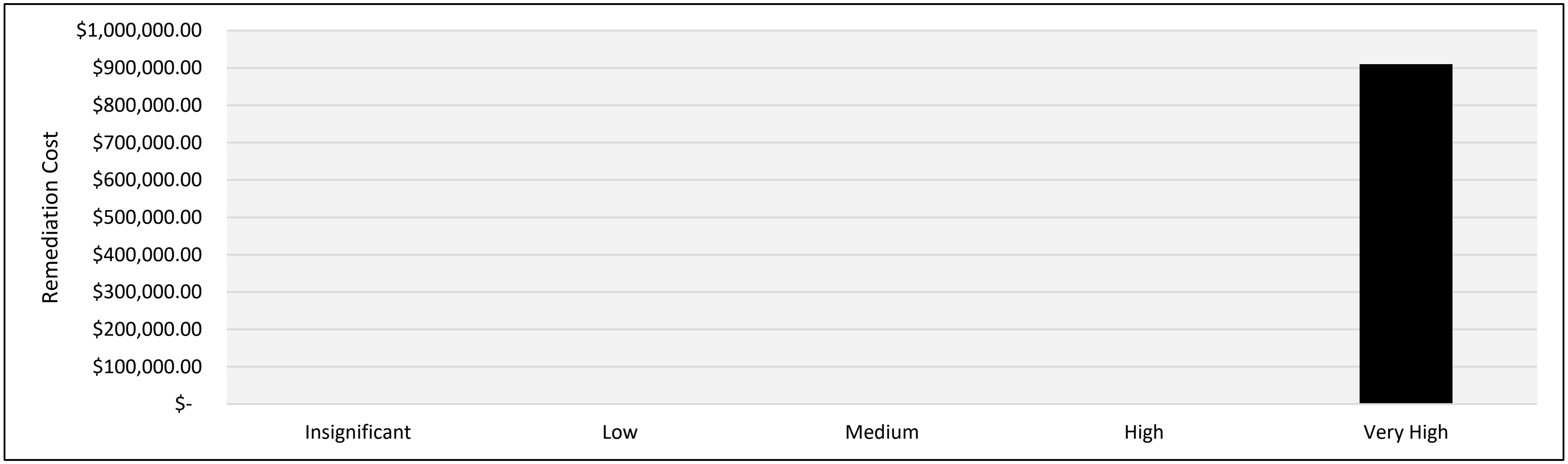
Health and Safety: Definite certainty for death or multiple deaths with possible permanent disabilities.

Operational & Internal Demand: Significant localized service disruption:200 - 1,000 people affected, Service interrupted 1-5 days.

Environmental: Material damage of local importance. Minor, short-term (within 6 months) very isolated damage to the environment.

Financial: Cost of Reactive response and replacement are over 200% of proactive replacement and increase in cost to providing service is over 50%.

Legal & Regulatory Compliance: Possible Claims and charges by interest groups or Government Agencies.



		Probability of Failure (PoF)				
Bridges	Consequence of Failure (CoF)	$ -	$ -	$ -	$ -	$ 910,000.00
		$ -	$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -	$ -

11.2 Culverts

Consequence of Failure Descriptions

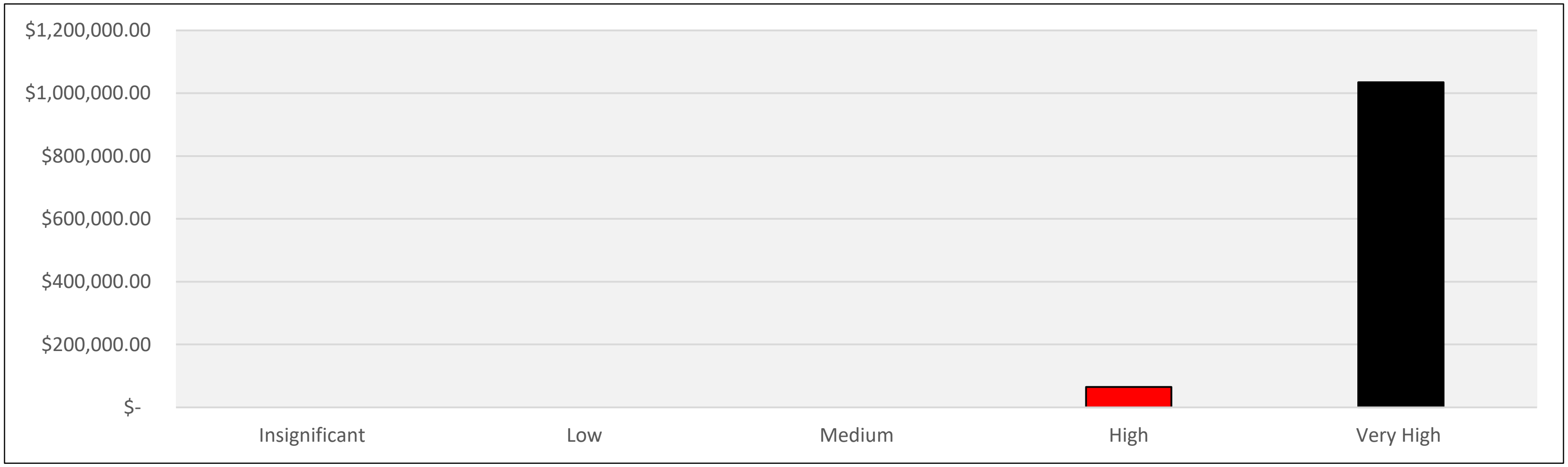
Health and Safety: Definite certainty for death or multiple deaths with possible permanent disabilities.

Operational & Internal Demand: Significant localized service disruption:200 - 1,000 people affected, Service interrupted 1-5 days.

Environmental: Material damage of local importance. Minor, short-term (within 6 months) very isolated damage to the environment.

Financial: Cost of Reactive response and replacement are over 200% of proactive replacement and Increase in cost to providing service is over 50%.

Legal & Regulatory Compliance: Possible Claims and charges by interest groups or Government Agencies.

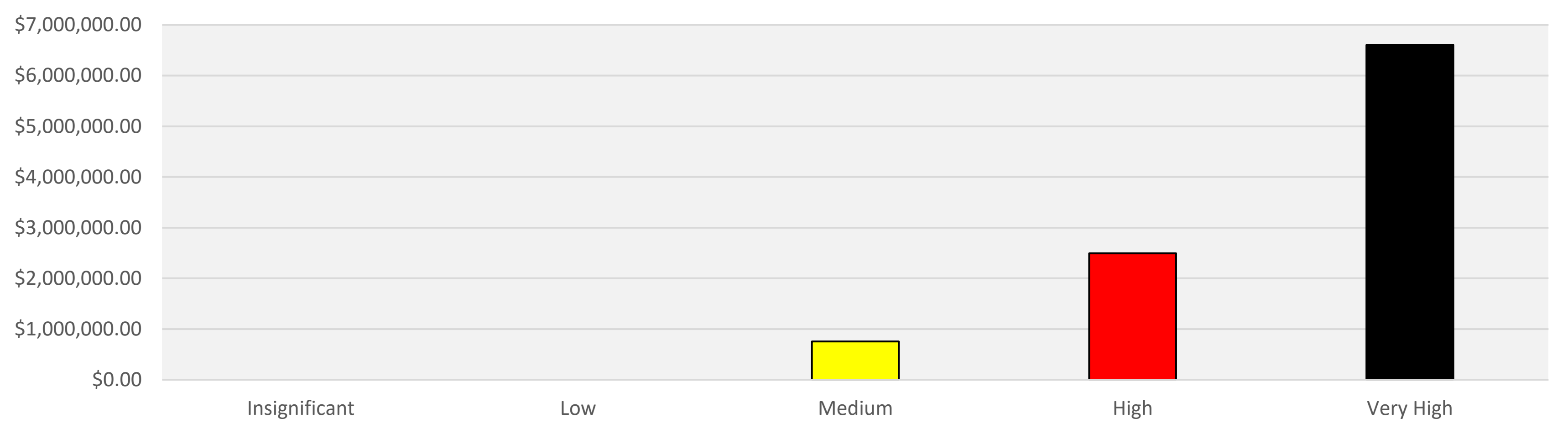


		Probability of Failure (PoF)				
Culverts	Consequence of Failure (CoF)	$ -	$ -	$ -		$ 1,035,000.00
		$ -	$ -	$ -	$ 65,000.00	$ -
		$ -	$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -	$ -

11.3 1 Lift, 2 Lift, Gravel and Surface Treated Roads

Consequence of Failure Descriptions

Health and Safety: Definite certainty for death or multiple deaths with possible permanent disabilities.
Operational & Internal Demand: Significant localized service disruption:200 - 1,000 people affected, Service interrupted 1-5 days.
Environmental: Material damage of local importance. Minor, short-term (within 6 months) very isolated damage to the environment.
Financial: Cost of Reactive response and replacement are over 200% of proactive replacement and Increase in cost to providing service is over 50%.
Legal & Regulatory Compliance: Potential claims by an individual possible.

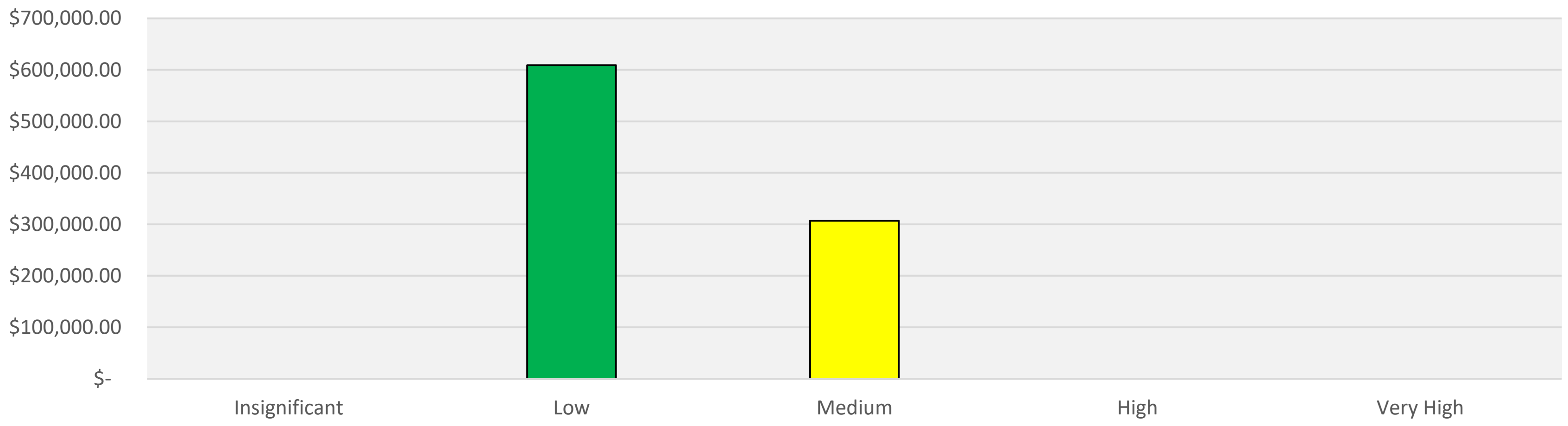


		Probability of Failure (PoF)				
Road Surfaces	Consequence of Failure (CoF)	$-	$-	$-	$-	$6,603,741.38
		$-	$-	$-	$2,543,759.85	$-
		$-	$-	$780,507.40	$-	$-
		$-	$-	$-	$-	$-
		$-	$-	$-	$-	$-

11.4 Buildings and Facilities

Consequence of Failure Descriptions

Health & Safety: No obvious potential for injury or impacts to health.
Legal & Regulatory Compliance: Claims by an individual possible.
Financial: Cost of Reactive response and replacement are over 125% to 200% of proactive replacement and Increase in cost to providing service is over 25%.
Environmental: Material damage of local importance. Minor, short-term (within 6 months) very isolated damage to the environment.
Operational & Internal Demand: Service disruption at a localized level: 10 - 200 people affected, service interrupted 1 day.

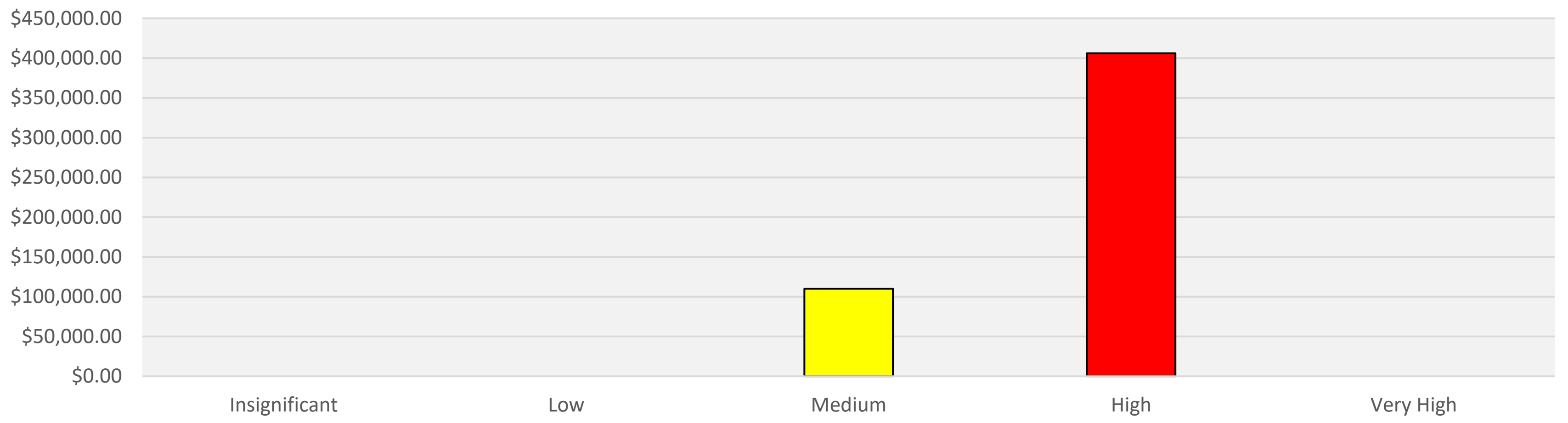


		Probability of Failure (PoF)				
Buildings and Facilities	Consequence of Failure (CoF)	$-	$-	$-	$-	$-
		$-	$-	$-	$-	$-
		$-	$-	$192,750.00	$-	$-
		$-	$609,000.00	$114,337.00	$-	$-
		$-	$-	$-	$-	$-

11.5 Parks and Recreation

Consequence of Failure Descriptions

Health and Safety: Possibility of serious injuries or impacts to health. May affect one or more individuals and/or result in short-term disabilities.
Operational & Internal Demand: Significant localized service disruption:200 - 1,000 people affected, Service interrupted 1-5 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement are over 125% to 200% of proactive replacement and Increase in cost to providing service is over 25%.
Legal & Regulatory Compliance: Potential claims by an individual possible.

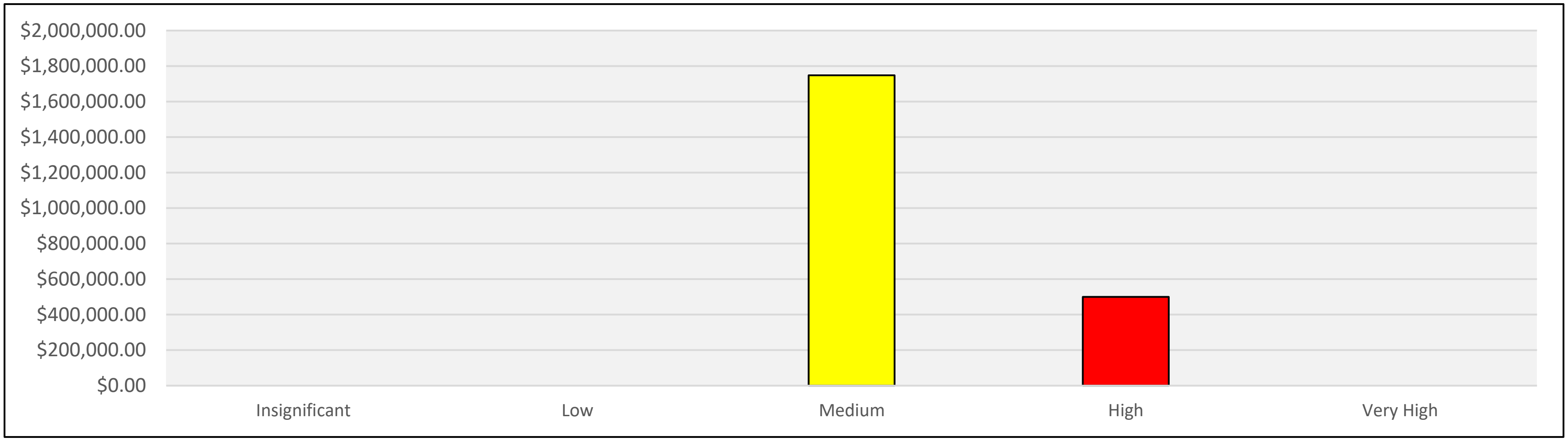


		Probability of Failure (PoF)				
Parks and Recreation	Consequence of Failure (CoF)	$-	$-	$-	$-	$-
		$-	$-	$-	$406,036.00	$-
		$-	$-	$-	$-	$-
		$-	$-	$110,000.00	$-	$-
		$-	$-	$-	$-	$-

11.6 Works Department – Licensed & Unlicensed Vehicles and Equipment

Consequence of Failure Descriptions

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Major localized disruption: 1,000 - 5,000 people affected, Service interrupted 5-30 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement is over 110% to 125% of proactive replacement and Increase in cost to providing service is over 10%.
Legal & Regulatory Compliance: Potential claims by an individual possible.

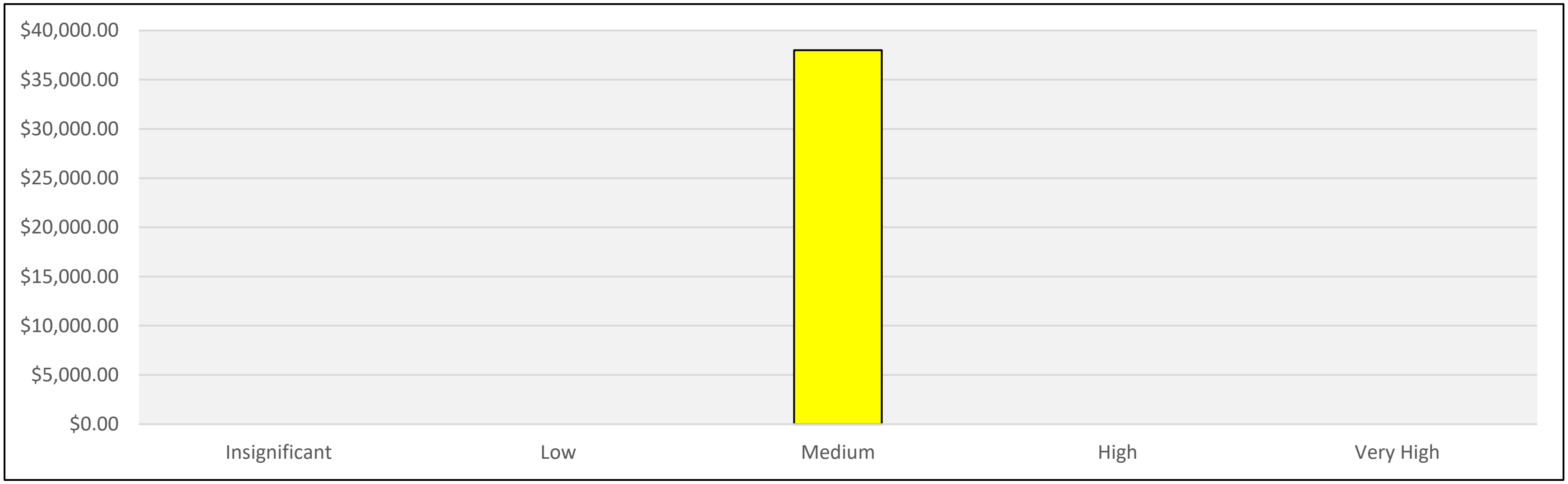


		Probability of Failure (PoF)				
Works, Parks, Building Dpts.	Consequence of Failure (CoF)	$-	$-	$-	$-	$-
		$-	$-	$-	$500,000.00	$-
		$-	$-	$1,576,000.00	$-	$-
		$-	$-	$172,000.00	$-	$-
		$-	$-	$-	$-	$-

11.7 Parks and Recreation Unlicensed vehicles

Consequence of Failure Descriptions

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Major localized disruption: 1,000 - 5,000 people affected, Service interrupted 5-30 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement is over 110% to 125% of proactive replacement and Increase in cost to providing service is over 10%.
Legal & Regulatory Compliance: Potential claims by an individual possible.

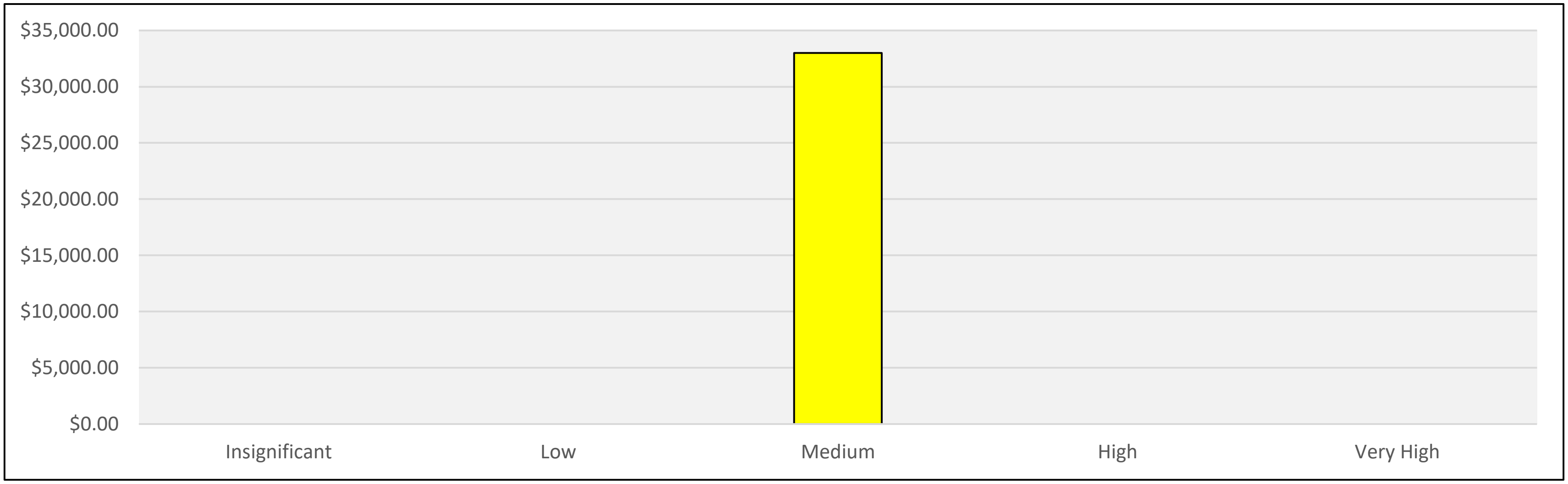


Probability of Failure (PoF)						
P & R Unlicensed	Consequence of Failure (CoF)	$-	$-	$-	$-	$-
		$-	$-	$-	$	$-
		$-	$-	$	$-	$-
		$-	$-	$38,000.00	$-	$-
		$-	$-	$-	$-	$-

11.8 Building Department Licensed Vehicles

Consequence of Failure Descriptions

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Major localized disruption: 1,000 - 5,000 people affected, Service interrupted 5-30 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement is over 110% to 125% of proactive replacement and Increase in cost to providing service is over 10%.
Legal & Regulatory Compliance: Potential claims by an individual possible.

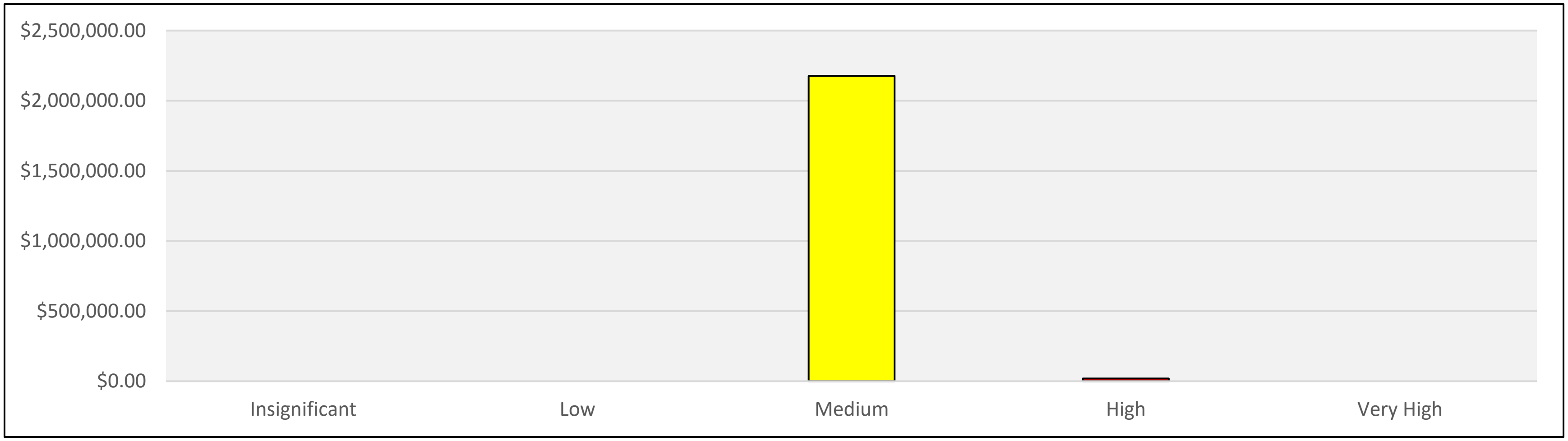


		Probability of Failure (PoF)				
BD Licensed Vehicles	Consequence of Failure (CoF)	$-	$-	$-	$-	$-
		$-	$-	$-	$	$-
		$-	$-	$33,000.00	$-	$-
		$-	$-	$	$-	$-
		$-	$-	$-	$-	$-

11.9 Fire Licensed Vehicles (Vehicles and Tires)

Consequence of Failure Description

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Major localized disruption: 1,000 - 5,000 people affected, Service interrupted 5-30 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement are over 125% to 200% of proactive replacement and Increase in cost to providing service is over 25%.
Legal & Regulatory Compliance: Cost of Reactive response and replacement is 110% to 120% of proactive replacement or Increase in cost to providing service is over 5%.

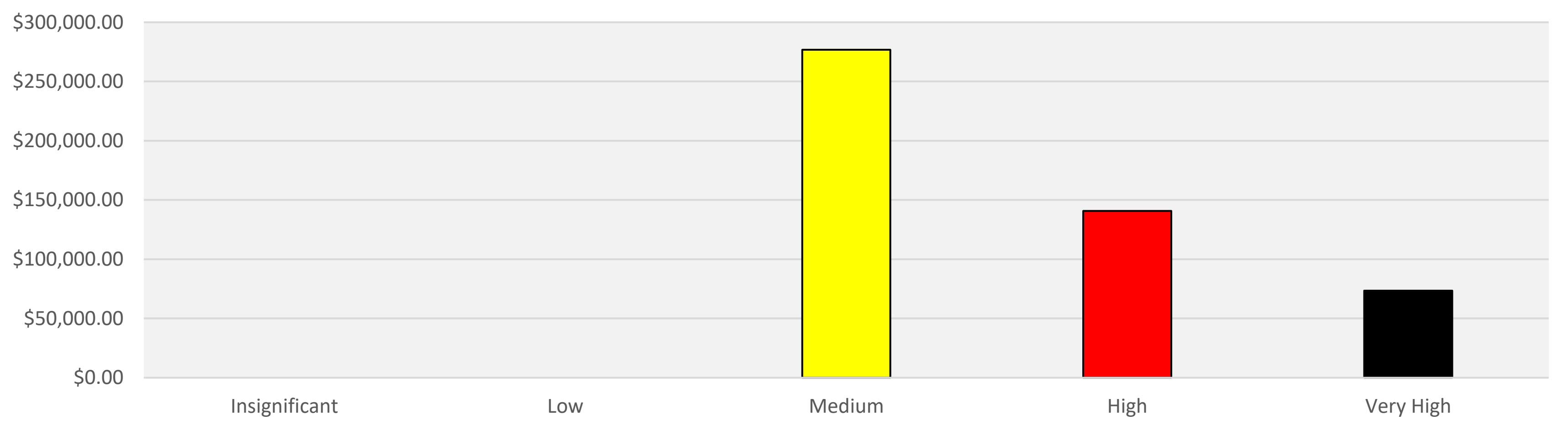


		Probability of Failure (PoF)				
Fire Licensed Vehicles	Consequence of Failure (CoF)	$-	$-	$-	$-	$-
		$-	$-	$-	$19,384.00	$-
		$-	$-	$1,502,016.00	$-	$-
		$-	$-	$24,650.00	$-	$-
		$-	$-	$-	$-	$-

11.10 Fire Equipment

Consequence of Failure Descriptions

Health and Safety: Probable likelihood for serious injury or impacts to the health of one or more individuals with a possibility for loss of a life and the possibility of long-term disabilities.
Operational & Internal Demand: Major localized disruption: 1,000 - 5,000 people affected, Service interrupted 5-30 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement are over 125% to 200% of proactive replacement and Increase in cost to providing service is over 25%.
Legal & Regulatory Compliance: Potential claims by an individual possible.

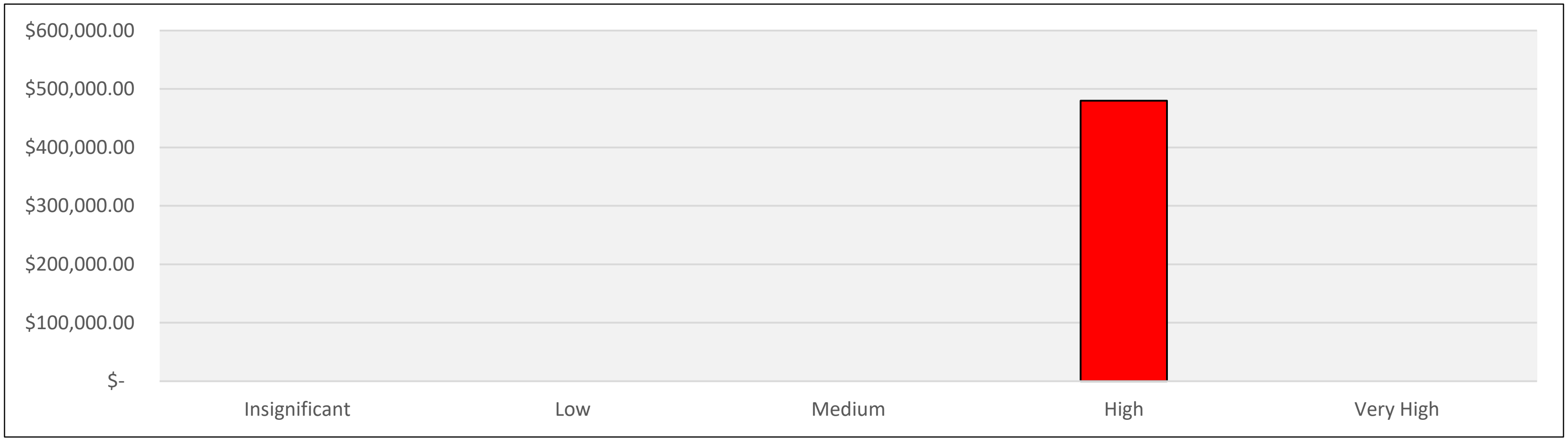


		Probability of Failure (PoF)				
Fire Equipment	Consequence of Failure (CoF)	$-	$-	$-	$-	$73,500.00
		$-	$-	$-	$140,800.00	$-
		$-	$-	$276,850.00	$-	$-
		$-	$-	$-	$-	$-
		$-	$-	$-	$-	$-

11.11 Storm Water Management Ponds

Consequence of Failure Descriptions

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Service disruption at a localized level: 10 - 200 people affected, service interrupted 1 day.
Environmental: Significant long-term (> 1 year) widespread damage to the environment.
Financial: Cost of Reactive response and replacement is over 110% to 125% of proactive replacement and Increase in cost to providing service is over 10%.
Legal & Regulatory Compliance: Possible Claims and charges by interest groups or Government Agencies.

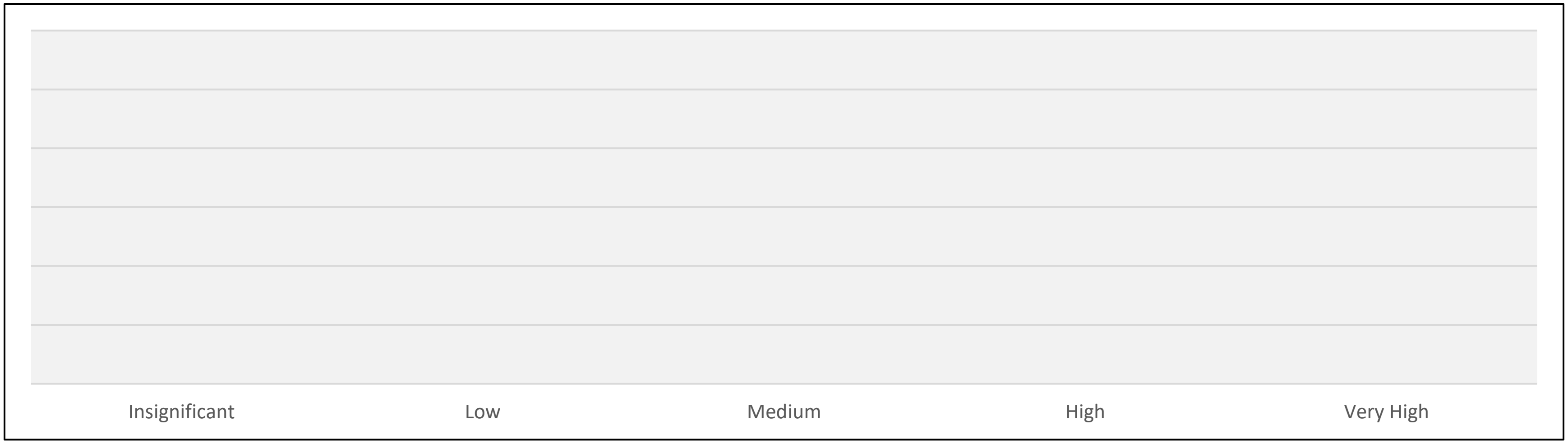


		Probability of Failure (PoF)				
Storm Water Management Ponds	Consequence of Failure (CoF)	$-	$-	$-	$-	$-
		$-	$-	$-	$480,000.00	$-
		$-	$-	$-	$-	$-
		$-	$-	$-	$-	$-
		$-	$-	$-	$-	$-

11.12 Street lights and Poles (No Data)

Consequence of Failure Descriptions

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Significant localized service disruption:200 - 1,000 people affected, Service interrupted 1-5 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement is over 110% to 125% of proactive replacement and Increase in cost to providing service is over 10%.
Legal & Regulatory Compliance: Probable Claims and charges by interest groups or Government Agencies.

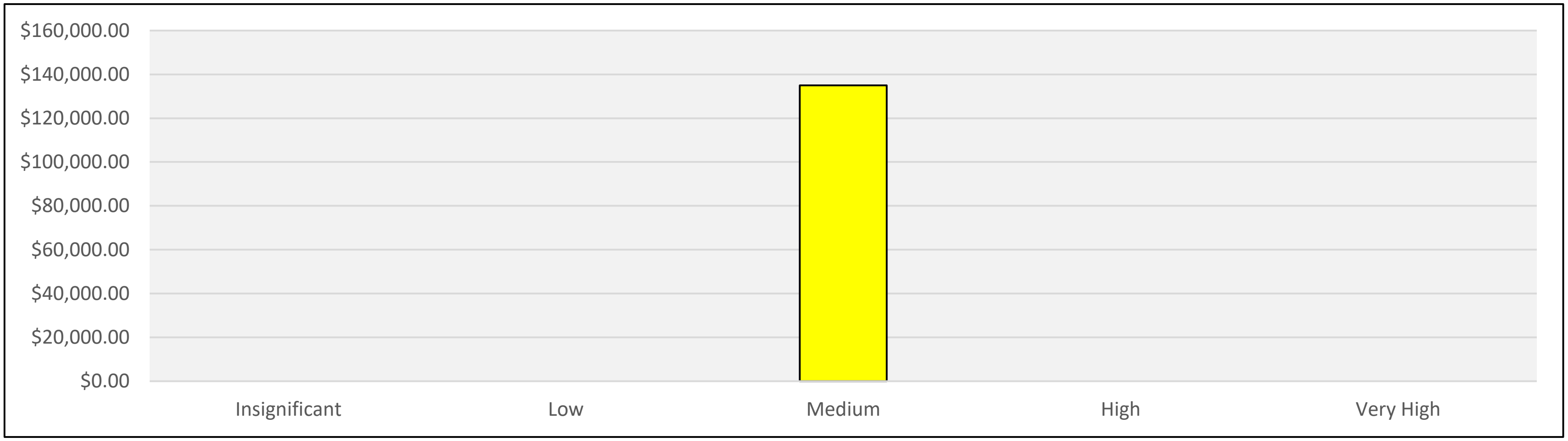


		Probability of Failure (PoF)				
Street light and Poles	Consequence of Failure (CoF)	⬛	⬛	⬛	⬛	⬛
		🟥	🟥	🟥	🟥	🟥
		🟨	🟨	🟨	🟨	🟨
		🟩	🟩	🟩	🟩	🟩
		🟩	🟩	🟩	🟩	🟩

11.13 Sidewalks

Consequence of Failure Descriptions

Health and Safety: Potential for minor injury or impacts to health of an individual. Full recovery is expected.
Operational & Internal Demand: Significant localized service disruption:200 - 1,000 people affected, Service interrupted 1-5 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement are over 125% to 200% of proactive replacement and Increase in cost to providing service is over 25%.
Legal & Regulatory Compliance: Potential claims by an individual possible.

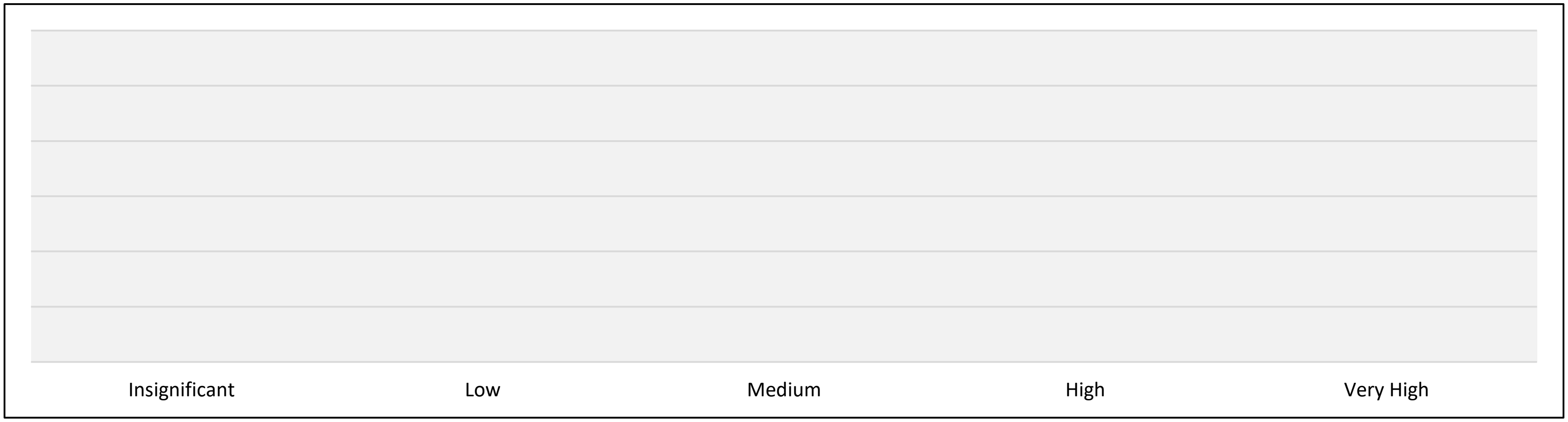


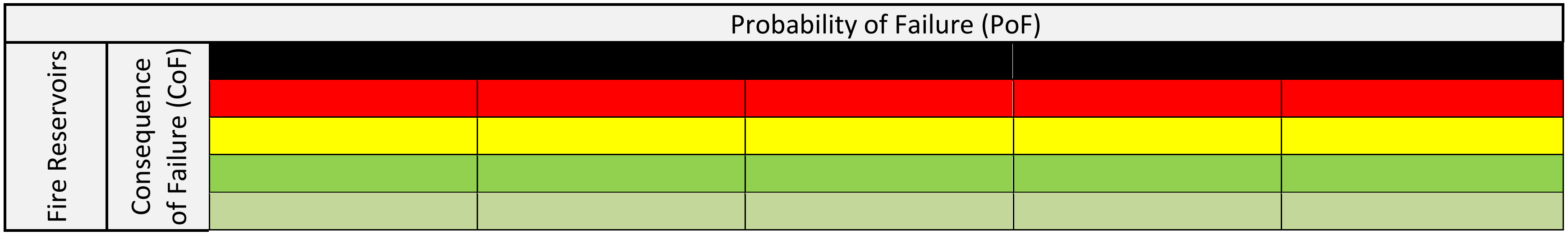
		Probability of Failure (PoF)				
Sidewalks	Consequence of Failure (CoF)	$-	$-	$-	$-	$-
		$-	$-	$-	$-	$-
		$-	$-	$-	$-	$-
		$-	$-	$135,000.00	$-	$-
		$-	$-	$-	$-	$-

11.14 Fire Reservoirs (No Data)

Consequence of Failure Descriptions

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Major localized disruption: 1,000 - 5,000 people affected, Service interrupted 5-30 days.
Environmental: Very negligible impact. Reversible within 1 week.
Financial: Cost of Reactive response and replacement are over 125% to 200% of proactive replacement and Increase in cost to providing service is over 25%.
Legal & Regulatory Compliance: Probable Claims and charges by interest groups or Government Agencies.





11.15 Regulatory/Warnings Signs (No Data)

Consequence of Failure Descriptions

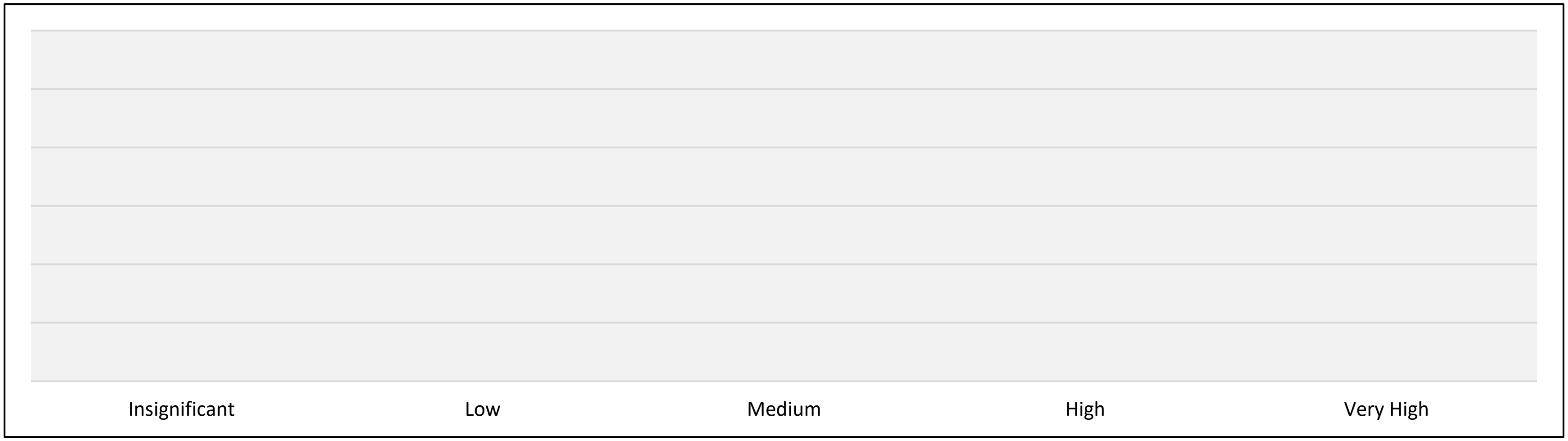
Health and Safety: Probable likelihood for serious injury or impacts to the health of one or more individuals with a possibility for loss of a life and the possibility of long-term disabilities.

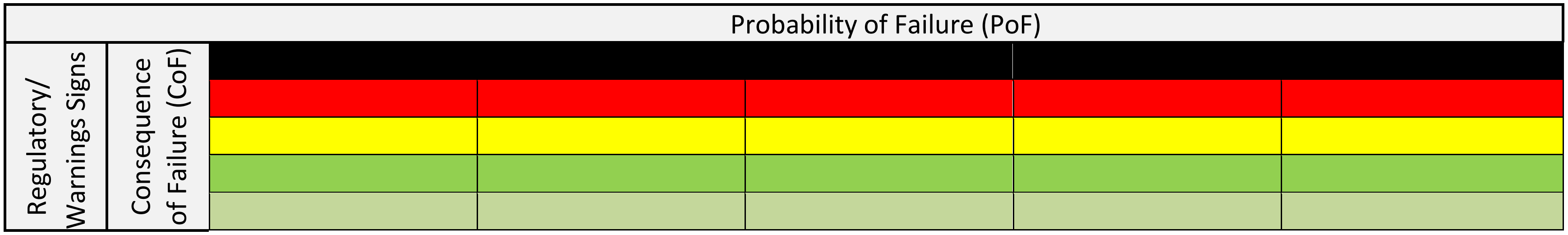
Operational & Internal Demand: Significant localized service disruption:200 - 1,000 people affected, Service interrupted 1-5 days.

Environmental: Very negligible impact. Reversible within 1 week.

Financial: Cost of Reactive response and replacement are over 125% to 200% of proactive replacement and Increase in cost to providing service is over 25%.

Legal & Regulatory Compliance: Definite claims and charges by interest groups or government agencies.

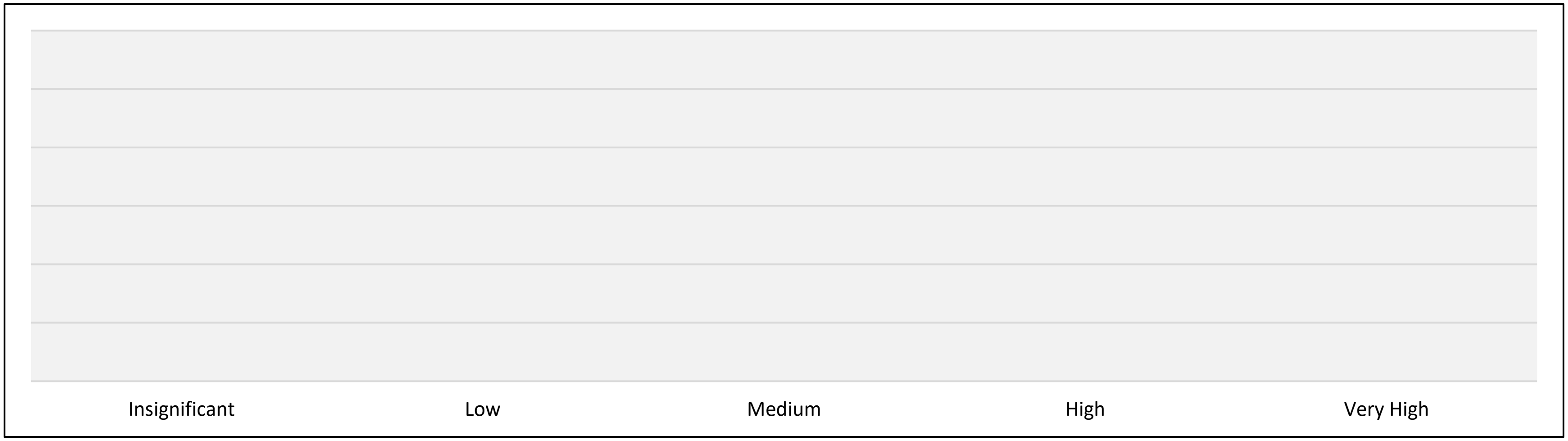


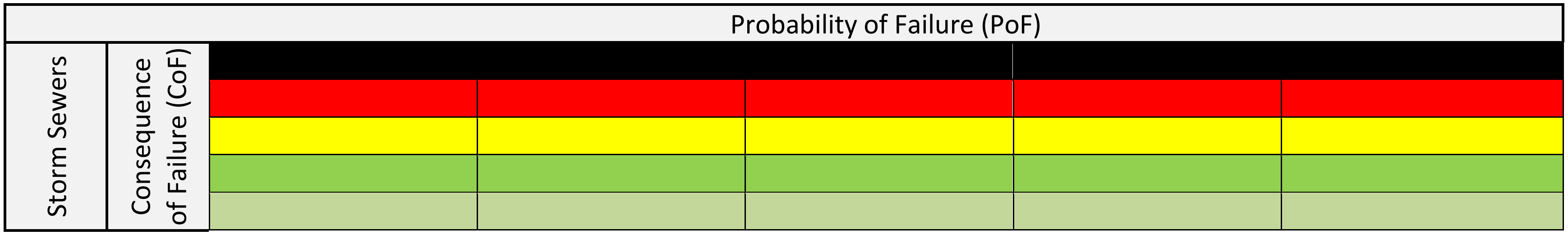


11.16 Storm Sewers (No Data)

Consequence of Failure Descriptions

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Service disruption at a localized level: 10 - 200 people affected, service interrupted 1 day.
Environmental: Significant long-term (> 1 year) widespread damage to the environment.
Financial: Cost of Reactive response and replacement is over 110% to 125% of proactive replacement and Increase in cost to providing service is over 10%.
Legal & Regulatory Compliance: Probable Claims and charges by interest groups or Government Agencies.

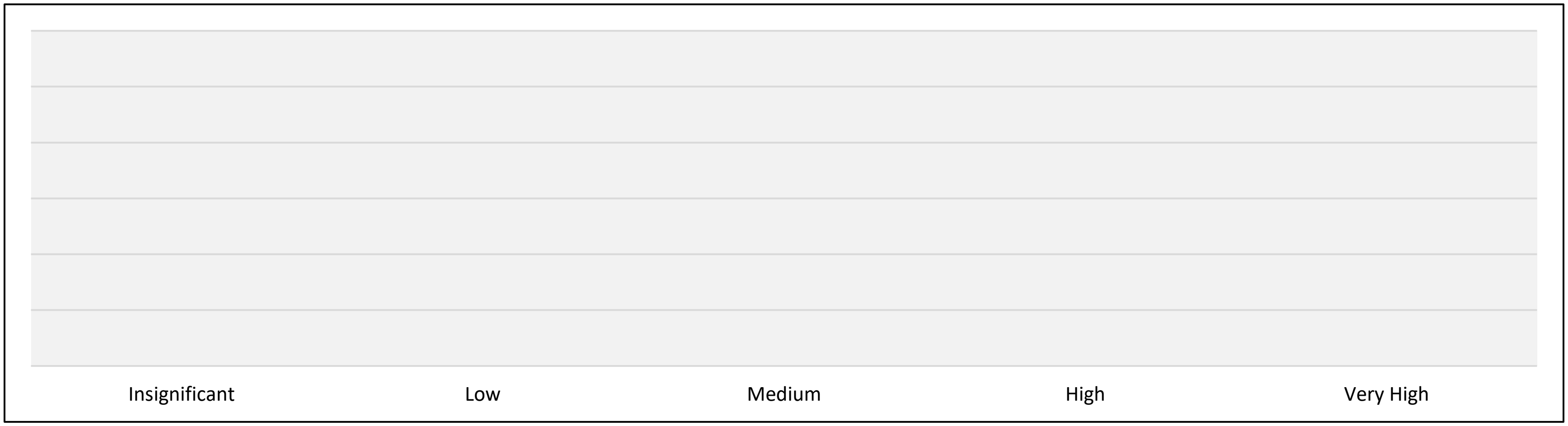


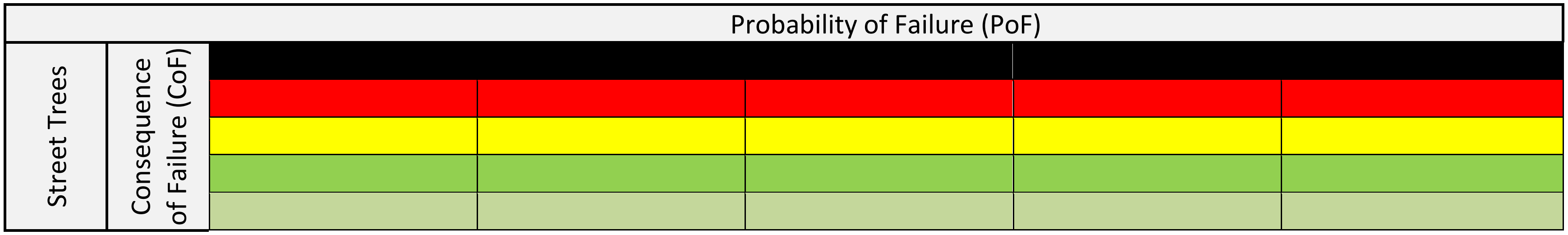


11.17 Street Trees (No Data)

Consequence of Failure Descriptions

Health and Safety: No obvious potential for injury or impacts to health.
Operational & Internal Demand: Service disruption at a localized level: 10 - 200 people affected, service interrupted 1 day.
Environmental: Significant long-term (> 1 year) widespread damage to the environment.
Financial: Cost of Reactive response and replacement is 110% to 120% of proactive replacement and Increase in cost to providing service is over 5%.
Legal & Regulatory Compliance: No claims or charges.





12.0 Financial Plan

12.1 Legislative Requirement

Ontario Regulation 588/17 requires that for the proposed levels of service a municipality shall prepare a 10-year lifecycle management and financial strategy. The regulation requires that the lifecycle management and financial strategy set out the following:

- An identification of the lifecycle activities that would need to be undertaken to achieve the proposed level of service for each asset category;
- An identification of the costs of undertaking the lifecycle activities;
- An identification of the annual funding projected to be available;
- An explanation of the financial options examined; and
- An identification of any funding shortfall and an explanation of how the funding shortfall and associated risks will be addressed.

Sections 8-9 identified the lifecycle activities (and the projected costs associated with those activities) that would need to be undertaken to achieve the proposed level of service for each asset category. Sections 12-13 identify the proposed annual funding projected to be available, an explanation of the financial strategy options examined and an explanation of how any funding shortfall and associated risks will be addressed.

Under this section three financial strategy options were developed. It should be noted that a number of assumptions were required to be made in the development of these options, as well as financial policy considerations. These assumptions and financial policy considerations are discussed below.

12.2 Financial Strategy Assumptions

The information used in the development of the financial strategy options was provided by Township staff and UEM, with the three financial strategy options being based on funding the asset management lifecycle activities as detailed in Sections 8-9. The following assumptions used in the development of these options were reviewed with Township staff and considered reasonable.

12.3 Capital Financing Assumptions

It has been assumed that certain capital grants would be available towards financing the asset management lifecycles activities. The grant amounts contained in the financial strategy are consistent with those outlined in the Township's 2019 Proposed Capital Budget, Township staff direction, and consist of the following grant sources:

- Ontario Community Infrastructure Grant (OCIF)
- Gas Tax Funding
- County Accessibility Grant

It should be noted that the OCIF grant is assumed to only be available to 2020 as this is the last year of the official grant program. Should this grant program be renewed it is recommended that the financial strategy be reviewed, and adjustments made at that time.

It has also been assumed that a portion of the Aggregate Revenue received annually by the Township would be available for financing Asset Management Plan capital related activities. As well, approximately $80 thousand has been assumed to be available from the Public Works DC Reserve Fund for financing the asset management lifecycles activities. This is consistent with the 2014 Development Charges Study that identified 15.6% of roads projects to be deemed growth-related, and therefore eligible for use of DC funds.

The balance of capital financing necessary to undertake the recommended lifecycle activities is assumed to come from the capital asset replacement discretionary reserve, or the use of long-term debt. It should be noted that the use of long-term debt will only be considered for financing asset management lifecycles activities when available funds are insufficient in the capital asset replacement discretionary reserve. Insufficient funds are deemed to occur when the capital asset replacement discretionary reserve reaches its recommended minimum target balance. The financial policies regarding the use of long-term debt and the capital asset replacement discretionary reserve recommended target balances are discussed later in this section.

Assumptions on the sources of capital financing are also discussed under Annual Capital Levy Assumptions and Debt Management Assumptions, as well as under Financial Policy Considerations regarding the Recommended Asset Management Lifecycle Activity Funding Target and Recommended Long-Term Debt Capacity Restrictions.

12.4 Capital Asset Replacement Discretionary Reserve Assumptions

There are several discretionary reserves which have been established by the Township for a variety of purposes. All discretionary reserves were reviewed with Township staff, and capital asset replacement related reserves were identified. It is assumed that the projected balances contained in these capital asset replacement related discretionary reserves would be available towards the funding of asset management lifecycle activities as recommended in this report. A one-time infusion of $507,627 was provided into these reserves from the Township’s 2018 Surplus. The sum-total of the 2019 opening balances of these capital asset replacement related discretionary reserves is estimated at $2,838,841. For purposes of the development of the financing strategy options it is assumed that there will be one consolidated discretionary reserve for capital asset management lifecycle activities. It is assumed that contributions to this reserve will come from the Township’s annual capital levy, with annual draws going towards funding the recommended asset management lifecycle activities. Assumptions regarding the annual Asset Management Plan capital levy and the asset management lifecycle activities are discussed below.

Assumptions have also been made regarding the extent to which annual draws can be made from this reserve. It is assumed that the capital asset replacement discretionary reserve can only be drawn on to fund annual asset management lifecycle activities to the extent that funds in the reserves exceed the recommended minimum target balance. Policies on the Recommended Capital Asset Replacement Discretionary Target Balances are discussed further under Financial Policy Considerations.

12.5 Asset Management Lifecycle Activities Assumptions

The asset management lifecycle activities and associated costs used in the development of the financial strategy options are as detailed in Sections 8-9 of this report. The costs as detailed in Sections 8-9 are however reflected in 2019 dollars. For purposes of developing the financial strategy options, the asset management lifecycle activities costs have been inflated to the year in which they are recommended to be incurred. The inflation of these costs is necessary in developing a realistic financial strategy as the Township's tax levy that will be required to, in-part, fund the asset management lifecycle activities will be in future dollars. It is assumed that the asset management lifecycle activities costs inflate annually by 2%.

12.6 Annual Asset Management Plan Capital Levy Assumptions

Each year, as part of the Townships annual budget setting process a capital levy is provided for in the annual estimates of costs to be funded from the current tax levy. In 2018 the Township's capital levy was established at $690,849, with a one-time adjustment of $232,500 being made to accommodate an operational matter related to OMERS. It is assumed that the base budget for the capital levy has been adjusted back in 2019 to a normalized level of $923,349. Upon discussions with Township staff it was directed that 75% of the 2019 base capital levy, or $692,512, be assumed to be dedicated towards the funding of asset management related operating costs. For purposes of developing the three financial strategy options the asset management related operating costs shall consist of:

- transfers to the capital asset replacement discretionary reserve, and
- servicing of any asset management lifecycle activity related long-term debt.

12.7 Debt Management Assumptions

In each year of the 10-year asset management lifecycle activity forecast, total capital financing must equal total capital expenditures. In years where available Asset Management Plan capital financing from all sources, including available funds from the capital asset replacement discretionary reserve are insufficient to finance the inflated costs related to the asset management lifecycle activities, it is assumed that long-term debt will be used to balance capital financing with capital expenditures.

When debt is considered necessary in a given year, it is assumed that the long-term debt is issued at the end of that year, with long-term debt servicing commencing in the following year. It is assumed that long-term debt will have a term of 10 years, with an interest rate of 3.5%. This is considered conservative as the Township has authority to issue long-term debt for financing capital assets for a term of the lesser of 40 years, or the useful life of the asset being financed by the long-term debt. The majority of assets impacted by the asset management lifecycle activities have useful lives far in excess of 10 years.

It is assumed that servicing of long-term debt will be provided from the annual capital levy, with the unallocated balance of the annual capital levy being transferred into the capital asset replacement discretionary reserve where it will be available, subject to the minimum balance policy, to fund the asset management lifecycle activities.

The financial policies regarding the use of long-term debt are discussed later in this section.

13.0 Financial Policy Considerations

13.1 Recommended Asset Management Lifecycle Activity Target Funding Levels

One of main objectives of the financial strategy options is to achieve a sustainable level of funding towards asset management related costs. For purposes of this Financial Policy Consideration, asset management related costs include the cost associated with asset management lifecycle activities, and the costs associated with servicing long-term debt incurred for financing past asset management lifecycle activities.

It is recommended that a sustainable level of asset management funding is deemed to be achieved when total Township asset management funding is equivalent to 2% of the projected estimated capital asset replacement values of all asset classes as contained in the Township's Asset Registry. Capital asset replacement values are currently estimated at approximately $80 million and are assumed to appreciate each year by 2%. This target level of asset management funding is considered best practice and is within the range of asset management target funding levels of other municipalities.

As noted previously it is assumed for the purposes of developing the Township's financial strategy options, the funding sources of asset management related costs consists of:

- Ontario Community Infrastructure Grant (OCIF)
- Gas Tax Funding
- County Accessibility Grant
- Aggregate Levy
- Public Works Development Charges
- Asset Management Plan Capital Levy

Other than the Asset Management Plan Capital Levy, all sources of funding asset management related costs have been clearly identified and quantified from the Township's 2019 Proposed Capital Budget and Township staff direction. Only the Asset Management Plan Capital Levy will vary under each financial strategy option. For each financial strategy option, the Asset Management Plan capital levy will increase each year at the % impact rate for each of the respective financial strategy options until the recommended asset management target funding level is achieved. Once this target funding level is achieved then only necessary increases in the Capital Levy will occur each year to ensure that the asset management target funding level is maintained.

13.2 Recommended Capital Asset Replacement Discretionary Reserve Target Balances

It is not uncommon for a municipality to have upper and lower target balances for their respective reserves. Under this Financial Policy Consideration, the minimum and maximum target balances of the capital asset replacement discretionary reserve be recommended such that the minimum reserve balance be set at an amount that would represent 10% of the inflated 10-year asset management lifecycle activity expenditures, with the maximum target balance not to exceed an amount that would represent 20% of the inflated 10-year asset management lifecycle activity expenditures. For purposes of the financial strategy options, the capital asset replacement discretionary reserve shall have a minimum balance of $1.73 million and a target balance of $3.47 million. This Financial Policy Consideration regarding target balances are considered best practice for asset replacement related reserves and is in-line with target balances of other municipalities.

As noted earlier in this section it is assumed that contributions to this reserve will come from the Township's annual capital levy, with annual draws going towards funding the recommended asset management lifecycle activities. Assumptions have also been made regarding the extent to which annual draws can be made from this reserve. It is assumed that the capital asset replacement discretionary reserve can only be used to fund annual asset management lifecycle activities to the extent that funds in the reserves exceed the recommended minimum target balance.

13.3 Recommended Long-Term Debt Capacity Restrictions

The use of long-term debt is an important financing tool that is available to the Township in providing flexibility for the financing of capital projects. The financial strategy options presented in this section identify the need for long-term debt to finance asset management lifecycle activities in years in which available funds in the capital asset replacement discretionary reserve are insufficient. When considering the use of long-term debt in the financing of capital works it is deemed best practice for a municipality to adopt a debt management policy to ensure the long-term debt is used and managed appropriately. While beyond the scope of this project to detail all possible considerations of a debt management policy, long-term debt capacity restrictions are discussed with the view to establishing a perspective on the degree to which long-term debt plays a role in the financial strategy options.

While statutory limitations of a municipality's indebtedness are provided annually by the Province, it is best practice for a municipality's debt management policy to contain tighter restrictions on the level of debt that the Township is willing to incur. Under Provincial regulation a municipality is not allowed to issue long-term debt which would result in the annual repayment of long-term debt and interest to exceed an amount that would represent 25% of that municipality's own source (net) revenues. Under this Financial Policy Consideration, it is recommended that this limit be reduced to long-term debt servicing that would not exceed an amount that would represent 10% of the Township's net revenues. Again, this is considered best practice and is used by many municipalities as an internal long-term debt capacity restriction.

14.0 Financial Strategy Options

As noted earlier in this section three financial strategy options were developed. Under the financial strategy options, different levels of annual Asset Management Plan capital levy funding increases are presented. The financial details of each of these options can be found in Financial Strategy Options Appendices 20.1, 20.2 and 20.3.

14.1 Asset Management Plan Capital Levy

The three options for annual Asset Management Plan capital levy funding increases are based on the tax impact that each respective increase in the annual Asset Management Plan capital levy will have on the typical single family detached dwelling (median valued single family detached dwelling within the Township).

The Asset Management Plan capital levy funding increase considered under the three financial strategy options are:

- Option 1 – Annual Asset Management Plan Capital Levy Increase is Equivalent to a 1% Tax Impact on the Typical Single Family Detached Dwelling.

- Option 2 – Annual Asset Management Plan Capital Levy Increase is Equivalent to a 2% Tax Impact on the Typical Single Family Detached Dwelling.

- Option 3 – Annual Asset Management Plan Capital Levy Increase is Equivalent to a 3% Tax Impact on the Typical Single Family Detached Dwelling.

In 2019 a $38,500 increase in the capital levy represents an approximate 1% tax impact on the typical single detached dwelling. $77,300 represents a 2% impact, with $115,950 representing an approximate 3% impact. The dollar amounts of the capital levy increases will increase each year as projected changes occur in the Townships future assessment values, as well as changes in the medium value of a typical single family detached dwelling. A comparison of projected annual capital levy increases over the forecast period for the three financial strategy options can be found below in Table 14.0 - 1 (Comparison of Annual Capital Levy Increases - $).

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	38,500	39,000	39,400	39,700	40,100	40,500	40,900	41,300	41,700	42,200
Option 2	77,300	78,800	80,400	82,000	84,000	83,761	34,222	34,907	35,604	36,317
Option 3	115,950	91,310	122,400	100,272	22,778	33,551	34,222	34,907	35,604	36,317

14.0 – 1 (Comparison of Annual Capital Levy Increases - $)

It should be noted however that the annual Asset Management Plan capital levy increase will occur each year at the same % impact rate for each of the respective financial strategy options when the recommended Asset Management Plan target funding, or sustainable funding level is not achieved. In years when the Asset Management Plan target funding level is achieved then only necessary increases in the Capital Levy will occur to ensure that the Asset Management Plan target funding level is maintained. A comparison of projected annual capital levy % impact rates over the forecast period for the three financial strategy options can be found below in Table 14.0 - 2 (Comparison of Annual Capital Levy Increases - %)

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Option 2	2.00%	2.00%	2.00%	2.00%	2.00%	1.96%	0.79%	0.80%	0.81%	0.82%
Option 3	3.00%	2.29%	3.00%	2.40%	0.54%	0.79%	0.80%	0.81%	0.82%	0.83%

14.0 – 2 (Comparison of Annual Capital Levy Increases - $)

Table 14.0 - 3 (Comparison of Annual Capital Levy - $) provides a comparison of the total capital levy generated each year under the three financial strategy options.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	731,012	770,012	809,412	849,112	889,212	929,712	970,612	1,011,912	1,053,612	1,095,812
Option 2	769,812	848,612	929,012	1,011,012	1,095,012	1,178,773	1,212,995	1,247,902	1,283,506	1,319,823
Option 3	808,462	899,772	1,022,172	1,122,444	1,145,222	1,178,773	1,212,995	1,247,902	1,283,506	1,319,823

14.0 – 3 (Comparison of Annual Asset Management Plan Capital Levy - $)

The total capital levy is allocated to between two Asset Management Plan related costs:

- transfers to the capital asset replacement discretionary reserve, and
- servicing of any asset management lifecycle activity related long-term debt.

Table 14.0 – 4 (Comparison of Transfers of Capital Levy to Capital Asset Replacement Discretionary Reserve - $) details for each financial strategy option the amounts that the Asset Management Plan Reserve will receive from the annual capital Levy. As can be noted in this table, the transfers under Option 1 are decreasing. This is due to the significant increase in debt servicing noted in Table 14.0 - 5. The increased debt servicing is the direct

result of the need for larger amounts of long-term debt to finance the asset management lifecycle activities under that option.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	731,012	770,012	695,652	632,346	633,562	497,859	453,499	451,529	334,093	367,151
Option 2	769,812	848,612	829,368	824,440	892,654	831,366	820,429	855,336	781,209	817,526
Option 3	808,462	899,772	933,327	959,171	981,949	881,603	876,705	911,612	851,019	887,336

14.0 – 4 (Comparison of Transfers of Capital Levy to Capital Asset Replacement Reserve - $)

Table 14.0 - 5 (Comparison of Servicing of Asset Management Plan Long Term Debt) details for each financial strategy option the amount of debt servicing which results from the financing of the asset management lifecycle activities. As noted, all three financial strategy options will require long-term debt in financing the asset management lifecycle activities.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	-	-	113,760	216,766	255,650	431,852	517,113	560,383	719,519	728,661
Option 2	-	-	99,643	186,572	202,358	347,406	392,566	392,566	502,297	502,297
Option 3	-	-	88,844	163,273	163,273	297,170	336,289	336,289	432,487	432,487

14.0 – 5 (Comparison of Servicing of Asset Management Plan Long-Term Debt - $)

14.2 Asset Management Plan Funding

Total Asset Management Plan funding represents the funding sources that the Township has directed towards funding asset management related costs. For the purposes for developing the Township's Financial Strategy options, the Asset Management Plan funding sources consist of:

- Ontario Community Infrastructure Grant (OCIF)
- Gas Tax Funding
- County Accessibility Grant
- Aggregate Levy
- Public Works Development Charges
- Asset Management Plan Capital Levy

The capital levy amount shown in Table 14.0 - 3, when combined with the other Asset Management Plan funding sources as detailed in Table 14.0 - 6 (Other Sources of Asset Management Plan Funding - $) show the total funds dedicated by the Township towards funding asset management related costs (see Table 14.0 - 7).

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Provincial/Federal Grants (OCIF)	169,421	168,923	-	-	-	-	-	-	-	-
Gas Tax Funding	222,547	222,547	232,662	232,662	242,778	242,778	242,778	242,778	242,778	242,778
Other (County Accessibility Grant Funding)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Aggregate Revenue	228,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Public Works Development Charges	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560
Total Other Sources of AMP Funding	**709,528**	**681,030**	**522,222**	**522,222**	**532,338**	**532,338**	**532,338**	**532,338**	**532,338**	**532,338**

14.0 – 6 (Other Sources of Asset Management Plan Funding - $)

Table 14.0 - 7 (Comparison of Asset Management Plan Funding Levels - $) details the Target Asset Management Plan funding levels over the forecast period and compares that target level to the Asset Management Plan Funding Levels provided under each financial strategy option. As can be seen in Table 14.0 - 7, Option 1 does not achieve a sustainable level of funding over the forecast period, whereas Option 2 achieves sustainable funding by 2023 and maintained for the balance of the forecast period. Option 3 achieves sustainable funding by 2020, however due to a reduction in Asset Management Plan funding from other

sources in 2021, a sustainable level of funding is not achieved in that year. A sustainable level of Asset Management Plan funding is again achieved in 2022 and maintained for the balance of the forecast period under Option 3.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Target AMP Funding Level (2% of Capital Asset Values)	**1,549,806**	**1,580,802**	**1,612,418**	**1,644,666**	**1,677,559**	**1,711,111**	**1,745,333**	**1,780,239**	**1,815,844**	**1,852,161**
Option 1	1,440,540	1,451,042	1,331,634	1,371,334	1,421,550	1,462,050	1,502,950	1,544,250	1,585,950	1,628,150
Option 2	1,479,340	1,529,642	1,451,234	1,533,234	1,627,350	1,711,111	1,745,333	1,780,240	1,815,844	1,852,161
Option 3	1,517,990	1,580,802	1,544,394	1,644,666	1,677,560	1,711,111	1,745,333	1,780,240	1,815,844	1,852,161

14.0 - 7 (Comparison of Asset Management Plan Funding Levels - $)

Table 14.0 - 8 (Inflated Asset Management Lifecycle Activities - $) presents the 2019-2028 asset management lifecycle activities' expenditures. As noted earlier in this section, these amounts reflect the asset management lifecycle activities' expenditure as presented in Sections 8-9 but have been adjusted to account for inflation over the forecast period.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Bridges	-	-	426,564	-	-	-	-	574,343	-	-
Culverts	-	-	561,816	-	-	-	-	643,264	-	-
Buildings and Facilities	15,750	22,440	114,444	63,672	32,473	200,115	11,262	17,230	35,150	528,335
Fire Equipment	21,000	314,823	6,242	-	12,989	9,937	69,259	27,568	43,351	14,341
Parks and Recreation	-	35,361	22,889	-	335,554	1,987	-	160,618	-	9,250
Asphalt Road 1 Lift	1,509,346	626,983	167,647	751,961	1,534,372	750,696	492,165	653,942	257,736	1,055,247
Asphalt Road 2 Lift	-	281,926	275,544	-	402,012	497,275	52,434	146,515	233,286	144,747
Asphalt Road Surface Treated	-	-	-	-	-	143,853	16,723	-	-	-
Gravel Road	140,000	66,300	67,626	68,979	70,358	71,765	73,201	74,665	76,158	77,681
Storm Water Management Ponds	-	153,000	171,666	175,099	-	-	-	-	-	-
Fire licensed vehicles	-	530,400	-	-	-	25,394	527,044	-	-	597,546
Fire vehicle tires	17,146	1,683	-	4,368	-	1,822	-	-	3,866	8,590
Sidewalk	25,000	112,200	-	-	-	-	-	-	-	-
Works licensed vehicles	-	652,800	260,100	-	243,547	-	103,607	-	292,915	298,773
Works Unlicensed vehicles	26,000	127,500	-	413,871	-	-	-	-	-	-
Building Department licensed vehicles	-	-	-	-	-	36,435	-	-	-	-
Parks and Recreation Unlicensed vehicles	-	-	-	-	-	-	-	9,189	-	35,853
Total Inflated Asset Management Lifecycle Activities Expenditures	**1,754,242**	**2,925,416**	**2,074,538**	**1,477,950**	**2,631,305**	**1,739,278**	**1,345,694**	**2,307,336**	**942,462**	**2,770,364**

14.0 - 8 (Inflated Asset Management Lifecycle Activities - $)

The asset management lifecycle activities expenditure is financed from various Asset Management Plan financing sources. These Asset Management Plan financing sources consist of:

- Ontario Community Infrastructure Grant (OCIF)
- Gas Tax Funding
- County Accessibility Grant
- Aggregate Levy
- Public Works Development Charges
- Transfers the Capital Asset Replacement Discretionary Reserve
- Long-Term Debt

Only the mix of transfers from the Capital Asset Replacement Discretionary Reserve and the use of long-term debt vary among the three financial strategy options. This mix of reserve transfer/debt is determined by the financial strategy option and the proposed increase in the Asset Management Plan Capital Levy in that option. Table 14.0 - 9 (Asset Management Plan Capital Financing Sources - $) details the 2019 – 2028 sources of capital financing.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Provincial/Federal Grants (OCIF)	169,421	168,923	-	-	-	-	-	-	-	-
Gas Tax Funding	222,547	222,547	232,662	232,662	242,778	242,778	242,778	242,778	242,778	242,778
Other (County Accessibility Grant Funding)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Aggregate Revenue	228,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Public Works Development Charges	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560
(Total of AMP Reserve / Long-Term Debt)	1,044,714	2,244,386	1,552,316	955,728	2,098,967	1,206,940	813,356	1,774,998	410,124	2,238,026
Total AMP Capital Financing Sources	**1,754,242**	**2,925,416**	**2,074,538**	**1,477,950**	**2,631,305**	**1,739,278**	**1,345,694**	**2,307,336**	**942,462**	**2,770,364**

14.0 – 9 (Asset Management Plan Capital Financing Sources - $)

The 2019-2028 Asset Management Plan Reserve Financing is detailed for each financial strategy option in Table 14.0 - 10 (Comparison of Asset Management Plan Reserve Financing - $). The 2019-2028 Long-Term Debt Financing under each financial strategy option is detailed in Table 14.0 - 11 (Comparison of Asset Management Plan Debt Financing - $)

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	1,044,714	1,298,292	695,652	632,346	633,562	497,859	453,499	451,529	334,093	367,151
Option 2	1,044,714	1,415,692	829,368	824,441	892,654	831,366	813,356	862,409	410,124	1,188,610
Option 3	1,044,714	1,505,502	933,327	955,728	985,393	881,602	813,356	974,962	410,124	1,328,232

14.0 – 10 (Comparison of Asset Management Plan Reserve Financing - $)

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	-	946,094	856,664	323,382	1,465,405	709,081	359,857	1,323,469	76,031	1,870,875
Option 2	-	828,694	722,948	131,287	1,206,313	375,574	-	912,589	-	1,049,416
Option 3	-	738,884	618,989	-	1,113,574	325,338	-	800,036	-	909,794

14.0 – 11 (Comparison of Asset Management Plan Debt Financing - $)

14.3 Capital Asset Replacement Discretionary Reserve

As noted earlier, contributions to the capital asset replacement discretionary reserve come from the Township's annual capital levy, with annual draws going towards funding the recommended asset management lifecycle activities. With consideration given to the recommended financial policy regarding the minimum target balance of the capital asset replacement discretionary reserve, Table 14.0 - 12 (Comparison of Asset Management Plan Reserve Balances - $) provides a comparison of the recommended minimum target balance with the forecast reserve balances under each financial strategy option. As can be seen in this table, for each option the reserve levels are at the minimum recommended balances for many of the years in the forecast period. This is due to the magnitude of the asset management lifecycle activities and the need for long-term debt to finance these costs. The associated long-term debt servicing reduces the amount of capital levy that is able to be transferred into the capital asset replacement discretionary reserve, thereby reducing the reserve funds available to finance future asset management lifecycle activities, which in-turn leads to the need for more long-term debt financing.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Minimum Balance at 10% of 10 year Capital Plan	**1,996,859**	**1,996,859**	**1,996,859**	**1,996,859**	**1,996,859**	**1,996,859**	**1,996,859**	**1,996,859**	**1,996,859**	**1,996,859**
Option 1	2,525,139	1,996,859	1,996,859	1,996,858	1,996,858	1,996,859	1,996,858	1,996,858	1,996,858	1,996,858
Option 2	2,563,939	1,996,859	1,996,859	1,996,858	1,996,858	1,996,859	2,003,931	1,996,858	2,367,943	1,996,859
Option 3	2,602,589	1,996,859	1,996,859	2,000,302	1,996,858	1,996,859	2,060,208	1,996,859	2,437,754	1,996,858

14.0 – 12 (Comparison of Asset Management Plan Reserve Balances - $)

14.4 Long-Term Debt

Long-term debt is required under each financing strategy option to fund the asset management lifecycle activities. The amount of required debt was previously detailed in Table 14.0 - 11 (Comparison of Asset

Management Plan Debt Financing - $) with the resulting long-term debt servicing being previously detailed in Table 14.0-5 (Comparison of Servicing of Asset Management Plan Long-Term Debt - $).

Table 14.0 - 13 (Comparison of Outstanding Long-Term Debt - $) details the outstanding debt balances over the forecast period for each financial strategy option. As can be seen Option 1 contains the highest level of outstanding debt at the end of the forecast period at $5.2 million, with Option 3 with the lowest level of outstanding debt at $2.8 million.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	-	946,094	1,722,112	1,889,001	3,164,872	3,552,871	3,519,965	4,406,250	3,916,981	5,196,290
Option 2	-	828,694	1,481,003	1,477,554	2,533,223	2,650,054	2,350,240	2,952,521	2,553,562	3,190,056
Option 3	-	738,884	1,294,890	1,176,938	2,168,432	2,272,495	2,015,744	2,550,041	2,206,806	2,761,352

14.0 - 13 (Comparison of Outstanding Long-Term Debt - $)

The recommended long-term debt capacity restriction noted in the Financial Policy Considerations limits the repayment of long-term debt to an amount that would represent 10% of the Township's net revenues. Table 14.0 - 14 (Comparison of Debt Repayment Limit - $) details the remaining debt servicing capacity under each financial strategy option.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
10% of Net Revenues	**556,512**	**584,337**	**613,554**	**644,232**	**676,444**	**710,266**	**745,779**	**783,068**	**822,221**	**863,332**
Option 1	556,512	584,337	499,795	427,466	420,794	278,413	228,666	222,685	102,703	134,672
Option 2	556,512	584,337	513,911	457,660	474,086	362,859	353,213	390,502	319,924	361,036
Option 3	556,512	584,337	524,710	480,959	513,171	413,096	409,490	446,779	389,735	430,846

14.0 - 14 (Comparison of Remaining Debt Repayment Limit - $)

Table 14.0 - 15 (Comparison of Remaining Debt Servicing Limit - %) views the long-term debt capacity restrictions from the perspective of a percentage of the limit remaining. Option 1 at the end of the forecast period has approximately 16% of the debt capacity available at the end of the forecast period. Option 2 has approximately 42% of the debt capacity remaining at the end of the forecast period, with Option 3 having half of the debt capacity available at the end of the forecast period.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	100%	100%	81%	66%	62%	39%	31%	28%	12%	16%
Option 2	100%	100%	84%	71%	70%	51%	47%	50%	39%	42%
Option 3	100%	100%	86%	75%	76%	58%	55%	57%	47%	50%

14.0 – 15 (Comparison of Remaining Debt Servicing Limit - %)

14.5 Assessment of Financial Strategy Options

All three financial strategy options presented identify the annual funding projected to be available over a 10-year period to finance the asset management lifecycle activities needed to deliver the proposed levels of services detailed in this report.

In assessing the three financial strategy options the overall level of Asset Management Plan funding available, and the degree of use of long-term debt to underwrite shortfalls in available capital asset replacement discretionary reserves is considered.

Table 14.0 - 16 (2019-2028 Asset Management Plan Funding - $) totals all Asset Management Plan funding sources over the forecast period, including other sources of Asset Management Plan funding as well as the capital levy funding, which will vary by financial strategy option. As noted in Table 14.0 - 16, Option 3 provides the highest level of Asset Management Plan financing over the forecast period, with $16.9 million.

Description	Total Other AMP Funding Sources	Total AMP Capital Levy	Total AMP Funding
Option 1	5,629,030	9,110,418	14,739,448
Option 2	5,629,030	10,896,457	16,525,487
Option 3	5,629,030	11,241,069	16,870,099

14.0 – 16 (2019-2028 Asset Management Plan Funding- $)

Table 14.0 - 17 (2019-2028 Capital Levy Allocation) allocates the capital levy funding noted in Table 14.0 - 16 between the transfers to the capital asset replacement discretionary reserve and servicing of Asset Management Plan related long-term debt.

Description	Total AMP Capital Levy	Total AMP Debt Servicing	Total Transferred in AMP Reserve
Option 1	9,110,418	3,543,703	5,566,714
Option 2	10,896,457	2,625,705	8,270,752
Option 3	11,241,069	2,250,111	8,990,957

14.0 – 17 (2019-2028 Capital Levy Allocation - $)

As noted in Table 14.0 - 17, Option 1 provides the lowest level of tax supported funding (capital levy) over the forecast period with $9.1 million, with Option 2 at $10.9 million and Option 3 with the highest level of tax supported funding at $11.2 million. While it should be noted that no funding shortfalls occurred in any of the financial strategy options presented, the use of long-term debt was necessary in all options to the ensure that sufficient Asset Management Plan financing was provided to ensure that the required asset management lifecycle activities could be undertaken.

The use of long-term debt requires debt servicing in the future, and therefore reduces the amount of the capital levy that can be transferred into the capital asset replacement discretionary reserve. The degree to which long-term debt was required under each option over the forecast period is evidenced by the amount Asset Management Plan debt servicing shown is Table 14.0 - 17.

Option 3 has the least debt servicing other the forecast period with $2.3 million of the total capital levy going towards servicing long-term debt that was required to fund the asset management lifecycle activities, with Option 2 requiring $2.6 million and Option 1 requiring $3.5 of the capital levy to servicing long-term debt.

While the capital asset replacement discretionary reserve balances over the forecast period under all financial strategy options are relatively the same, the degree to which the reserve can be drawn upon to fund the asset management lifecycle activities varies greatly. The differences among the three financial strategy options in regard to the funding of the asset management lifecycle activities from the capital asset replacement discretionary reserve is due to the Asset Management Plan capital levy being transferred into the reserve.

As can be seen in Table 14.0 - 17, over the forecast period, Option 1 transferred the least amount of funds into the capital asset replacement discretionary reserve at $5.6 million, with Option 2 transferring $8.3 million and Option 3 transferring the most at $9.0 million. The transfers into the capital asset replacement discretionary reserve allow for the reserve financing of the asset management lifecycle activities, thereby reducing the need for long-term debt financing, and therefore the need to service that debt in the future.

Table 14.0 - 18 (2019-2028 Reserve vs Debt Financing) provides the level of total reserve financing vs. the level of total debt financing for each financial strategy option over the forecast period.

Description	Total AMP Reserve Financing	Total AMP Debt Financing	Total AMP Reserve/Debt Financing
Option 1	6,408,697	7,930,858	14,339,555
Option 2	9,112,734	5,226,821	14,339,555
Option 3	9,832,940	4,506,615	14,339,555

14.0 - 18 (2019-2028 Reserve vs Debt Financing - $

15.0 Resources

15.1 Information Technology Strategy

As part of the project, UEM conducted a review of the available computer technology to support Asset Management at the Township. Regulation 588/17 requires the Township to maintain an Asset Registry and keep all data related to assets updated at least every two years.

15.2 Possible Database/Software Solutions

Puslinch has three valid options for achieving the automation of the process:

1. Maintain and upgrade the custom database and interface that was developed in 2018 as part of the Asset Management Project and is currently utilized for all asset data.
2. Purchase a purpose build software solution from a software vendor.
3. Contract a software developer for the development of a new custom build solution.

A “corporate approach” to information and data management is a pre-requisite for all the above options. This includes people, processes and technology. Functionality determination must be made by Puslinch. Basic information about the “inventory” should be freely accessible for use by any application in Puslinch or beyond. This means that the information should not be encumbered by software.

The Township of Puslinch should consider several requirements for their asset management software. They are as follows: the data should be hosted locally (if possible); the software should facilitate two-way data integration with GIS software (if possible); the ability to modify the database schema & associated attribute data; supporting multiple users with different access levels; the ability to hyperlink to site plans, as-built drawings etc.; and the creation of reports.

Additionally, UEM has identified several criteria for future asset management software. The criteria are as follows: the software must integrate PSAB management; inclusion of capital planning functionality; work order management system; GIS Integration; support multiple inventories (capital vs. non-capital); data is hosted locally; there should be two-way integration with existing databases.

15.3 Technology-Related Requirements

Upon review of the Townships’ existing data processes, UEM has identified some areas for improvement. The foundation of any asset management plan is the data pertaining to each asset. The entire process is reliant on solid, up to date information from the databases.

The current software environment has some associated risks, foremost being limited external database and technological support. It is recommended that the Township of Puslinch acquire software or establish a relationship with a reputable organization to provide support to facilitate the use of these new measurements.

By using Asset Management software, Puslinch will be able to produce detailed capital plans and create maintenance schedules based on the data in addition to meeting PSAB reporting requirements. A significant benefit to the procurement of asset management and maintenance management software is the ability to update asset registers and asset data to be performed directly by the programs and departments responsible for the assets. Prior to the procurement of any software, demonstrations should be arranged where software vendors demonstrate the capability of their software using Township of Puslinch data in order to ensure compatibility with Puslinch's existing IT environment.

15.4 Asset Management Tools

- The Ontario Goods Roads Association makes available, at no cost, to all Municipalities in Ontario a Municipal Data Works (MDW) tool that will enable the full maintenance of the Asset Registry. This tool is provided with a set of applications that will provide full update, maintenance and reporting of asset data.
- While full accounting reporting in MDW as required by MFOA is not yet available, these reports can be obtained through the export of data to Microsoft Excel and the reports can be formatted from Excel. It should be noted that OGRA working with the MFOA intends to build the reports to be available at MDW in the near future.
- Data in MDW should be updated at least once a year, but ideally semiannually.

16.0 Council Approval and Public Engagement

16.1 Council Approval

Council is responsible for approving the Township's goals and priorities. The planning process puts a spotlight on service delivery outcomes expected by the community. Municipalities relay heavily on their capital assets to carry out service delivery to the public. As a result, the asset management process supports the goals of service delivery and is fundamentally linked to many service delivery outcomes. This makes the asset management plan a key document that underpins Council's directions. Therefore, obtaining Council approval of the asset management process and the asset management plan ensures the asset management direction aligns with Council's corporate direction.

Once Council has approved the asset management process/plan, staff are able to undertake ongoing asset management actions knowing that they have council's support/direction, and that they are operating in a manner consistent with The Township's overall direction. Going forward, where asset management related issues are brought to Council, the asset management process provides content for discussions between Council, staff, and the public. However, the question becomes, "How will Council use this asset management process as a tool to make decisions on an ongoing basis?"

Council approves asset management reports and provides specific recommendations to include in the budget process. The recommendations are specific and include priority project identification, lifecycle cost investment levels, estimated impacts on rates, amongst others. Township staff would then incorporate the asset management recommendations into future budgets.

16.2 Public Engagement

Municipalities can benefit from seeking the public's involvement in developing, reviewing, and approving various aspects of the asset management process. The public's input may be directly sought as part of asset management plan discussions concerning levels of service, lifecycle management strategy scenarios, various financing strategy options, and/or other elements of the asset management process. In addition, feedback related to asset management plan issues can be indirectly derived from other public processes such as budget approvals or master plan approvals. Overall, ensuring some level of public engagement throughout the asset management process not only assists in gaining a level of public acceptance on asset management, but also a level of public ownership in the process.

O. Reg 588/17 outlines the following requirements with respect to AM Public Engagement:

- An Asset Management Policy must be developed and adopted by July 1, 2019 and reviewed and updated at least every 5 years. The Asset Management Policy outlines a requirement to include a commitment to provide opportunities for municipal residents and other interest parties to provide input into asset management planning.
- The Township will be required to post their Asset Management Policy and Asset Management Plan on the Township's website, and make copies of these documents available to the public, if requested.

In reference to Puslinch, the public were invited to provide input during the development stages of asset management planning. In this manner, the public had the opportunity to shape the direction of asset management processes by having the opportunity to comment on the Asset Management Policy and on Levels of Service Policies as well as impacts on the Capital Budgets.

The Public were made aware of a public meeting. The public were encouraged to provide comments on asset management topics in general. Prior to the meeting, the presentation was posted at the public counter of the Puslinch municipal office.

The Public Open Meeting was held on February 5, 2019 in the Council Chambers of Puslinch. The Sign-in-sheet indicated that 7 individuals attended. As of the end February 8th two emails were received by the Township.

Verbal concerns were as follows:

1. There is a need to establish a process that would allow the surface treatment of gravel roads or the paving of roads on which there are homes.
2. There was concern in regard to Old Morriston Park and the need for improvements that are not in the Township capital budget.

Verbal areas of clarification were as follows:

3. The methodologies used in order to quantify the condition of building components.
4. The methodologies use in determining the need for upgrading gravel roads.
5. The methodologies used to define level of service policies and their technical levels of service.

Areas of concern in the emails were as follows:

6. Service Level Policy for Gravel Roads.
7. Lack of Data in regard to condition of Gravel Roads.
8. Change in condition of roads to poor.
9. Opinion not to borrow money.
10. Staff levels for the Fire Department and the Township as a whole.

In regard to concerns and areas of clarification information is as follows:

1. UEM in development of the service level policy for Gravel Roads did not consider the spatial significance of gravel roads as they relate to proximity to lived in homes.
2. UEM identified in the asset registry that Old Morriston Park has many assets that are in poor condition. However, the decision for remediation activities to assets at the park are subject to the policies and objectives of the Township.
3. The methodologies used to quantify the condition of buildings have been extracted from the recent Building Condition Assessment. This assessment did not use a condition index in order to assess condition but instead a visual inspection of relevant components of the building structure.
4. The methodologies used to determine the need to upgrade a gravel road have been developed through the review of reports, staff input, input from neighboring municipalities in Wellington County, Minimum Maintenance Standards Ontario Regulation 239/02, and policies of jurisdictions primarily in the United States.
5. Asset Class Level of service policies were developed using information sourced from relevant provincial policies, regulations, internal expert opinion, and the recommendations of staff.
6. The lack of Data for Gravel Roads is an issue that may be improved by way of the regular collection of maintenance information for each gravel road segment.
7. The condition of road surfaces has not changed, only the methodology for classifying how their condition is interpreted has changed. This asset management plan considers that a road surface is in “poor” or “critical” condition based on how soon it is expected to be scheduled for remediation work. The capital planning methodology for road surfaces for the Township for this asset management plan is more conservative and specific than the last asset management plans past methodologies. The current condition classification methodology states that a road is to be remediated when it’s pavement condition index (PCI) reaches a threshold of 65 for class 3 roads, and 60 for class 4 and 5 roads. Based on the adopted expected deterioration rate of 2 pavement condition points per year class roads 3 are expected to be remediated every 17 years and class 4 and 5 roads every 20. This results in the majority of roads being classified as “Good” to “Fair” with the balance “Poor” to “Critical” due to expected remediation work for the road surface.
8. UEM and DFA have stated what is required by way of capital costs to maintain the Township assets based on the level of service policies included in the report. Any change in the financial recommendations would result in the Township not meeting the level of service.
9. A review of staffing levels of the Fire Department and the Township as a whole are beyond the scope of this Asset Management Plan.

17.0 Conclusions

The Township of Puslinch has implemented an Asset Management Strategy and Plan, which assesses the Township's assets based on condition assessments, lifecycles, Levels of Service requirements, and Risk Analysis. The decision process is executed through a model created by UEM. The model applies the Asset Management strategies to the Township's asset data. The outputs of the model are used to develop and prioritize assets for Capital Plans, which address those assets that pose the greatest risk. The Asset Management Plan is expected to achieve improved performance of the Township's services as well as:

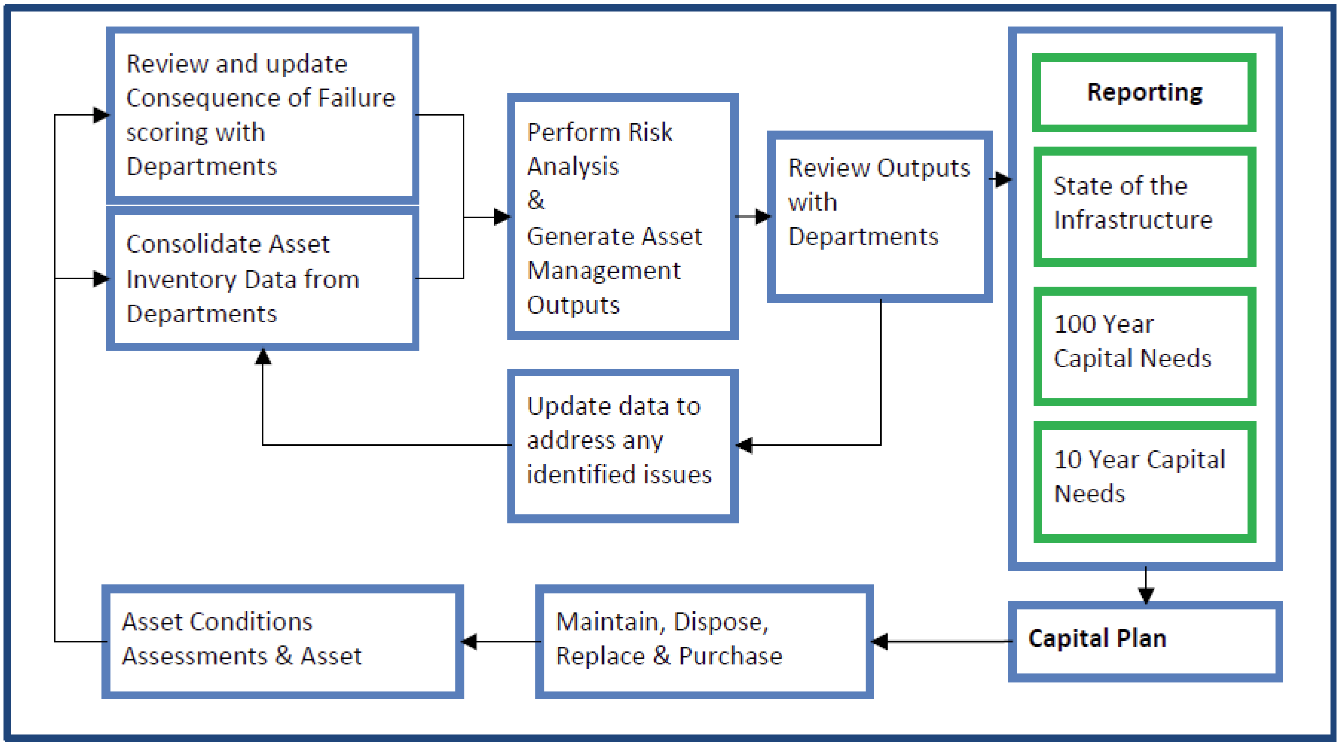
- Enhanced customer satisfaction from improved performance and control of the Levels of Service (Levels of Service);
- Improved financial planning for maintenance and replacement of key infrastructure assets;
- Improved Risk Management Strategies;
- Optimized return on investment and/or growth;
- Improved health, safety and environmental performance;
- Sustainable long-term planning and performance; and
- Improved corporate stewardship, including greater staff satisfaction.

The Asset Management Program will be improved yearly through improved data collection, data confidence, data architecture, business processes, and Asset Management procedures. The Township of Puslinch is committed to Asset Management Policies and Plans that can be used to provide appropriate information to the Township's Council for decision making during the annual budget process.

Scientific evidence that human activity is resulting in climate change is documented and accepted as changes in climate are now a significant factor in the design and management of assets. However, the ability to project the impact of climate change and establish a time frame for impacts on infrastructure is very limited. Engineers and asset managers make effective use of a limited capacity in order to accurately project environmental conditions over the lifetime of assets and asset systems. If adaptation to climate change is to be effective, engineers and asset managers must learn to work with uncertain information about a future climate that will be significantly different to that of the past.

17.1 Ongoing Maintenance of the Asset Management Program

Asset Management requires ongoing updates to the data and reviews of the processes and assumptions used in the development of the Asset Management Plan. At a minimum, on a yearly basis the Asset Hierarchy as well as the Consequence of Failure weightings and scoring should be reviewed by the Asset Management Team and representatives from each department to ensure that the decision-making parameters inherent in the Asset Management Framework remain valid. All departments should work with the Asset Management Team on an ongoing basis to ensure that the asset inventory is up to date and reflects the most recent condition assessments and replacement costs available.



17 - 1 Asset Management Maintenance

In undertaking this assignment and observing the working relationships of staff it became apparent that there is very little if any support staff between the Director of Finance/Treasurer and those Department Heads who are responsible for operations. Although skilled from an operations perspective the Department Heads will need assistance in the ongoing maintenance of the asset management system, especially with the updating of the asset registry.

The Township of Puslinch should consider additional staff and technical resources to assist the Director of Finance/Treasurer with the consolidation of asset inventory into the asset registry and the generation of reports consistent with the requirements of Regulation 588/17 and Council as well as any other reports associated with the management of the physical assets of the Township.

17.2 Capital Program

The capital program was developed based on the replacement and or remediation of assets based on studies that have been completed by the Township, the knowledge of staff, and the knowledge and expertise of the UEM Team. Based upon such knowledge that has been incorporated into the asset registry capital needs over a 10-year period were identified in the plan based upon reducing risk to the Township. Such an approach created “peaks” and “valleys” in the capital plan based upon the lifecycle of current assets and or the policies and practices adopted by the Township. Council in their wisdom may defer a capital project in order to reduce such “peaks” and “valleys” and should recognize that a consequence of doing so may be an increase in risk. However, the normal practice of municipalities is to finance a project prior to undertaking the design, tendering and construction of such a project that often leads to the reconstruction of the project a year after the funding of the project. In many cases the funding of the debt associated with the reconstruction of the project occurs after completion of the project.

17.3 Service Level Policy: Hard Surface Roads

The Township of Puslinch through their Pavement Condition Study accepts a Remediation Pavement Condition Index for hard surface roads of 65 for class 3 roads, 65 for class 4 roads, and 65 for class 5 roads. However, the Township takes into consideration other factors in preparing their capital budget as outlined in Section 9.0 of this report. Rather than relying on the Remediation Pavement Condition Index such other factors impact in part inclusion in the capital budget. Based upon a review of previous projects Pavement Condition Index has not fallen below 60 for class 3 roads, 60 for class 4 roads and 60 for class 5 roads prior to a recommendation being formulated for inclusion into the capital budget. Therefore, the UEM team is prepared to recommend that the minimum Remediation Pavement Condition Index be 65 for class 3 roads, 60 for class 4 roads and 60 for class 5 roads. This recommendation is presented in the UEM proposed level of service policy for Hard Surface Roads.

18.0 Recommendations

The following is a list of recommendations for ongoing improvement of the management of the Township's assets. The identified costs are estimates only and should not be considered as quotes.

18.1 Proposed Level of Service Policies

Recommendation: That the levels of the service policies in Section 5 of this report be approved.

The levels of service were developed based upon input from staff and the Council of the Township of Puslinch. These level of service policies reflect in principle the existing practices of the Township of Puslinch. The policies were presented to the public on February 5, 2019.

Estimated Cost: As per the budget implications table outlined in the end of this section.

18.2 Staff

Formalized Asset Management Policies should be developed which details roles responsibilities and procedures for the execution of the Asset Management Plan.

Recommendation: Identify an Asset Management champion in each Department to ensure ownership of Asset Management processes.

Estimated Cost: Minimal internal cost

Recommendation: Assign responsibility for maintaining asset data to the programs and departments responsible for the assets.

Estimated Cost: Minimal internal cost

Recommendation: Additional staff and technical resources consistent with section 17.1, paragraph 3.

Estimated Cost: $50,000 per year in salary & benefits

Recommendation:	Identify the Director of Finance/Treasurer as the lead responsible for asset management.
Estimated Cost:	Minimal internal cost

18.3 Financial Strategy

In considering the explanation of the three financial strategy options, it is recommended that Option 3 as detailed in Appendix 20.3 be adopted by the Township towards a 10-year financial strategy for the funding of asset management lifecycle activities as noted in this report.

It is also recommended that the following Financial Policy Considerations by adopted in the implementation of the asset management financial strategy.

- A lifecycle activity target funding level be set at an amount equal to 2% of estimated replacement value of the Townships Capital assets contained in the Asset Registry;
- That an upper and lower target balances of asset replacement related reserves be set at amounts of 10% and 20% of the inflated 10-year asset management lifecycle activity expenditure; and
- That a long-term debt repayment limit be established at an amount not to exceed 10% of the Township's net revenues, and that consideration be given towards development of a comprehensive debt management policy.

Finally, it is recommended that the long-term financial strategy be reviewed annually subject to any material changes that may occur.

18.4 Fleet

As part of this project vehicles owned by Puslinch, both fire and works, were entered into the Asset Registry utilizing replacement costs provided in the 2017 BDO Fleet Management Report. Council in an initial review raised the question of purchasing used vehicles rather than new vehicles. The UEM Team are not experts that would be capable of assessing the value of used vehicles nor the purchase price of used equipment especially when dealing with fire and works department vehicles. The Asset Registry cannot project the year in which Council may wish to purchase used vehicles. However, the Asset Registry could be modified subsequent to the purchase of use vehicles.

18.5 Boundary Roads – Road Structures & Bridges and Culverts

The Township entered into boundary road agreements with adjacent municipalities. The information provided to the UEM Team was that the responsibility for capital improvements to such boundary roads lies with the adjacent municipalities. However, in completing the Asset Registry capital improvements were provided in the registry based on 50% the total reconstruction costs of such boundary roads. In going forward, the Township should request a capital program for boundary roads that would include replacement costs and proposed year of improvements. Although the UEM Team was not provided with the boundary road agreements it is only natural that if there are conflicts that discussions occur between municipal staff to determine accurate data to be entered into the asset registry that would impact the capital program of Puslinch.

Replacement Costs in regard to Bridge and Culverts on boundary roads were based on full replacement cost. However, remediation costs that have been entered into the asset inventory were based upon the costs identified in the 2017 OSIM report. Pages 8,9 and 21 and 41 of Appendix D of the OSIM report relate to roadside safety improvements which were the installation of guard rails as an unfunded component of bridge rehabilitation. In reviewing the 2017 OSIM report such guard rails are to be installed on the approaches to the Bridge and or Culvert structures. It is suggested that the terms of reference for the next update of the OSIM report include direction that such guard rails deemed necessary to meet the design standards of the Province of Ontario include that guardrails are a component of either rehabilitation or replacement.

18.6 Capital Program

The asset management plan and strategy are a means to support the Township's budget process as long as the asset management plan is updated annually as well as future planning and growth. Updating the capital expenditure for each asset class to incorporate the recommended studies, condition assessments and maintenance scheduled required to maintain the proposed service level policies are as follows.

Estimated Cost:

- Gravel Roads
    - Inspection of Gravel Base $6,000 from intersection to intersection.
    - Gravel Road Study $25,000
- Hard Surface Roads
    - Traffic Volume Study $25,000
    - Pavement Condition Index Report $24,500
- Street Trees: Tree Inspections $6,000
- Buildings and Facilities
    - Arc Flash Study $7,500,
    - Building Condition Assessment $25,000
    - Infra-Red Scanning $3,000
- Sidewalks: Sidewalk Winter Maintenance $20,000
- Street Light and Poles Inspections $20,000
- Georeferencing of Storm Sewer Assets $5,000

18.7 Technical Levels of Service

Currently the sole Technical Levels of Service (TLOS) used to determine the Probability of Failure is condition or remaining service life. Condition is based on the visual or physical analysis of the asset whereas remaining service life is based on the age and condition of assets. For higher quality technical levels of service tracking UEM recommends incorporating Performance-based levels of service in the future. Performance-based TLOS relate to measurements that are not directly related to condition/remaining service life such as the accessibility of buildings for persons with disabilities. Performance TLOS may be mandated by legislation, like the Storm Water Management Planning and Design Manual, or explicitly identified by the Township in a

Service Level Agreement. New business and reporting practices will need to be implemented in order to collect and maintain the data required to evaluate performance- based TLOS.

Recommendation: Develop & incorporate Performance TLOS

Estimated Cost: $30,000 in consultant fees.

18.8 Technology Related Requirements

As previously indicated in Section 15.4 of this report, the Ontario Good Roads Association makes available, at no cost, a tool identified as the Municipal Data Works (MDW) that will maintain asset data.

Recommendation: Negotiate with the Ontario Good Road Association for access to Municipal Data Works and allow the importation of Puslinch data into MDW.

Estimated Cost: minimal costs.

18.9 Climate Change

Recommendation: Climate Change should be a consideration in all asset condition assessment reports in the future in order to project deterioration rates associated with such climate change.

Estimated Cost: Minimal internal cost.

19.0 Asset Registry Recommendations

19.1 Bridges and Culverts:

Recommendation: The Township of Puslinch is recommended to follow the remediation schedule provided by the qualified engineer for all Bridge and Culvert structures. Any further improvements to a structure should be implemented as a sub-component to the total remediation cost.

This recommendation is in response to the Bridge and Culvert Inspection report conducted in 2017. This report separates guardrails as a “Road Improvement Safety” Cost. UEM recommends that the next report integrate the costs for Road Improvements in the final remediation cost of each structure if it is mandated by the Roadside Safety Manual and Geometric Design Guide.

Estimated Cost: No Costs.

19.2 Hard Surface Roads:

Recommendation: Road surfaces be inspected by a qualified engineer every 5 years. Subsequent inspections should follow the same methodologies of the one prior.

The 2016 pavement condition study used Pavement Condition Index as a condition rating methodology. Thus, every subsequent study should be consistent unless some revolutionary methodology is deemed more appropriate. Following the same condition methodologies will help the Township better update their asset registry and as well allow for the ability to conduct trend analysis. Each replacement/remediation schedule should be integrated into the Asset Registry as a separate table in order to track remediations to each road segment over time. Furthermore, the delivered report should maintain the current data structure as it’s been delivered in the asset registry and as well should be stored in a data format that allows for seamless updating of the asset registry.

Estimated Cost: Refer to Capital Program recommendations.

19.3 Gravel Roads:

Recommendation: The Township should collect condition data for each gravel road segment during routine inspections. When and if a Gravel Road requires regrading it should be documented according to the grading triggers listed in the proposed service level policy (Section 5.2) provided in this document. Each regrading activity should be considered as a lifecycle event. Grading events result from frost leaving the gravel road, Pot holes in the gravel road, Rainfall resulting in a significant number of washouts and rutting due to truck traffic. In addition to grading events, the Township should be tracking any ditching that could improve drainage and any other activities that may have a positive or negative impact on the condition of the road base.

Tracking of deterioration rates will assist the Township in long-term financial planning for gravel road surfaces and as well assist in achieving the proposed service level policy for Gravel Roads. Further, the proposed service level policy states that to qualify a gravel road for hard surfacing certain data be available for consideration. Such data can be collected through regular inspections of the surface, collection and storage of grading frequencies and traffic volume studies.

Estimated Cost: Refer to Capital Program recommendations.

19.4 Traffic Volume Study

Recommendation: To better manage the lifecycle of each road segment UEM recommends that a traffic volume study be done every 5 years for all road surfaces. Traffic volume data will help the Township optimize their lifecycle model for roads by increasing or decreasing the deterioration rate of two PCI points per year based on the expected traffic on that surface over time.

Estimated Cost: $25,000 every 5 years.

19.5 Buildings and Facilities:

Recommendation: Each Building and Facility in the Township of Puslinch should be inspected every 5 years.

Subsequent inspections should follow the same methodologies of the one prior such as the vernacular used to describe each building component and data structure that surrounds it. The remediation schedule if provided should be delivered in the same template as the previous to allow for seamless updating of the asset registry. Furthermore, each schedule should be integrated into the Asset Registry as a separate table to track remediations to each component over time. The Township should conduct Arch Flash Studies and Infra-Red Scanning of all electric equipment and wire terminations every 5 years.

Estimated Cost: Refer to Capital Program recommendations.

19.6 Storm Water Management Ponds

Recommendation: Follow the remediation schedule provided by the qualified engineer.

The remediation schedule should be in a tabular format that can easily distinguish each Stormwater Management Pond component and the repairs if necessary, to such component. If no applicable component can be identified, then the repair and its costs should be applied to the pond enclosure. Furthermore, each pond component should be provided a condition score that ranges from 1 (Very Poor Condition) to 5 (Excellent Condition) Subsequent inspections should follow the same methodologies as the one prior.

Estimated Cost: No Costs.

19.7 Fire Reservoirs

Recommendation: Document each inspection of each Fire Reservoir in a tabular format and update the condition of each Fire Reservoir in the asset registry with a condition score that ranges from 1 (Very Poor Condition) to 5 (Excellent Condition) subsequent to each inspection. The condition score that was rated prior should be stored as a separate record in order to track how the lifecycle of each fire reservoir is being managed overtime.

Estimated Cost: No Costs.

19.8 Fire Equipment

Recommendation: Standardize Fire Equipment assets in the asset registry for more effective management of lifecycle, lifecycle events, and condition ratings.

Implement an inspection table and a lifecycle event activity table for Fire Equipment assets.

Estimated Cost: No Costs.

19.9 Fleet: Works, Building, Parks and Fire Department Vehicles

Recommendation: The Township implement an inspection table for each vehicle and as well a lifecycle event activity table.

Each inspection should document vehicle hours (if applicable to the service level policy) and vehicle kilometers. Documented vehicle hours should be standardized to a 1-5 scale in order to be consistent with the condition standard for other asset classes. The Lifecycle activity table should document any major vehicle servicing and any major accident or mechanical failure associated with the vehicle. These tables should become the primary methodology for establishing vehicle condition and lifecycle.

Estimated Cost: No Costs.

19.10 Parks and Recreation, Sidewalks and Street Lights and Poles

Recommendation: Implement an inspection table and lifecycle event table for each Parks and Recreation, Sidewalk, and Street Lights and Pole asset.

Each inspection should at the very minimum apply a condition rating to the asset. Each lifecycle event that occurs should be documented for each asset in order to track the lifecycle of the parks and recreation asset.

Estimated Cost: No Costs.

19.11 Street Trees

Recommendation: Update the asset registry in order to create a more comprehensive inventory of the current stock of street trees managed by the Township. Including an inspection table and lifecycle event table for each Street Tree asset.

Estimated Cost: $6,000.

19.12 Storm Sewers

Recommendation: Update the GIS information for all storm sewer assets.

The spatial structure of the Storm Sewer assets in the asset registry has been formulated through consultation with staff without referencing to as constructed drawings. Each Storm Sewer should be georeferenced according to their ground truth location.

Each Storm Sewer should have each cleaning event loaded into a condition assessment table to account for the condition of the asset. Furthermore, if any significant repairs occur to a Storm Sewer asset such repairs should be loaded into an asset lifecycle event table.

Estimated Cost: $5,000 for georeferencing of Storm Sewer assets.

19.13 Inspection & Lifecycle Tables

Recommendation: The storage of condition assessment data and lifecycle events data should be documented in separate tables than in the Asset Tables in the Asset Registry Database. By storing the data in separate tables, the historical data quality is maintained and allows for multi-step data verification and over time the ability to conduct trend analysis.

If the Township chooses to rely on only “updating” the condition column of an asset table with current condition data, historical data will be lost.

Estimated Cost: No Costs.

19.14 Budget Implications

The following table summarizes recommendations that have an associated cost

Budget Implications for this Asset Management Plan

Major Grouping	Budget Item	Description	Frequency	Cost
Service Level Policies	Bridges and Culverts	Bridge and Culvert Inspection Reports	Every 2 Years	$15,000.00
	Gravel Roads	Gravel Base Inspection	Subject to Review of Gravel Road Surface Treatment	$6,000.00
		Gravel Road Study	Once.	$25,000.00
		Gravel Road surface treatment	Subject to Review of Gravel Road Surface Treatment	$52,000.00/km
	Hard Surface Roads	Pavement Condition Study	Every 5 Years	$24,500.00
		Traffic Volume Study	Every 5 Years	$25,000.00
	Storm Water Management Ponds	Pond Inspections	At Least Once Per Year	$5,000.00
	Storm Sewer	Sewer Inspections	At Least Once Per Year	$5,000.00
	Storm Sewer	Geolocation of catch basins	Once	$5,000.00
	Street Trees	Tree Inspections	On the Year of Inspection	$6,000.00
	Street Light & Poles	Pole and Arm Inspections	Every 5 Years	$20,0000
	Buildings and Facilities	Building Condition Assessment	Every 5 Years	$25,000.00
		Infra-Red Scanning	Every 5 Years	$3,000.00
		Arc Flash Study	Every 5 Years	$7,500.00
	Sidewalks	Sidewalk Winter Maintenance	Routine Maintenance of Sidewalks During Winter Periods	$20,000.00
Asset Management Maintenance	Staffing	Additional staff and technical resources	-	$50,000.00/ Year

20.0 Appendices

20.1 Financial Strategy Option 1 (1 Percent Impact)

Township of Puslinch
Option 1
2019 - 2028 AMP Forecast
Inflated $
Table 1

Description	**Forecast**									
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Capital Expenditures										
Bridges	-	-	426,564	-	-	-	-	574,343	-	-
Culverts	-	-	561,816	-	-	-	-	643,264	-	-
Buildings and Facilities	15,750	22,440	114,444	63,672	32,473	200,115	11,262	17,230	35,150	528,335
Fire Equipment	21,000	314,823	6,242	-	12,989	9,937	69,259	27,568	43,351	14,341
Parks and Recreation	-	35,361	22,889	-	335,554	1,987	-	160,618	-	9,250
Asphalt Road 1 Lift	1,509,346	626,983	167,647	751,961	1,534,372	750,696	492,165	653,942	257,736	1,055,247
Asphalt Road 2 Lift	-	281,926	275,544	-	402,012	497,275	52,434	146,515	233,286	144,747
Asphalt Road Surface Treated	-	-	-	-	-	143,853	16,723	-	-	-
Gravel Road	140,000	66,300	67,626	68,979	70,358	71,765	73,201	74,665	76,158	77,681
Storm Water Management Ponds	-	153,000	171,666	175,099	-	-	-	-	-	-
Fire licensed vehicles	-	530,400	-	-	-	25,394	527,044	-	-	597,546
Fire vehicle tires	17,146	1,683	-	4,368	-	1,822	-	-	3,866	8,590
Sidewalk	25,000	112,200	-	-	-	-	-	-	-	-
Works licensed vehicles	-	652,800	260,100	-	243,547	-	103,607	-	292,915	298,773
Works Unlicensed vehicles	26,000	127,500	-	413,871	-	-	-	-	-	-
Building Department licensed vehicles	-	-	-	-	-	36,435	-	-	-	-
Parks and Recreation Unlicensed vehicles	-	-	-	-	-	-	-	9,189	-	35,853
Total Capital Expenditures - Capital Program	**1,754,242**	**2,925,416**	**2,074,538**	**1,477,950**	**2,631,305**	**1,739,278**	**1,345,694**	**2,307,336**	**942,462**	**2,770,364**
Capital Financing										
Provincial/Federal Grants (OCIF)	169,421	168,923	-	-	-	-	-	-	-	-
Gas Tax Funding	222,547	222,547	232,662	232,662	242,778	242,778	242,778	242,778	242,778	242,778
Other (County Accessibility Grant Funding)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Aggregate Revenue	228,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Public Works Development Charges	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560
Non-Growth Related Debenture Requirements	-	946,094	856,664	323,382	1,465,405	709,081	359,857	1,323,469	76,031	1,870,875
Capital Asset Replacement Discretionary Reserve	1,044,714	1,298,292	695,652	632,346	633,562	497,859	453,499	451,529	334,093	367,151
Total Capital Financing	**1,754,242**	**2,925,416**	**2,074,538**	**1,477,950**	**2,631,305**	**1,739,278**	**1,345,694**	**2,307,336**	**942,462**	**2,770,364**

Township of Puslinch
Option 1
Capital Asset Replacement Discretionary Reserve
Table 2

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Opening Balance	2,838,841	2,525,139	1,996,859	1,996,859	1,996,858	1,996,858	1,996,859	1,996,858	1,996,858	1,996,858
Transfer from Operating (AMP Capital Levy)	731,012	770,012	695,652	632,346	633,562	497,859	453,499	451,529	334,093	367,151
Transfer to Capital	1,044,714	1,298,292	695,652	632,346	633,562	497,859	453,499	451,529	334,093	367,151
Closing Balance	2,525,139	1,996,859	1,996,859	1,996,858	1,996,858	1,996,859	1,996,858	1,996,858	1,996,858	1,996,858
Reserve Target Balances										
Minimum Balance at 10% of 10 year Capital Plan	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859
Closing Reserve Balance	$ 2,525,139	$ 1,996,859	$ 1,996,859	$ 1,996,858	$ 1,996,858	$ 1,996,859	$ 1,996,858	$ 1,996,858	$ 1,996,858	$ 1,996,858
Target Balance at 20% of 10 year Capital Plan	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717

Township of Puslinch
Option 1
Operating Budget Forecast - AMP Capital Related
Table 3

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Capital-Related										
New Non-Growth Related Debt (Principal)	-	-	80,646	156,492	189,535	321,082	392,763	437,184	565,300	591,566
New Non-Growth Related Debt (Interest)	-	-	33,113	60,274	66,115	110,771	124,350	123,199	154,219	137,094
Transfer to Capital Asset Replacement Discretionary Reserve	731,012	770,012	695,652	632,346	633,562	497,859	453,499	451,529	334,093	367,151
Total AMP Capital Related Expenditures	**731,012**	**770,012**	**809,412**	**849,112**	**889,212**	**929,712**	**970,612**	**1,011,912**	**1,053,612**	**1,095,812**

Township of Puslinch
Option 1
AMP Capital Levy Impact
Table 4

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
AMP Capital Levy (Previous Year)	692,512	731,012	770,012	809,412	849,112	889,212	929,712	970,612	1,011,912	1,053,612
AMP Capital Levy Increase	38,500	39,000	39,400	39,700	40,100	40,500	40,900	41,300	41,700	42,200
Percent Tax Impact on Median Value SFD	**1.00%**	**1.00%**	**1.00%**	**1.00%**	**1.00%**	**1.00%**	**1.00%**	**1.00%**	**1.00%**	**1.00%**
AMP Capital Levy (Current Year)	731,012	770,012	809,412	849,112	889,212	929,712	970,612	1,011,912	1,053,612	1,095,812
Total Non-Growth Debt Servicing	-	-	113,760	216,766	255,650	431,852	517,113	560,383	719,519	728,661
Transfer to Capital Asset Replacement Discretionary Reserve	731,012	770,012	695,652	632,346	633,562	497,859	453,499	451,529	334,093	367,151

Township of Puslinch
Option 1
AMP Funding Target Levels
Table 5

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Estimated Value of Capital Assets	77,490,278	79,040,084	80,620,885	82,233,303	83,877,969	85,555,528	87,266,639	89,011,972	90,792,211	92,608,055
Target AMP Funding Level (2% of Capital Asset Values)	1,549,806	1,580,802	1,612,418	1,644,666	1,677,559	1,711,111	1,745,333	1,780,239	1,815,844	1,852,161
AMP Capital Levy	731,012	770,012	809,412	849,112	889,212	929,712	970,612	1,011,912	1,053,612	1,095,812
Other Sources of AMP Capital Financing	709,528	681,030	522,222	522,222	532,338	532,338	532,338	532,338	532,338	532,338
Total Available AMP Funding	1,440,540	1,451,042	1,331,634	1,371,334	1,421,550	1,462,050	1,502,950	1,544,250	1,585,950	1,628,150
Above or (below) target level of AMP Funding	(109,266)	(129,760)	(280,784)	(273,332)	(256,010)	(249,061)	(242,383)	(235,990)	(229,894)	(224,011)

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Township of Puslinch
Option 1
AMP Debt
Table 6a

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Opening Debt Balance	-	-	946,094	1,722,112	1,889,001	3,164,872	3,552,871	3,519,965	4,406,250	3,916,981
Total Debt Servicing	-	-	113,760	216,766	255,650	431,852	517,113	560,383	719,519	728,661
Interest on Debt	-	-	33,113	60,274	66,115	110,771	124,350	123,199	154,219	137,094
Principal Repayment	-	-	80,646	156,492	189,535	321,082	392,763	437,184	565,300	591,566
New Debt Issue	-	946,094	856,664	323,382	1,465,405	709,081	359,857	1,323,469	76,031	1,870,875
Closing Balance	-	946,094	1,722,112	1,889,001	3,164,872	3,552,871	3,519,965	4,406,250	3,916,981	5,196,290

Township of Puslinch
Option 1
AMP Annual Repayment Limit - 10%
Table 6b

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Estimated Net Township Revenues	5,565,118	5,843,374	6,135,543	6,442,320	6,764,436	7,102,657	7,457,790	7,830,680	8,222,214	8,633,325
10% of Net Revenues	556,512	584,337	613,554	644,232	676,444	710,266	745,779	783,068	822,221	863,332
Debt Limit Remaining $	556,512	584,337	499,795	427,466	420,794	278,413	228,666	222,685	102,703	134,672
Percent of Limit Remaining	100%	100%	81%	66%	62%	39%	31%	28%	12%	16%

20.2 Financial Strategy Option 2 (2 Percent Impact)

Township of Puslinch
Option 1
AMP Funding Target Levels
Table 5

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Estimated Value of Capital Assets	77,490,278	79,040,084	80,620,885	82,233,303	83,877,969	85,555,528	87,266,639	89,011,972	90,792,211	92,608,055
Target AMP Funding Level (2% of Capital Asset Values)	1,549,806	1,580,802	1,612,418	1,644,666	1,677,559	1,711,111	1,745,333	1,780,239	1,815,844	1,852,161
AMP Capital Levy	731,012	770,012	809,412	849,112	889,212	929,712	970,612	1,011,912	1,053,612	1,095,812
Other Sources of AMP Capital Financing	709,528	681,030	522,222	522,222	532,338	532,338	532,338	532,338	532,338	532,338
Total Available AMP Funding	1,440,540	1,451,042	1,331,634	1,371,334	1,421,550	1,462,050	1,502,950	1,544,250	1,585,950	1,628,150
Above or (below) target level of AMP Funding	(109,266)	(129,760)	(280,784)	(273,332)	(256,010)	(249,061)	(242,383)	(235,990)	(229,894)	(224,011)

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Township of Puslinch
Option 1
AMP Debt
Table 6a

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Opening Debt Balance	-	-	946,094	1,722,112	1,889,001	3,164,872	3,552,871	3,519,965	4,406,250	3,916,981
Total Debt Servicing	-	-	113,760	216,766	255,650	431,852	517,113	560,383	719,519	728,661
Interest on Debt	-	-	33,113	60,274	66,115	110,771	124,350	123,199	154,219	137,094
Principal Repayment	-	-	80,646	156,492	189,535	321,082	392,763	437,184	565,300	591,566
New Debt Issue	-	946,094	856,664	323,382	1,465,405	709,081	359,857	1,323,469	76,031	1,870,875
Closing Balance	-	946,094	1,722,112	1,889,001	3,164,872	3,552,871	3,519,965	4,406,250	3,916,981	5,196,290

Township of Puslinch
Option 1
AMP Annual Repayment Limit - 10%
Table 6b

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Estimated Net Township Revenues	5,565,118	5,843,374	6,135,543	6,442,320	6,764,436	7,102,657	7,457,790	7,830,680	8,222,214	8,633,325
10% of Net Revenues	556,512	584,337	613,554	644,232	676,444	710,266	745,779	783,068	822,221	863,332
Debt Limit Remaining $	556,512	584,337	499,795	427,466	420,794	278,413	228,666	222,685	102,703	134,672
Percent of Limit Remaining	100%	100%	81%	66%	62%	39%	31%	28%	12%	16%

Township of Puslinch
Option 2
Capital Asset Replacement Discretionary Reserve
Table 2

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Opening Balance	2,838,841	2,563,939	1,996,859	1,996,859	1,996,858	1,996,858	1,996,859	2,003,931	1,996,858	2,367,943
Transfer from Operating (AMP Capital Levy)	769,812	848,612	829,368	824,440	892,654	831,366	820,429	855,336	781,209	817,526
Transfer to Capital	1,044,714	1,415,692	829,368	824,441	892,654	831,366	813,356	862,409	410,124	1,188,610
Closing Balance	2,563,939	1,996,859	1,996,859	1,996,858	1,996,858	1,996,859	2,003,931	1,996,858	2,367,943	1,996,859
Reserve Target Balances										
Minimum Balance at 10% of 10 year Capital Plan	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859	$ 1,996,859
Closing Reserve Balance	$ 2,563,939	$ 1,996,859	$ 1,996,859	$ 1,996,858	$ 1,996,858	$ 1,996,859	$ 2,003,931	$ 1,996,858	$ 2,367,943	$ 1,996,859
Target Balance at 20% of 10 year Capital Plan	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717	$ 3,993,717

Township of Puslinch
Option 2
Operating Budget Forecast - AMP Capital Related
Table 3

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Capital-Related										
New Non-Growth Related Debt (Principal)	-	-	70,639	134,736	150,643	258,744	299,814	310,308	398,959	412,922
New Non-Growth Related Debt (Interest)	-	-	29,004	51,835	51,714	88,663	92,752	82,258	103,338	89,375
Transfer to Capital Asset Replacement Discretionary Reserve	769,812	848,612	829,368	824,440	892,654	831,366	820,429	855,336	781,209	817,526
Total AMP Capital Related Expenditures	**769,812**	**848,612**	**929,012**	**1,011,012**	**1,095,012**	**1,178,773**	**1,212,995**	**1,247,902**	**1,283,506**	**1,319,823**

Township of Puslinch
Option 2
AMP Capital Levy Impact
Table 4

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
AMP Capital Levy (Previous Year)	692,512	769,812	848,612	929,012	1,011,012	1,095,012	1,178,773	1,212,995	1,247,902	1,283,506
AMP Capital Levy Increase	77,300	78,800	80,400	82,000	84,000	83,761	34,222	34,907	35,604	36,317
Percent Tax Impact on Median Value SFD	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
AMP Capital Levy (Current Year)	769,812	848,612	929,012	1,011,012	1,095,012	1,178,773	1,212,995	1,247,902	1,283,506	1,319,823
Total Non-Growth Debt Servicing	-	-	99,643	186,572	202,358	347,406	392,566	392,566	502,297	502,297
Transfer to Capital Asset Replacement Discretionary Reserve	769,812	848,612	829,368	824,440	892,654	831,366	820,429	855,336	781,209	817,526

Township of Puslinch
Option 2
AMP Funding Target Levels
Table 5

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Estimated Value of Capital Assets	77,490,278	79,040,084	80,620,885	82,233,303	83,877,969	85,555,528	87,266,639	89,011,972	90,792,211	92,608,055
Target AMP Funding Level (2% of Capital Asset Values)	1,549,806	1,580,802	1,612,418	1,644,666	1,677,559	1,711,111	1,745,333	1,780,239	1,815,844	1,852,161
AMP Capital Levy	769,812	848,612	929,012	1,011,012	1,095,012	1,178,773	1,212,995	1,247,902	1,283,506	1,319,823
Other Sources of AMP Capital Financing	709,528	681,030	522,222	522,222	532,338	532,338	532,338	532,338	532,338	532,338
Total Available AMP Funding	1,479,340	1,529,642	1,451,234	1,533,234	1,627,350	1,711,111	1,745,333	1,780,240	1,815,844	1,852,161
Above or (below) target level of AMP Funding	(70,466)	(51,160)	(161,184)	(111,432)	(50,210)	0	(0)	0	(0)	(0)

Township of Puslinch
Option 2
AMP Debt
Table 6a

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Opening Debt Balance	-	-	828,694	1,481,003	1,477,554	2,533,223	2,650,054	2,350,240	2,952,521	2,553,562
Total Debt Servicing	-	-	99,643	186,572	202,358	347,406	392,566	392,566	502,297	502,297
Interest on Debt	-	-	29,004	51,835	51,714	88,663	92,752	82,258	103,338	89,375
Principal Repayment	-	-	70,639	134,736	150,643	258,744	299,814	310,308	398,959	412,922
New Debt Issue	-	828,694	722,948	131,287	1,206,313	375,574	-	912,589	-	1,049,416
Closing Balance	-	828,694	1,481,003	1,477,554	2,533,223	2,650,054	2,350,240	2,952,521	2,553,562	3,190,056

Township of Puslinch
Option 2
AMP Annual Repayment Limit - 10%
Table 6b

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Estimated Net Township Revenues	5,565,118	5,843,374	6,135,543	6,442,320	6,764,436	7,102,657	7,457,790	7,830,680	8,222,214	8,633,325
10% of Net Revenues	556,512	584,337	613,554	644,232	676,444	710,266	745,779	783,068	822,221	863,332
Debt Limit Remaining $	556,512	584,337	513,911	457,660	474,086	362,859	353,213	390,502	319,924	361,036
Percent of Limit Remaining	100%	100%	84%	71%	70%	51%	47%	50%	39%	42%

20.3 Financial Strategy Option 3 (3 Percent Impact)

Township of Puslinch
Option 3
2019 - 2028 AMP Forecast
Inflated $
Table 1

Description	Forecast									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Capital Expenditures										
Bridges	-	-	426,564	-	-	-	-	574,343	-	-
Culverts	-	-	561,816	-	-	-	-	643,264	-	-
Buildings and Facilities	15,750	22,440	114,444	63,672	32,473	200,115	11,262	17,230	35,150	528,335
Fire Equipment	21,000	314,823	6,242	-	12,989	9,937	69,259	27,568	43,351	14,341
Parks and Recreation	-	35,361	22,889	-	335,554	1,987	-	160,618	-	9,250
Asphalt Road 1 Lift	1,509,346	626,983	167,647	751,961	1,534,372	750,696	492,165	653,942	257,736	1,055,247
Asphalt Road 2 Lift	-	281,926	275,544	-	402,012	497,275	52,434	146,515	233,286	144,747
Asphalt Road Surface Treated	-	-	-	-	-	143,853	16,723	-	-	-
Gravel Road	140,000	66,300	67,626	68,979	70,358	71,765	73,201	74,665	76,158	77,681
Storm Water Management Ponds	-	153,000	171,666	175,099	-	-	-	-	-	-
Fire licensed vehicles	-	530,400	-	-	-	25,394	527,044	-	-	597,546
Fire vehicle tires	17,146	1,683	-	4,368	-	1,822	-	-	3,866	8,590
Sidewalk	25,000	112,200	-	-	-	-	-	-	-	-
Works licensed vehicles	-	652,800	260,100	-	243,547	-	103,607	-	292,915	298,773
Works Unlicensed vehicles	26,000	127,500	-	413,871	-	-	-	-	-	-
Building Department licensed vehicles	-	-	-	-	-	36,435	-	-	-	-
Parks and Recreation Unlicensed vehicles	-	-	-	-	-	-	-	9,189	-	35,853
Total Capital Expenditures - Capital Program	**1,754,242**	**2,925,416**	**2,074,538**	**1,477,950**	**2,631,305**	**1,739,278**	**1,345,694**	**2,307,336**	**942,462**	**2,770,364**
Capital Financing										
Provincial/Federal Grants (OCIF)	169,421	168,923	-	-	-	-	-	-	-	-
Gas Tax Funding	222,547	222,547	232,662	232,662	242,778	242,778	242,778	242,778	242,778	242,778
Other (County Accessibility Grant Funding)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Aggregate Revenue	228,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Public Works Development Charges	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560
Non-Growth Related Debenture Requirements	-	738,884	618,989	-	1,113,574	325,338	-	800,036	-	909,794
Capital Asset Replacement Discretionary Reserve	1,044,714	1,505,502	933,327	955,728	985,393	881,602	813,356	974,962	410,124	1,328,232
Total Capital Financing	**1,754,242**	**2,925,416**	**2,074,538**	**1,477,950**	**2,631,305**	**1,739,278**	**1,345,694**	**2,307,336**	**942,462**	**2,770,364**

Township of Puslinch
Option 3
2019 - 2028 AMP Forecast
Inflated $
Table 1

Description	Forecast									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Capital Expenditures										
Bridges	-	-	426,564	-	-	-	-	574,343	-	-
Culverts	-	-	561,816	-	-	-	-	643,264	-	-
Buildings and Facilities	15,750	22,440	114,444	63,672	32,473	200,115	11,262	17,230	35,150	528,335
Fire Equipment	21,000	314,823	6,242	-	12,989	9,937	69,259	27,568	43,351	14,341
Parks and Recreation	-	35,361	22,889	-	335,554	1,987	-	160,618	-	9,250
Asphalt Road 1 Lift	1,509,346	626,983	167,647	751,961	1,534,372	750,696	492,165	653,942	257,736	1,055,247
Asphalt Road 2 Lift	-	281,926	275,544	-	402,012	497,275	52,434	146,515	233,286	144,747
Asphalt Road Surface Treated	-	-	-	-	-	143,853	16,723	-	-	-
Gravel Road	140,000	66,300	67,626	68,979	70,358	71,765	73,201	74,665	76,158	77,681
Storm Water Management Ponds	-	153,000	171,666	175,099	-	-	-	-	-	-
Fire licensed vehicles	-	530,400	-	-	-	25,394	527,044	-	-	597,546
Fire vehicle tires	17,146	1,683	-	4,368	-	1,822	-	-	3,866	8,590
Sidewalk	25,000	112,200	-	-	-	-	-	-	-	-
Works licensed vehicles	-	652,800	260,100	-	243,547	-	103,607	-	292,915	298,773
Works Unlicensed vehicles	26,000	127,500	-	413,871	-	-	-	-	-	-
Building Department licensed vehicles	-	-	-	-	-	36,435	-	-	-	-
Parks and Recreation Unlicensed vehicles	-	-	-	-	-	-	-	9,189	-	35,853
Total Capital Expenditures - Capital Program	**1,754,242**	**2,925,416**	**2,074,538**	**1,477,950**	**2,631,305**	**1,739,278**	**1,345,694**	**2,307,336**	**942,462**	**2,770,364**
Capital Financing										
Provincial/Federal Grants (OCIF)	169,421	168,923	-	-	-	-	-	-	-	-
Gas Tax Funding	222,547	222,547	232,662	232,662	242,778	242,778	242,778	242,778	242,778	242,778
Other (County Accessibility Grant Funding)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Aggregate Revenue	228,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Public Works Development Charges	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560	79,560
Non-Growth Related Debenture Requirements	-	738,884	618,989	-	1,113,574	325,338	-	800,036	-	909,794
Capital Asset Replacement Discretionary Reserve	1,044,714	1,505,502	933,327	955,728	985,393	881,602	813,356	974,962	410,124	1,328,232
Total Capital Financing	**1,754,242**	**2,925,416**	**2,074,538**	**1,477,950**	**2,631,305**	**1,739,278**	**1,345,694**	**2,307,336**	**942,462**	**2,770,364**

Township of Puslinch
Option 3
AMP Funding Target Levels
Table 5

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Estimated Value of Capital Assets	77,490,278	79,040,084	80,620,885	82,233,303	83,877,969	85,555,528	87,266,639	89,011,972	90,792,211	92,608,055
Target AMP Funding Level (2% of Capital Asset Values)	1,549,806	1,580,802	1,612,418	1,644,666	1,677,559	1,711,111	1,745,333	1,780,239	1,815,844	1,852,161
AMP Capital Levy	808,462	899,772	1,022,172	1,122,444	1,145,222	1,178,773	1,212,995	1,247,902	1,283,506	1,319,823
Other Sources of AMP Capital Financing	709,528	681,030	522,222	522,222	532,338	532,338	532,338	532,338	532,338	532,338
Total Available AMP Funding	1,517,990	1,580,802	1,544,394	1,644,666	1,677,560	1,711,111	1,745,333	1,780,240	1,815,844	1,852,161
Above or (below) target level of AMP Funding	(31,816)	0	(68,024)	(0)	0	0	(0)	0	(0)	(0)

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Township of Puslinch
Option 3
AMP Debt
Table 6a

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Opening Debt Balance	-	-	738,884	1,294,890	1,176,938	2,168,432	2,272,495	2,015,744	2,550,041	2,206,806
Total Debt Servicing	-	-	88,844	163,273	163,273	297,170	336,289	336,289	432,487	432,487
Interest on Debt	-	-	25,861	45,321	41,193	75,895	79,537	70,551	89,251	77,238
Principal Repayment	-	-	62,983	117,951	122,080	221,275	256,752	265,738	343,235	355,248
New Debt Issue	-	738,884	618,989	-	1,113,574	325,338	-	800,036	-	909,794
Closing Balance	-	738,884	1,294,890	1,176,938	2,168,432	2,272,495	2,015,744	2,550,041	2,206,806	2,761,352

Township of Puslinch
Option 3
AMP Annual Repayment Limit - 10%
Table 6b

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Estimated Net Township Revenues	5,565,118	5,843,374	6,135,543	6,442,320	6,764,436	7,102,657	7,457,790	7,830,680	8,222,214	8,633,325
10% of Net Revenues	556,512	584,337	613,554	644,232	676,444	710,266	745,779	783,068	822,221	863,332
Debt Limit Remaining $	556,512	584,337	524,710	480,959	513,171	413,096	409,490	446,779	389,735	430,846
Percent of Limit Remaining	100%	100%	86%	75%	76%	58%	55%	57%	47%	50%

20.4 The Township of Puslinch Asset Management Policy

Purpose

An Asset Management Policy formalizes the Township of Puslinch commitment to asset management, aligns its asset management actions with strategic goals and objectives, and provides direction to guide Council and staff in carrying out its business. Such a policy will support the Township in focusing its infrastructure efforts on managing risks, addressing priorities, and meeting short and long-term needs within the bounds of possible funding.

Vision

The Township's vision is to proactively manage its assets to best serve the Township's objectives, including:

- Prioritizing the need for existing and future assets to effectively deliver services,
- Supporting sustainability and economic development, and
- Maintaining prudent financial planning and decision making.

Objectives

The objectives of this policy are to:

- Provide a consistent framework for implementing asset management throughout the Township in compliance with Regulation 588/17.
- Demonstrate transparent, accountable, and informed decision-making that considers the Township's strategic plans, budget, service levels and risks.

Strategic Alignment

The Township adopted in principle a Community Based Strategic Plan, a Master Fire Plan, a Parks and Recreation Master Plan, a Community Improvement Plan and an Asset Management Plan. These plans were designed to meet the legislative requirements and work together to achieve the Township's mission of providing innovation and excellence in service delivery. Spending requirements defined in the budgeting process and in long-term financial planning will reflect the objectives of these plans.

All of the Township's plans rely to some extent on the physical assets owned by the Township and the commitment of staff to ensure their strategic use. This includes the long-term maintenance, repair and replacement of existing assets along with the acquisition of new assets to meet the evolving needs of the Township.

Asset Management Planning therefore will not occur in isolation from other municipal goals, plans and policies.

Stakeholder Engagement

The Township recognizes the importance of stakeholder engagement as an integral component of a comprehensive Asset Management Plan. The Township fosters informed dialogue with all stakeholders by:

- Providing residents and other stakeholders served by the Township opportunities to provide input; and
- Coordinating Asset Management Planning with other infrastructure owning government agencies and bodies.

Guiding Principles

The Infrastructure for Jobs and Prosperity Act, 2015 establishes principles to guide Asset Management Planning. The Township will strive, where possible, to incorporate the following principles into decisions respecting infrastructure planning and investment:

- **Forward looking:** Take a long-term view while considering demographic and economic trends in the County.
- **Budgeting and planning:** Take into account any applicable budgets or fiscal plans.
- **Prioritizing:** Clearly identify infrastructure priorities which will drive investment decisions.
- **Economic development:** Promote economic competitiveness, productivity, job creation, and training opportunities.
- **Transparency:** Promote an open and transparent decision-making process through the sharing, posting or access to information subject to any restrictions or prohibitions on the collection, use or disclosure of information.
- **Consistency:** Ensure the delivery of core public services such as Roads, Infrastructure and Fire.
- **Environmentally conscious:** Consider the impact of infrastructure on the environment and climate change. Endeavour to make use of acceptable recycled aggregates.
- **Health and safety:** ensure that the health and safety of workers involved in the construction and maintenance of infrastructure assets is protected.
- **Community focused:** Consider the community benefits arising from an infrastructure project such as improvements to public space within the Township and promoting accessibility. The Township shall coordinate planning for asset management when municipal infrastructure assets connect or are interrelated with the County and neighboring Municipalities.

- **Innovation:** foster innovation by creating opportunities to make use of innovative technologies, services, and practices, particularly where doing so would utilize technology, techniques, and practices developed in Ontario.
- **Integration:** where relevant and appropriate, be mindful and consider the principles and content of non-binding provincial or municipal plans and strategies established under an Act or otherwise, in planning and making decisions surrounding the infrastructure that supports them.

Community Planning

Asset Management Planning will align with the County of Wellington Official Plan. The Township will achieve this by consulting with those responsible for managing the services to analyze the future costs and viability of projected changes.

Climate Change

The Township where applicable and appropriate will consider designing infrastructure to be resilient to the effects of climate change and support disaster planning to facilitate business continuity.

Scope and Capitalization Thresholds

The Township will use a service-based (qualitative) perspective when applying this policy to municipal assets, rather than a monetary value (quantitative). The capitalization threshold developed for financial reporting will not be the guide in selecting assets covered by the Asset Management Planning process.

Financial Planning and Budgeting

The Township will integrate Asset Management Planning into the annual capital budget, operating budget, and its long-term financial plan. The Asset Management Plan will be used as a resource in order to:

- Identify all potential revenues and costs (including operating, maintenance, replacement and decommissioning) associated with forthcoming infrastructure asset decisions;
- Evaluate the validity and need of each significant new capital asset, including considering the impact on future operating costs; and Incorporate new revenue tools and alternative funding strategies where possible.

The department level budget submission will be reviewed and evaluated by the CAO and Director of Finance in the preparation of the Township`s annual budget. Service area personnel will reference the Asset Management Plan for their area in order to look up forecasted spending needs identified in the plan, verify progress made on the Plan to identify potential gaps, prioritize spending needs and recent developments. Finance staff will be involved in the

Asset Management Planning process to coordinate the information from service personnel in the preparation of the budget submission.

Governance and Continuous Improvement

Council is entrusted with the responsibility of overseeing, on behalf of citizens, a large range of services provided through a diverse portfolio of assets. Council, having stewardship responsibility, is the final decision maker on all matters related to asset management in the Township. The Council and staff are committed to the success of Asset Management Planning. The following details the responsibilities of the key stakeholders within the Township:

Council:

- Approve by resolution the Asset Management Plan and its updates every five years;
- Conduct an annual review of the Asset Management Plan on or before July 1st of every year, that includes:
    - Progress on ongoing efforts to implement the Asset Management Plan;
    - Consideration of the Asset Management Policy;
    - Any factors affecting the ability of the Township to implement its Asset Management Plan;
    - Consultation with staff;
    - Support efforts to improve and implement the Asset Management Plan.

CAO:

- Maintain compliance with the Asset Management Policy and Provincial Asset management regulations.

Senior Management:

- Oversee Asset Management Planning activities that fall within their service area.

20.5 Puslinch Asset Registry (No Regulatory/Warning Signs) - Reduced Fields

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
1001	Bridges	Cook's Mill Bridge	1992	$593,190	50	70	4	High
1003	Bridges	Little's Bridge	1910	$219,765	50	22	2	Very High
1009	Bridges	Moyer's Bridge	1931	$495,040	50	63	2	Very High
1005	Bridges	Leslie Road West Between Lots 35/36	1965	$445,900	50	74	4	High
1006	Bridges	Concession 1, Lots 9/10, West Of SR 10S	1970	$783,510	50	61	3	High
1007	Bridges	French's Bridge	1984	$309,140	50	67	3	High
1008	Bridges	Galt Creek Bridge Gore Road Lot 2	1948	$745,875	50	60	2	Very High
2002	Culverts	Culvert Of Cook's Mill Race	2013	$97,200	50	52	2	High
2004	Culverts	McFarlane's Culvert	2002	$126,585	50	75	4	High
2006	Culverts	Victoria Road Culvert Over Galt Creek	1960	$225,630	50	72	2	High
2007	Culverts	Irish Creek Culvert On Townline Road	1936	$239,400	50	57	2	High
2008	Culverts	7th Concession Culvert	2012	$55,688	50	75	4	High
2009	Culverts	Gilmour Rd Culvert Over Aberfoyle Creek	1930	$138,600	50	50	2	High
2010	Culverts	Ellis Road Culvert Over Puslinch Lake Irish Creek	1920	$283,500	50	43	2	High
2011	Culverts	Ellis Road Culvert At Lot 10 Conc 2	2010	$131,670	50	75	3	High
2012	Culverts	Concession 2 Bridge/Culvert Over Mill Creek	1994	$560,700	50	75	3	High
2013	Culverts	Victoria Road Culvert North Of Leslie	1950	$177,165	50	70	3	High
2014	Culverts	Leslie Road Culvert West Of Victoria	1945	$171,450	50	55	2	High
2015	Culverts	Culvert Of Flamborough T/L West Of Victoria	2010	$264,735	50	75	4	High
2016	Culverts	Flamborough T/L Bridge/Culvert East Of Macpherson Ln	2010	$219,240	50	75	4	High

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
2017	Culverts	Gore Road Culvert	1960	$84,546	50	100	4	High
2018	Culverts	Gore Road Dual Culvert	1950	$63,135	50	100	4	High
2019	Culverts	7th Concession Culvert	1960	$194,400	50	74	4	High
53PCC	Buildings and Facilities	Puslinch Community Centre: Structure	1983	$3,000	40	4	4	Medium
67PCC	Buildings and Facilities	Puslinch Community Centre: Roof	1983	$100,000	40	5	5	Low
9PCC	Buildings and Facilities	Puslinch Community Centre: Walls & Windows	1983	$140,000	20	4	4	Medium
46PCC	Buildings and Facilities	Puslinch Community Centre: Interior Finishes	1983	$125,757	40	5	5	Low
93PCC	Buildings and Facilities	Puslinch Community Centre: Mechanical	1983	$45,000	40	5	5	Low
26PCC	Buildings and Facilities	Puslinch Community Centre: Electrical	1983	$61,000	40	5	5	Low
40PCC	Buildings and Facilities	Puslinch Community Centre: Fire, Life-Safety	1983	$5,750	40	5	5	Low
41PCC	Buildings and Facilities	Puslinch Community Centre: Septic Tank	1983	$15,000	30	3	3	Medium
95MC	Buildings and Facilities	Municipal Complex: Structure	1984	$144,921	40	4	4	Medium
56MC	Buildings and Facilities	Municipal Complex: Roof	1984	$42,734	40	5	5	Low
46MC	Buildings and Facilities	Municipal Complex: Walls & Windows	1984	$147,695	20	4	4	Medium
77MC	Buildings and Facilities	Municipal Complex: Interior Finishes	1984	$103,461	40	5	5	Low
59MC	Buildings and Facilities	Municipal Complex: Mechanical	1984	$222,667	40	5	5	Low

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
21MC	Buildings and Facilities	Municipal Complex: Electrical	1984	$56,979	40	5	5	Low
1MC	Buildings and Facilities	Municipal Complex: Fire, Life-Safety	1984	$35,987	40	5	5	Low
15002	Buildings and Facilities	Municipal Complex: Parking Lot Municipal Complex	1984	$162,750	25	2	2	Medium
41MC	Buildings and Facilities	Municipal Complex: Septic Tank	1983	$15,000	30	3	3	Medium
64BSBBPCC	Buildings and Facilities	Blue Storage Building Behind PCC: Structure		$38,282	40	3	3	Medium
71BSBBPCC	Buildings and Facilities	Blue Storage Building Behind PCC: Roof		$30,000	40	3	3	Medium
66BSBBPCC	Buildings and Facilities	Blue Storage Building Behind PCC: Walls & Windows		$37,384	20	3	3	Medium
14BSBBPCC	Buildings and Facilities	Blue Storage Building Behind PCC: Interior Finishes		$1,794	40	3	3	Medium
70BSBBPCC	Buildings and Facilities	Blue Storage Building Behind PCC: Mechanical		$23,328	40	3	3	Medium
89BSBBPCC	Buildings and Facilities	Blue Storage Building Behind PCC: Electrical		$20,188	40	3	3	Medium
44BSBBPCC	Buildings and Facilities	Blue Storage Building Behind PCC: Fire, Life-Safety		$20,038	40	3	3	Medium
92RSB	Buildings and Facilities	Roads Storage Building: Structure		$64,395	40	4	4	Medium
95RSB	Buildings and Facilities	Roads Storage Building: Roof		$14,338	40	4	4	Medium
7RSB	Buildings and Facilities	Roads Storage Building: Walls & Windows		$62,886	40	4	4	Medium
24RSB	Buildings and Facilities	Roads Storage BuildingInterior Finishes		$3,019	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
15RSB	Buildings and Facilities	Roads Storage BuildingMechanical		$39,241	40	4	4	Medium
81RSB	Buildings and Facilities	Roads Storage Building: Electrical		$33,958	40	4	4	Medium
86RSB	Buildings and Facilities	Roads Storage Building: Fire, Life-Safety		$33,707	40	4	4	Medium
33OCC	Buildings and Facilities	Optimist Community Centre:Structure	2010	$175,892	40	5	5	Low
66OCC	Buildings and Facilities	Optimist Community Centre: Roof	2010	$28,600	40	5	5	Low
51OCC	Buildings and Facilities	Optimist Community Centre: Walls & Windows	2010	$76,506	40	5	5	Low
44OCC	Buildings and Facilities	Optimist Community Centre: Interior Finishes	2010	$143,002	20	5	5	Low
97OCC	Buildings and Facilities	Optimist Community Centre: Mechanical	2010	$148,007	40	5	5	Low
22OCC	Buildings and Facilities	Optimist Community Centre:Electrical	2010	$75,076	40	5	5	Low
18OCC	Buildings and Facilities	Optimist Community Centre:Fire, Life-Safety	2010	$26,455	40	4	4	Medium
39OCCIR	Buildings and Facilities	Optimist Community Centre Ice Rink::Structure	2010	$125,235	40	4	4	Medium
95OCCIR	Buildings and Facilities	Optimist Community Centre Ice Rink: Roof	2010	$27,884	40	4	4	Medium
13OCCIR	Buildings and Facilities	Optimist Community Centre Ice Rink::Walls & Windows	2010	$122,300	40	4	4	Medium
58OCCIR	Buildings and Facilities	Optimist Community Centre Ice Rink: Interior Finishes	2010	$5,870	20	4	4	Medium
17OCCIR	Buildings and Facilities	Optimist Community Centre Ice Rink::Mechanical	2010	$76,315	40	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
51OCCIR	Buildings and Facilities	Optimist Community Centre Ice Rink: Electrical	2010	$66,042	40	1	1	High
88OCCIR	Buildings and Facilities	Optimist Community Centre Ice Rink: Fire, Life-Safety	2010	$65,553	40	4	4	Medium
41OCC	Buildings and Facilities	Optimist Community Centre Ice Rink: Septic Tank	2010	$15,000	30	3	3	Medium
3011	Buildings and Facilities	Community Centre Complex: Concession Booth At Community Centre Ball Diamond, C Road 46	1992	$20,000	40	3	3	Medium
3035	Buildings and Facilities	Community Centre Complex: Storage Building at Horse Paddock		$20,000	30	3	3	Medium
3009MM	Buildings and Facilities	Morriston Meadows: Booth/Washroom Building	1988	$20,000	40	3	3	Medium
41MM	Buildings and Facilities	Morriston Meadows: Septic Tank		$15,000	30	5	5	Low
41OMM	Buildings and Facilities	Old Morriston: Septic Tank		$15,000	30	5	5	Low
210PCC	Buildings and Facilities	Puslinch Community Centre: Generator				5	5	Low
210MC	Buildings and Facilities	Muncipal Complex: Generator				5	5	Low
4001	Buildings and Facilities	Server	2019	$42,000	5	5	5	Low
4002	Buildings and Facilities	Computer Assets		$10,000	5	5	5	Low
4004	Buildings and Facilities	Microsoft Office Licenses		$15,000	5	5	5	Low
42OMM	Buildings and Facilities	Old Morriston Park: Concession Booth		$20,000		3	3	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
3066	Buildings and Facilities	Old Morriston: Equipment Storage Room		$400	40	3	3	Medium
3281	Buildings and Facilities	Old Morriston: Equipment Storage Room, Panel		$10,000	20	3	3	Medium
3067	Buildings and Facilities	Badenoch Soccer Field: Storage Shed		$20,000	40	4	4	Medium
1	Asphalt Road 1 Lift	Gore Road	2015	$1,318,519	25	64	1	Very High
6	Asphalt Road 1 Lift	Gore Road	2002	$305,620	25	64	1	Very High
7	Asphalt Road Surface Treated	Gore Road	1999	$64,965	7	64	1	Very High
44	Asphalt Road 1 Lift	Ellis Road	2017	$696,391	25	98	5	Medium
56	Asphalt Road 1 Lift	Concession 4	2012	$660,207	25	64	1	Very High
58	Asphalt Road 1 Lift	Concession 4	2003	$393,745	25	64	1	Very High
68	Asphalt Road 1 Lift	Forestell Road	2018	$261,686	25	98	5	Medium
69	Asphalt Road 1 Lift	Forestell Road	2018	$395,009	25	98	5	Medium
124	Asphalt Road 1 Lift	Victoria Road South	2012	$925,640	25	62	1	Very High
125A	Asphalt Road 1 Lift	Victoria Road South	2000	$193,535	25	62	1	Very High
137	Asphalt Road 1 Lift	Watson Road South	1996	$1,320,708	25	64	1	Very High

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
72_SURFACE	Asphalt Road 2 Lift	Laird Road West	2017	$951,590	25	96	5	Medium
73_SURFACE	Asphalt Road 2 Lift	Laird Road West	2017	$381,987	25	96	5	Medium
74_SURFACE	Asphalt Road 2 Lift	Laird Road West	2017	$571,335	25	96	5	Medium
27B	Asphalt Road 2 Lift	Calfass Road	2016	$44,716	25	95.18593	5	Medium
20	Asphalt Road 1 Lift	Leslie Road W	2016	$600,992	25	95	5	Medium
125B	Asphalt Road 1 Lift	Victoria Road South	2016	$164,074	25	95	5	Medium
138	Asphalt Road 1 Lift	Watson Road South	2016	$678,845	25	95	5	Medium
180	Asphalt Road 1 Lift	Currie Drive	2015	$196,555	25	93.11961	4	High
210	Asphalt Road 1 Lift	Lang Court	2015	$34,267	25	93.11961	4	High
209	Asphalt Road 2 Lift	Winer Court	2015	$41,238	25	93.11961	4	High
2	Asphalt Road 1 Lift	Gore Road	2015	$487,415	25	93	4	High
181	Asphalt Road 1 Lift	Ochs Drive	2015	$183,332	25	93	4	High
99A	Asphalt Road 1 Lift	SR 10	2011	$95,748	25	92.5	4	High
3	Asphalt Road 1 Lift	Gore Road	2013	$658,618	25	91.09846	4	High
12	Asphalt Road 1 Lift	Concession 1	2013	$182,643	25	91	4	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
13B	Asphalt Road 1 Lift	Concession 1	1999	$115,752	25	91	4	High
33	Asphalt Road 1 Lift	Concession 2	2014	$657,503	25	90.63927	4	High
122	Asphalt Road 1 Lift	Victoria Road South	2014	$225,460	25	89.26172	4	High
123	Asphalt Road 1 Lift	Victoria Road South	2014	$711,618	25	89.26172	4	High
213_SURFACE	Asphalt Road 2 Lift	Tawse Place	1990	$71,054	25	88.23214	4	High
203_SURFACE	Asphalt Road 2 Lift	Daymond Drive	2007	$150,295	25	86.9658	4	High
198	Asphalt Road 2 Lift	Kerr Crescent	1995	$384,857	25	86	4	High
201_SURFACE	Asphalt Road 2 Lift	Carriage Lane	2000	$340,271	25	86	4	High
202_SURFACE	Asphalt Road 2 Lift	Cassin Court	2007	$130,866	25	86	4	High
191	Asphalt Road 2 Lift	Settler's Road	1995	$147,056	25	85	4	High
78	Asphalt Road 1 Lift	Niska Road	2012	$193,510	25	84.6	3	High
126	Asphalt Road 1 Lift	Victoria Road South	2013	$660,891	25	84.5858	3	High
50_SURFACE	Asphalt Road 2 Lift	Cockburn Street	2000	$56,932	25	84.01182	3	High
55	Asphalt Road 1 Lift	Concession 4	2010	$394,785	25	83.20824	3	High
82	Asphalt Road 1 Lift	Cooks Mill Road	2013	$136,438	25	82.86386	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
162_SURFACE	Asphalt Road 2 Lift	Nicholas Beaver Road	2007	$441,761	25	82	3	High
45A	Asphalt Road 1 Lift	Ellis Road	2010	$162,927	25	81.94549	3	High
45B	Asphalt Road 1 Lift	Ellis Road	1995	$574,749	25	81.94549	3	High
94	Asphalt Road 1 Lift	Sideroad 10 North	2000	$637,500	25	90	4	High
77	Asphalt Road 1 Lift	Hume Road	2010	$747,037	25	81.37151	3	High
208_SURFACE	Asphalt Road 2 Lift	Boreham Drive	1999	$140,930	25	80.79753	3	High
30	Asphalt Road 1 Lift	Main St And Back	2011	$110,087	25	79.7	3	High
190	Asphalt Road 2 Lift	Telfer Glen	1996	$321,772	25	79.64957	3	High
9	Asphalt Road 1 Lift	Puslinch-Flamborough Townline	2003	$344,544	25	79.19039	3	High
10	Asphalt Road 1 Lift	Puslinch-Flamborough Townline	2002	$423,819	25	79.19039	3	High
214	Asphalt Road 2 Lift	Beiber Road	2004	$78,269	25	78.846	3	High
13A	Asphalt Road 1 Lift	Concession 1	2007	$1,013,067	25	78.58929	3	High
34	Asphalt Road 1 Lift	Concession 2	2010	$667,781	25	77	3	High
35	Asphalt Road 2 Lift	Concession 2	2013	$945,359	25	76.89447	3	High
36	Asphalt Road 2 Lift	Concession 2/2A	1999	$411,923	25	76.89447	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
205	Asphalt Road 2 Lift	Fox Run Drive	2000	$108,410	25	76.55008	3	High
206	Asphalt Road 2 Lift	Fox Run Drive	2000	$57,511	25	76.55008	3	High
207	Asphalt Road 2 Lift	Fox Run Drive	2000	$301,634	25	76.55008	3	High
196	Asphalt Road 2 Lift	Fox Run Drive	2004	$190,078	25	76.55	3	High
195	Asphalt Road 2 Lift	Deer View Ridge	2004	$306,895	25	75.9761	3	High
48	Asphalt Road 1 Lift	Smith Road	1990	$105,774	25	75.53048	3	High
21	Asphalt Road 1 Lift	Leslie Road West	2003	$642,266	25	75.51692	3	High
115	Asphalt Road 2 Lift	Concession 7	2013	$197,428	25	75.5	3	High
116	Asphalt Road 2 Lift	Concession 7	2000	$143,334	25	75.5	3	High
14	Asphalt Road 1 Lift	Concession 1	2013	$659,171	25	75.28733	3	High
46_SURFACE	Asphalt Road 2 Lift	Gilmour Road	2007	$79,051	25	74.91271	2	Very High
160	Asphalt Road 1 Lift	Concession 4	2004	$142,387	25	74.56832	2	Very High
161	Asphalt Road 1 Lift	Concession 4	2004	$107,682	25	74.56832	2	Very High
132	Asphalt Road 1 Lift	McRae Station Road	1996	$214,909	25	74.38252	2	Very High
38	Asphalt Road 1 Lift	Mason Road	2000	$70,941	25	74.25416	2	Very High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
32	Asphalt Road 1 Lift	Concession 2	2014	$669,541	25	73.56539	2	Very High
51_SURFACE	Asphalt Road 2 Lift	Old Brock Road	2000	$153,783	25	72.76182	2	Very High
16	Asphalt Road 1 Lift	Concession 1	1999	$657,152	25	72.54578	2	Very High
166	Asphalt Road 1 Lift	Sideroad 20 North	2003	$354,891	25	71.92802	2	Very High
164_SURFACE	Asphalt Road 2 Lift	McLean Road/Concession 7	2004	$492,285	25	71.81322	2	Very High
165_SURFACE	Asphalt Road 2 Lift	McLean Road/Concession 7	2004	$382,470	25	71.81322	2	Very High
18	Asphalt Road 1 Lift	Concession 1/Leslie Rd W	1999	$776,119	25	71.8	2	Very High
19	Asphalt Road 1 Lift	Concession 1	2001	$147,053	25	71.8	2	Very High
4	Asphalt Road 1 Lift	Gore Road	2004	$830,576	25	71.16823	2	Very High
28_SURFACE	Asphalt Road 2 Lift	Victoria Street And Church Street	2000	$130,336	25	70.89486	2	Very High
5	Asphalt Road 1 Lift	Gore Road	1990	$486,434	25	70.13507	2	Very High
204_SURFACE	Asphalt Road 2 Lift	Bridle Path	1990	$514,571	25	69.9	2	Very High
185_SURFACE	Asphalt Road 2 Lift	Bridle Path	1990	$205,657	25	69.89192	2	Very High
212A	Asphalt Road 1 Lift	Winer Road	2000	$189,390	25	69.7469	2	Very High
212B_SURFACE	Asphalt Road 2 Lift	Winer Road	2007	$165,696	25	69.7469	2	Very High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
63B	Asphalt Road 1 Lift	Maltby Road East	2012	$321,929	25	69.68	2	Very High
63A	Asphalt Road 1 Lift	Maltby Road East	2011	$324,700	25	69.67589	2	Very High
17	Asphalt Road 1 Lift	Concession 1	1997	$658,028	25	69.10191	2	Very High
97	Asphalt Road 1 Lift	Sideroad 10 North	1998	$330,654	25	69.05812	2	Very High
108	Asphalt Road 1 Lift	Sideroad 20 North	2004	$651,901	25	68.82853	2	Very High
148	Asphalt Road 1 Lift	Puslinch-Flamborough Townline	2003	$96,036	25	68.6	2	Very High
22	Asphalt Road 1 Lift	Leslie Road West	2003	$171,807	25	68.59894	2	Very High
23	Asphalt Road 1 Lift	Leslie Road West	2003	$389,820	25	68.59894	2	Very High
25	Asphalt Road 1 Lift	Leslie Road West	2004	$323,909	25	68.59894	2	Very High
54A	Asphalt Road 1 Lift	Roszell Road 2013	2012	$420,896	25	68.3	2	Very High
66	Asphalt Road 1 Lift	Forestell Road	2018	$388,958	25	99	5	Medium
90	Asphalt Road 1 Lift	Roszell Road	1990	$316,669	25	68.3	2	Very High
88	Asphalt Road 1 Lift	Townline Road	1990	$464,824	25	67.91016	2	Very High
40_SURFACE	Asphalt Road 2 Lift	McLean Road West	1995	$912,914	25	67.56577	2	Very High
59	Asphalt Road 1 Lift	Concession 4	2003	$659,044	25	67.33618	2	Very High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
158	Asphalt Road 1 Lift	McLean Road East	1996	$207,799	25	67.33618	2	Very High
121A	Asphalt Road 1 Lift	Maddaugh Road	2004	$155,390	25	66.7622	2	Very High
121B	Asphalt Road 1 Lift	Maddaugh Road	2003	$161,851	25	66.7622	2	Very High
15	Asphalt Road 1 Lift	Concession 1	1996	$660,788	25	66.64741	2	Very High
153	Asphalt Road Surface Treated	Nassagaweya-Puslinch Townline	2017	$54,921	7	98	5	Medium
154	Asphalt Road Surface Treated	Nassagaweya-Puslinch Townline	2017	$28,974	7	98	5	Medium
155	Asphalt Road Surface Treated	Nassagaweya-Puslinch Townline	2017	$21,613	7	98	5	Medium
120	Asphalt Road Surface Treated	Maddaugh Road	1997	$24,785	7	66.7622	2	Very High
134	Asphalt Road 1 Lift	Watson Road South	1996	$197,037	25	65.84384	2	Very High
135	Asphalt Road 1 Lift	Watson Road South	1990	$182,905	25	65.84384	2	Very High
136	Asphalt Road 1 Lift	Watson Road South	1998	$271,867	25	65.84384	2	Very High
140	Asphalt Road 1 Lift	Watson Road South	2001	$524,575	25	65.72904	2	Very High
139	Asphalt Road 1 Lift	Watson Road South	2001	$650,584	25	65.7	2	Very High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
133	Asphalt Road 1 Lift	Watson Road South	1997	$315,092	25	65.15506	2	Very High
52	Asphalt Road 1 Lift	Maple Leaf Lane	2000	$226,827	25	65	2	Very High
57	Asphalt Road 1 Lift	Concession 4	2004	$262,338	25	65	2	Very High
67	Asphalt Road 1 Lift	Forestell Road	2017	$662,722	25	98	5	Medium
71	Asphalt Road 1 Lift	Laird Road West		$71,000	25	70	2	Very High
95b	Asphalt Road 1 Lift	Side Road 10 North		$13,668	25	98	5	Medium
96	Asphalt Road 1 Lift	Sideroad 10 North		$177,500	25	78	3	High
29	Asphalt Road 1 Lift	Main Street	2001	$155,895	25	80	3	High
81	Gravel Road	Cooks Mill Road	2003	$107,488	50	90	4	High
79	Gravel Road	Farnham Road	2003	$170,773	50	90	4	High
98	Gravel Road	Sideroad 10 North	2007	$84,074	50	90	4	High
200	Gravel Road	Boyce Drive	2003	$44,973	50	90	4	High
129	Gravel Road	Carter Road	2003	$328,113	50	90	4	High
211	Gravel Road	Anne Street	2003	$11,201	50	90	4	High
31	Gravel Road	Little Road	2001	$69,183	50	90	4	High
100	Gravel Road	Sideroad 12 North	2002	$59,580	50	90	4	High
142	Gravel Road	Concession 11	2002	$366,533	50	90	4	High
146	Gravel Road	Concession 11	2002	$364,390	50	90	4	High
53	Gravel Road	Hammersley Road	2002	$177,891	50	90	4	High
92	Gravel Road	Sideroad 10 South	2001	$370,103	50	90	4	High
101	Gravel Road	Sideroad 12 N	2001	$184,577	50	90	4	High
150	Gravel Road	Nassagaweya-Puslinch Townline	2001	$366,034	50	90	4	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
26	Gravel Road	Small Road	2001	$76,786	50	90	4	High
64	Gravel Road	Maltby Road East	2001	$367,343	50	90	4	High
91	Gravel Road	Sideroad 10 South	2000	$333,431	50	90	4	High
103	Gravel Road	Pioneer Trail	2000	$301,750	50	90	4	High
43	Gravel Road	Sideroad 17	2000	$66,804	50	90	4	High
104	Gravel Road	Sideroad 20 South	2000	$335,435	50	90	4	High
8	Gravel Road	MacPherson's Lane	2000	$155,895	50	90	4	High
106	Gravel Road	Sideroad 20 North	2000	$185,238	50	90	4	High
105	Gravel Road	Sideroad 20 South	2000	$371,540	50	90	4	High
110	Gravel Road	Sideroad 25 South	2000	$336,664	50	90	4	High
144	Gravel Road	Concession 11	2000	$346,743	50	90	4	High
93	Gravel Road	Sideroad 10 South	2000	$131,053	50	90	4	High
27	Gravel Road	Calfass Road	2000	$368,608	50	90	4	High
111	Gravel Road	Sideroad 25 South	2000	$371,176	50	90	4	High
112	Gravel Road	Sideroad 25 North	2000	$100,564	50	90	4	High
99B	Gravel Road	Sideroad 10 North	2000	$70,389	50	90	4	High
145	Gravel Road	Concession 11	2000	$364,394	50	90	4	High
65	Gravel Road	Maltby Road East	1990	$54,652	50	90	4	High
143	Gravel Road	Concession 11	2000	$234,387	50	90	4	High
118	Gravel Road	Concession 7	1990	$364,220	50	90	4	High
37	Gravel Road	Concession 2	2000	$42,245	50	90	4	High
152	Gravel Road	Midway Lane	2001	$146,615	50	90	4	High
113	Gravel Road	Concession 7	1990	$340,978	50	90	4	High
95A	Gravel Road	Sideroad 10 North	2000	$337,250	25	90	4	High
159	Gravel Road	McLean Road East	2004	$64,192	50	90	4	High
47	Gravel Road	Gilmour Road	2002	$306,805	50	90	4	High
114	Gravel Road	Concession 7	1990	$470,198	50	90	4	High
149	Gravel Road	Darkwood	1997	$25,028	50	90	4	High
157	Gravel Road	Jones Baseline	2003	$76,148	50	90	4	High
175	Gravel Road	Rhodes Road		$151,585	50	90	4	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
176	Gravel Road	Eagle Lane		$133,303	50	90	4	High
GRM	Gravel Road	All Gravel Road Maitenance					5	Medium
FR_1	Fire Reservoir	Tank: (Arkell) #30 Boreham Dr	1999	$50,000	50	3	3	High
FR_2	Fire Reservoir	Tank: (Arkell) #38 Boreham Dr	1999	$50,000	50	3	3	High
FR_3	Fire Reservoir	Tank: (Audrey Meadows) Catherine Ct	2011	$50,000	50	3	3	High
FR_4	Fire Reservoir	Tank: (Audrey Meadows) Old Ruby	2011	$50,000	50	3	3	High
FR_5	Fire Reservoir	Tank: (Audrey Meadows) Old Ruby	2011	$50,000	50	3	3	High
FR_6	Fire Reservoir	Tank: (Community Center) #23 Brock Rd	2010	$50,000	50	3	3	High
FR_7	Fire Reservoir	Tank: (Estate Homes) #33 Carriage Ln	2000	$50,000	50	3	3	High
FR_8	Fire Reservoir	Tank: (Estate Homes) 65 Carriage Ln	2000	$50,000	50	3	3	High
FR_9	Fire Reservoir	Tank: (Estate Subdivision) #32 Daymond Dr	2009	$50,000	50	3	3	High
FR_10	Fire Reservoir	Tank: (Hammersley) #7480 Hammersley Dr	1999	$50,000	50	3	3	High
FR_11	Fire Reservoir	Tank: (Puslinch Fire) 7404 Well Rd 34	2002	$50,000	50	3	3	High
FR_12	Fire Reservoir	Tank: (Puslinch Fire) 6495 Roszell Rd		$50,000	50	3	3	High
FR_13	Fire Reservoir	Tank: (Estate Homes) #37 Fox Run Dr	1989	$50,000	50	3	3	High
FR_14	Fire Reservoir	Tank: (1719303 Ontario Inc.) Morriston Estates Subdivision		$50,000	50	3	3	High
FR_15	Fire Reservoir	Tank: DRS Developments		$50,000	50	3	3	High
3037	Parks and Recreation	Community Centre Complex: Light Poles at Back Field		$15,600	20	5	5	Medium
3039	Parks and Recreation	Community Centre Complex: Gravel Parking Lot & Road		$86,000	50	5	5	Medium
3822	Parks and Recreation	Community Centre Complex: Puslinch Community Gardens Cobblestone Walkways		$2,520	20	5	5	Medium
3823	Parks and Recreation	Community Centre Complex: Puslinch Community Gardens Benches		$500	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
3041	Parks and Recreation	Morriston Meadows: Morriston Playground		$25,000	25	4	4	Medium
3042	Parks and Recreation	Morriston Meadows: Gravel Parking Lot		$47,300	25	4	4	Medium
3010	Parks and Recreation	Morriston Meadows: Picnic Pavillion, Morriston Meadows Park	1993	$30,000	40	5	5	Medium
3043	Parks and Recreation	Morriston Meadows: Picnic Tables		$3,500	20	5	5	Medium
3044	Parks and Recreation	Morriston Meadows: Basketball Court		$22,425	20	4	4	Medium
3279	Parks and Recreation	Morriston Meadows: Basketball Court Post and Hoops		$1,000	20	4	4	Medium
3046	Parks and Recreation	Morriston Meadows: Bleachers		$10,000	25	1	1	High
3047	Parks and Recreation	Morriston Meadows: Benches		$1,000	20	1	1	High
3048	Parks and Recreation	Morriston Meadows: Fencing Backstop		$1,638	20	4	4	Medium
3049	Parks and Recreation	Morriston Meadows: Fencing Outfield		$29,344	20	4	4	Medium
3050	Parks and Recreation	Morriston Meadows: Fencing Backstop		$1,965	20	4	4	Medium
3051	Parks and Recreation	Morriston Meadows: Fencing Infield		$3,930	20	4	4	Medium
3052	Parks and Recreation	Morriston Meadows: 6 Seat HighBleachers		$5,000	25	1	1	High
3053	Parks and Recreation	Morriston Meadows: 6 Seat High Bleachers		$5,000	25	1	1	High
3054	Parks and Recreation	Morriston Meadows: Fencing Around Park		$26,200	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
3055	Parks and Recreation	Morriston Meadows: Fencing Behind Large Baseball Diamond		$13,100	20	5	5	Medium
3056	Parks and Recreation	Old Morriston: Gravel Road		$7,740	25	2	2	High
3057	Parks and Recreation	Old Morriston: Fencing Outfield		$28,820	20	3	3	Medium
3058	Parks and Recreation	Old Morriston: Fencing Infield		$1,834	20	4	4	Medium
3059	Parks and Recreation	Old Morriston: Fencing Backstop		$3,668	20	1	1	High
3060	Parks and Recreation	Old Morriston: 6 seat Concrete Bleachers		$10,000	50	1	1	High
3061	Parks and Recreation	Old Morriston: Ball Park Benches		$500	20	3	3	Medium
3063	Parks and Recreation	Old Morriston: Light Towers		$161,385	40	1	1	High
3064	Parks and Recreation	Old Morriston: Light Fixtures		$24,500	20	3	3	Medium
3065	Parks and Recreation	Old Morriston: Batting Cages		$13,100	20	3	3	Medium
3068	Parks and Recreation	Badenoch Soccer Field: 3 Seat Bleacher		$2,000	25	1	1	High
3070	Parks and Recreation	Badenoch Soccer Field: Fencing (East Side)		$14,934	20	2	2	High
3071	Parks and Recreation	Badenoch Soccer Field: Fencing (North and West Side)		$27,641	20	5	5	Medium
3072	Parks and Recreation	Badenoch Soccer Field: Septic Tank		$15,000	30	3	3	Medium
3074	Parks and Recreation	Boreham Drive Park: Basketball Court		$22,425	25	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
3260	Parks and Recreation	Boreham Drive: Basketball Court Post and Hoops		$1,000	20	4	4	Medium
3075	Parks and Recreation	Boreham Drive Park: Arkell Playground		$25,000	25	5	5	Medium
3076	Parks and Recreation	Boreham Drive Park: Sign		$1,500	20	5	5	Medium
3077	Parks and Recreation	Telfer Glen Park Trail			50	5	5	Medium
307989	Parks and Recreation	Wayne Stokley Trail	2016			5	5	Medium
3087	Parks and Recreation	Community Centre Complex: Fencing Around Community Centre		$65,500	20	5	5	Medium
3082	Parks and Recreation	Community Centre Complex: Parking Lot Community Centre Complex		$91,875	25	2	2	High
3078	Parks and Recreation	Community Centre Complex: Puslinch Community Centre Sidewalks		$1,500	20	4	4	Medium
3079	Parks and Recreation	Community Centre Complex: Swing Gates		$9,000	30	4	4	Medium
3080	Parks and Recreation	Community Centre Complex: Soccer Field		$575,000	25	5	5	Medium
3013	Parks and Recreation	Community Centre Complex: Light Poles		$161,385	40	5	5	Medium
3014	Parks and Recreation	Community Centre Complex: Wooden Bleacher		$5,000	20	3	3	Medium
3015	Parks and Recreation	Community Centre Complex: Metal Bleacher		$13,725	30	5	5	Medium
3016	Parks and Recreation	Community Centre Complex: Fencing Outfield		$28,689	20	4	4	Medium
3017	Parks and Recreation	Community Centre Complex: Fencing Backstop		$1,572	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
3019	Parks and Recreation	Community Centre Complex: Netting Backstop		$250	20	4	4	Medium
3020	Parks and Recreation	Community Centre Complex: Fencing Infield		$6,550	20	4	4	Medium
3024	Parks and Recreation	Community Centre Complex: Batting Cages		$9,000	20	3	3	Medium
3025	Parks and Recreation	Community Centre Complex: Wooden Fences Beside Batting Cages		$1,800	15	2	2	High
3026	Parks and Recreation	Community Centre Complex: Concrete Hydropole		$4,000	20	5	5	Medium
3028	Parks and Recreation	Community Centre Complex: Light Poles		$5,200	20	2	2	High
3081	Parks and Recreation	Community Centre Complex: Light Fixtures		$3,500	20	5	5	Medium
3029	Parks and Recreation	Community Centre Complex: Fencing		$9,694	20	2	2	High
3031	Parks and Recreation	Community Centre Complex: Aberfoyle Playground		$25,000	25	4	4	Medium
3032	Parks and Recreation	Community Centre Complex: Fencing Outside Aberfoyle Playground		$3,930	20	3	3	Medium
14003	Parks and Recreation	Community Centre Complex: Tennis Court Fencing	1988	$21,615	40	5	5	Medium
14005	Parks and Recreation	Community Centre Complex: Paving Tennis Court	2009	$44,625	40	3	3	Medium
3033	Parks and Recreation	Community Centre Complex: Aerial Transformers				4	4	Medium
14004	Parks and Recreation	Community Centre Complex: Horse Run Fencing	2010	$5,030	40	2	2	High
14006	Parks and Recreation	Community Centre Complex: Light Poles at Horse Paddock	2009	$15,510	40	4	4	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
3036	Parks and Recreation	Community Centre Complex: Horse Paddock Bleachers		$30,000	20	1	1	High
3013-1	Parks and Recreation	Community Centre Complex: Light Fixtures		$28,000	25	5	5	Medium
2301000006054310000	Parks and Recreation	Fox Run Park						Insignificant
2301000005121000000	Parks and Recreation	Morriston Historic Corner Block Park Area						Insignificant
8015-3	Works Unlicensed vehicles	Pumps		$5,000	20	5	5	Medium
8001	Works Unlicensed vehicles	JCB Backhoe 6	2008	$125,000	12	2	2	Medium
8003	Works Unlicensed vehicles	Road Grader G740 501	2000	$350,000	25		5	Medium
8002	Works Unlicensed vehicles	Road Grader G740 501	2000	$350,000	25		2	Medium
8018	Works Unlicensed vehicles	Brush Chipper	2015	$40,000	10	81	5	Medium
7007	Parks and Recreation Unlicensed vehicles	Lawn Tractor	2018	$30,000	10		4	Medium
8020	Parks and Recreation	Olympia Ice Resurfacer	2017	$80,000	25	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
	Unlicensed vehicles							
8012	Parks and Recreation Unlicensed vehicles	Trailers (1) - Parks Department	2014	$5,000	20		4	Medium
5040	Fire licensed vehicles	Pumper 32	2010	$300,000	20		4	Medium
5033	Fire licensed vehicles	Aerial 33	2003	$500,000	25	55667	3	Medium
5031	Fire licensed vehicles	Fire Pumper 31	2005	$468,000	20		3	Medium
5038	Fire licensed vehicles	Freightliner Pumper Tanker 38	2012	$450,000	20		4	Medium
5035	Fire licensed vehicles	Rescue Truck 35	2000	$520,000	20		3	Medium
7006	Fire licensed vehicles	Tanker 37	2010	$410,000	20		4	Medium
7005A	Fire licensed vehicles	2013 Vehicle For Fire & Rescue	2016	$23,000	7		4	Medium
5030	Fire licensed vehicles	Antique Fire Truck						
1_66FVT	Fire vehicle tires	P-31	2004	$648	10		1	High
2_11FVT	Fire vehicle tires	P-31	2004	$648	10		1	High
3_3FVT	Fire vehicle tires	P-31	2003	$825	10		1	High
4_96FVT	Fire vehicle tires	P-31	2003	$825	10		1	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
5_81FVT	Fire vehicle tires	P-31	2003	$825	10		1	High
6_77FVT	Fire vehicle tires	P-31	2003	$825	10		1	High
7_64FVT	Fire vehicle tires	P-32	2012	$686	10		3	Medium
8_19FVT	Fire vehicle tires	P-32	2012	$686	10		3	Medium
9_22FVT	Fire vehicle tires	P-32	2012	$686	10		3	Medium
10_14FVT	Fire vehicle tires	P-32	2012	$686	10		3	Medium
11_90FVT	Fire vehicle tires	P-32	2012	$686	10		3	Medium
12_46FVT	Fire vehicle tires	P-32	2012	$686	10		3	Medium
13_63FVT	Fire vehicle tires	A-33	2012	$825	8		3	Medium
14_38FVT	Fire vehicle tires	A-33	2012	$825	8		3	Medium
15_73FVT	Fire vehicle tires	A-33	2011	$825	8		3	Medium
16_16FVT	Fire vehicle tires	A-33	2011	$825	8		3	Medium
17_74FVT	Fire vehicle tires	A-33	2011	$825	8		3	Medium
18_76FVT	Fire vehicle tires	A-33	2011	$825	8		3	Medium
19_36FVT	Fire vehicle tires	R-35	2016	$648	10		4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
20_20FVT	Fire vehicle tires	R-35	2016	$648	10		4	Medium
21_91FVT	Fire vehicle tires	R-35	2017	$370	10		4	Medium
22_65FVT	Fire vehicle tires	R-35	2017	$370	10		4	Medium
23_30FVT	Fire vehicle tires	R-35	2017	$370	10		4	Medium
24_66FVT	Fire vehicle tires	R-35	2017	$370	10		4	Medium
25_57FVT	Fire vehicle tires	T-37	2014	$825	10		4	Medium
26_100FVT	Fire vehicle tires	T-37	2014	$825	10		4	Medium
27_69FVT	Fire vehicle tires	T-37	2009	$825	10		1	High
28_4FVT	Fire vehicle tires	T-37	2009	$825	10		1	High
29_40FVT	Fire vehicle tires	T-37	2009	$825	10		1	High
30_35FVT	Fire vehicle tires	T-37	2009	$825	10		1	High
31_1FVT	Fire vehicle tires	T-37	2009	$825	10		1	High
32_77FVT	Fire vehicle tires	T-37	2009	$825	10		1	High
33_70FVT	Fire vehicle tires	T-37	2009	$825	10		1	High
45_1FVT	Fire vehicle tires	C-1	2014	$250	10		1	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
46_31FVT	Fire vehicle tires	C-1	2014	$250	10		1	High
47_71FVT	Fire vehicle tires	C-1	2014	$250	10		1	High
48_70FVT	Fire vehicle tires	C-1	2014	$250	10		1	High
34_59FVT	Fire vehicle tires	T-37	2009	$825	10		1	High
35_18FVT	Fire vehicle tires	T-38	2018	$825	10		1	High
36_27FVT	Fire vehicle tires	T-38	2018	$825	10		1	High
37_60FVT	Fire vehicle tires	T-38	2018	$648	10		1	High
38_76FVT	Fire vehicle tires	T-38	2018	$648	10		1	High
39_53FVT	Fire vehicle tires	T-38	2018	$648	10		1	High
40_1FVT	Fire vehicle tires	T-38-FT	2006	$825	10		1	High
41_1FVT	Fire vehicle tires	T-38-FT	2009	$825	10		1	High
42_14FVT	Fire vehicle tires	T-38	2018	$648	10		1	High
43_24FVT	Fire vehicle tires	T-38	2018	$648	10		1	High
44_8FVT	Fire vehicle tires	T-38	2018	$648	10		1	High
49_56FVT	Fire vehicle tires	C-1 Winter	2017	$250	10		1	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
50_57FVT	Fire vehicle tires	C-1 Winter	2017	$250	10		1	High
51_94FVT	Fire vehicle tires	C-1 Winter	2017	$250	10		1	High
52_10FVT	Fire vehicle tires	C-1 Winter	2017	$250	10		1	High
53_10FVT	Fire vehicle tires	P-30	2002	$370	10		1	High
54_43FVT	Fire vehicle tires	P-30	2002	$370	10		1	High
55_80FVT	Fire vehicle tires	P-30	2002	$370	10		1	High
56_8FVT	Fire vehicle tires	P-30	2002	$370	10		1	High
57_20FVT	Fire vehicle tires	P-30	2002	$370	10		1	High
58_81FVT	Fire vehicle tires	P-30	2002	$370	10		1	High
8016	Works licensed vehicles	2013 International Plow Truck 301	2013	$250,000	8	74804	2	Medium
8014	Works licensed vehicles	2012 Dump/Plow 302	2012	$250,000	8	96095	2	Medium
8017	Works licensed vehicles	2015 International Plow Truck - 303	2015	$225,000	8	31032	2	Medium
8013	Works licensed vehicles	2011 Single Axle Truck 304	2011	$250,000	8	77523	1	High
7003	Works licensed vehicles	1 Ton Dump/Plow 305	2008	$100,000	12	103534	2	Medium
8019	Works licensed vehicles	2015 GMC Sierra 1500	2015	$40,000	5	42610	3	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
7009	Works licensed vehicles	2017 Pickup Truck - Staff - 3/4 Ton	2017	$52,000	8	4198	3	Medium
7008	Works licensed vehicles	2011 Chevy Silverado Pickup 4	2011	$40,000	7	125958	1	High
7005B	Building Department licensed vehicles	2016 Mid-Size Pickup	2016	$33,000	7		3	Medium
4060	Parks and Recreation Unlicensed vehicles	Floor Scrubber	2016	$8,000	10		4	Medium
8015	Works Unlicensed vehicles	Anti-Ice Equipment					5	Medium
8015-1	Works Unlicensed vehicles	Slide in Spray Unt		$5,000	20	5	5	Medium
8015-2	Works Unlicensed vehicles	Storage Tank		$14,000	20	5	5	Medium
2002PW	Works Unlicensed vehicles	2002 Water Pump and Hose			10			
73_67FE	Fire Equipment	Bunker Gear #301 1301002761 1301002766	2013	$3,000	10	3	3	High
74_22FE	Fire Equipment	Bunker Gear #336 1301002757 1301002762	2013	$3,000	10	3	3	High
75_67FE	Fire Equipment	Bunker Gear #392 1301002758 1301002763	2013	$3,000	10	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
76_55FE	Fire Equipment	Bunker Gear #337 1301002760 1301002765	2013	$3,000	10	4	4	Medium
77_100FE	Fire Equipment	Bunker Gear #388 4748801 4749620	2014	$3,000	10	4	4	Medium
78_9FE	Fire Equipment	Bunker Gear #318	2014	$3,000	10	4	4	Medium
79_75FE	Fire Equipment	Bunker Gear #310 4748800 4749619	2014	$3,000	10	4	4	Medium
80_57FE	Fire Equipment	Bunker Gear #333 4924090 4924085	2015	$3,000	10	4	4	Medium
81_37FE	Fire Equipment	Bunker Gear #387 4924092 4924080	2015	$3,000	10	4	4	Medium
83_94FE	Fire Equipment	Bunker Gear #326 4924091 4924082	2015	$3,000	10	4	4	Medium
84_89FE	Fire Equipment	Bunker Gear #321 4992302 4924081	2015	$3,000	10	4	4	Medium
85_11FE	Fire Equipment	Bunker Gear #370 4924095 4924083	2015	$3,000	10	4	4	Medium
86_72FE	Fire Equipment	Bunker Gear #381 4924093 4924086	2015	$3,000	10	4	4	Medium
87_51FE	Fire Equipment	Bunker Gear #306 4992301 4992304	2015	$3,000	10	4	4	Medium
88_35FE	Fire Equipment	Bunker Gear #309 4924096 4924084	2015	$3,000	10	4	4	Medium
89_97FE	Fire Equipment	Bunker Gear #307 4924089 4924079	2015	$3,000	10	4	4	Medium
90_29FE	Fire Equipment	Bunker Gear #380 4992303 4992306	2015	$3,000	10	4	4	Medium
91_44FE	Fire Equipment	Bunker Gear #375 4924077 4992305	2015	$3,000	10	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
92_20FE	Fire Equipment	Bunker Gear #303 5017234 5017235	2015	$3,000	10	4	4	Medium
93_73FE	Fire Equipment	Bunker Gear #320 4924094 4924087	2015	$3,000	10	4	4	Medium
94_89FE	Fire Equipment	Bunker Gear #355 4924088 4924078	2015	$3,000	10	4	4	Medium
95_47FE	Fire Equipment	Bunker Gear #315 5085806 5085940	2016	$3,000	10	5	5	Medium
96_14FE	Fire Equipment	Bunker Gear #319 5122954 5085938	2016	$3,000	10	5	5	Medium
97_58FE	Fire Equipment	Bunker Gear #391 5085805 5085939	2016	$3,000	10	5	5	Medium
98_23FE	Fire Equipment	Bunker Gear #379 5312492 5312493	2017	$3,000	10	5	5	Medium
99_1FE	Fire Equipment	Bunker Gear #382 5310558 5310560	2017	$3,000	10	5	5	Medium
100_87FE	Fire Equipment	Bunker Gear #323 5310555 5310559	2017	$3,000	10	5	5	Medium
101_49FE	Fire Equipment	Bunker Gear #385 5310557 5310562	2017	$3,000	10	5	5	Medium
102_20FE	Fire Equipment	Bunker Gear #322 5310556 5310561	2017	$3,000	10	5	5	Medium
103_101FE	Fire Equipment	Bunker Gear #350 5483616 5483622	2018	$3,000	10	5	5	Medium
104_60FE	Fire Equipment	Bunker Gear #335 5483615 5483621	2018	$3,000	10	5	5	Medium
105_24FE	Fire Equipment	Bunker Gear #302 5483614 5483619	2018	$3,000	10	5	5	Medium
106_92FE	Fire Equipment	Bunker Gear #305 5483613 5483618	2018	$3,000	10	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
1_26FE	Fire Equipment	Air Cylinder Compressor	2014	$29,490	20	5	5	Medium
2_46FE	Fire Equipment	Portable Radios		$45,000		4	4	Medium
3_18FE	Fire Equipment	Mobile/Truck Radios		$40,000		4	4	Medium
4_35FE	Fire Equipment	Pagers		$22,000		3	3	High
5_44FE	Fire Equipment	Vehicle Extrication Equipment		$25,000		4	4	Medium
6_70FE	Fire Equipment	Power Hydraulic Tool set	2000	$52,500	20	1	1	Very High
7_82FE	Fire Equipment	Edraulic Combination Tool		$15,000	20	4	4	Medium
8_93FE	Fire Equipment	Thermal Imaging Camera	2009	$6,000	10	1	1	Very High
9_104FE	Fire Equipment	Washer/Extractor	2017	$10,000	10	4	4	Medium
10_2FE	Fire Equipment	Gear Dryer	2017	$6,000	10	4	4	Medium
11_103FE	Fire Equipment	Rapid Deployment Water Craft	2010	$6,000	10	4	4	Medium
12_41FE	Fire Equipment	Defibrillators Fire & Rescue Service Trucks	2017	$15,000	8	3	3	High
1212_41FE	Fire Equipment	Defibrillators - Municipal Buildings	2017	$4,500	8	5	5	Medium
13_89FE	Fire Equipment	Portable Pumps	2006	$15,000	20	4	4	Medium
14_25FE	Fire Equipment	Air Cylinder:84	2005	$1,500	15	3	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
15_87FE	Fire Equipment	Air Cylinder:85	2006	$1,500	15	3	3	High
16_87FE	Fire Equipment	Air Cylinder:87	2007	$1,500	15	3	3	High
17_76FE	Fire Equipment	Air Cylinder:88	2008	$1,500	15	3	3	High
18_90FE	Fire Equipment	Air Cylinder:100	2004	$1,500	15	3	3	High
19_90FE	Fire Equipment	Air Cylinder:101	2005	$1,500	15	3	3	High
20_85FE	Fire Equipment	Air Cylinder:102	2006	$1,500	15	3	3	High
21_85FE	Fire Equipment	Air Cylinder:103	2007	$1,500	15	3	3	High
22_9FE	Fire Equipment	Air Cylinder:104	2006	$1,500	15	3	3	High
23_42FE	Fire Equipment	Air Cylinder:105	2005	$1,500	15	3	3	High
24_94FE	Fire Equipment	Air Cylinder:106	2006	$1,500	15	3	3	High
25_35FE	Fire Equipment	Air Cylinder:107	2005	$1,500	15	3	3	High
26_23FE	Fire Equipment	Air Cylinder:108	2005	$1,500	15	3	3	High
27_67FE	Fire Equipment	Air Cylinder:109	2005	$1,500	15	3	3	High
28_48FE	Fire Equipment	Air Cylinder:310	2008	$1,500	15	3	3	High
29_64FE	Fire Equipment	Air Cylinder:311	2008	$1,500	15	3	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
30_89FE	Fire Equipment	Air Cylinder:312	2005	$1,500	15	3	3	High
31_89FE	Fire Equipment	Air Cylinder:313	2005	$1,500	15	3	3	High
32_104FE	Fire Equipment	Air Cylinder:314	2008	$1,500	15	3	3	High
33_34FE	Fire Equipment	Air Cylinder:315	2008	$1,500	15	3	3	High
34_30FE	Fire Equipment	Air Cylinder:316	2010	$1,500	15	3	3	High
35_104FE	Fire Equipment	Air Cylinder:317	2011	$1,500	15	3	3	High
36_48FE	Fire Equipment	Air Cylinder:318	2012	$1,500	15	3	3	High
37_107FE	Fire Equipment	Air Cylinder:319	2013	$1,500	15	3	3	High
38_15FE	Fire Equipment	Air Cylinder:320	2007	$1,500	15	3	3	High
39_99FE	Fire Equipment	Air Cylinder:323	2007	$1,500	15	3	3	High
40_31FE	Fire Equipment	Air Cylinder:334	2007	$1,500	15	3	3	High
41_37FE	Fire Equipment	Air Cylinder:335	2005	$1,500	15	3	3	High
42_79FE	Fire Equipment	Air Cylinder:336	2007	$1,500	15	3	3	High
43_107FE	Fire Equipment	Air Cylinder:337	2006	$1,500	15	3	3	High
44_55FE	Fire Equipment	Air Cylinder:339	2006	$1,500	15	3	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
45_27FE	Fire Equipment	Air Cylinder:340	2007	$1,500	15	3	3	High
46_91FE	Fire Equipment	Air Cylinder:341	2008	$1,500	15	3	3	High
47_55FE	Fire Equipment	Air Cylinder:342	2009	$1,500	15	3	3	High
48_109FE	Fire Equipment	Air Cylinder:343	2010	$1,500	15	3	3	High
49_104FE	Fire Equipment	Air Cylinder:344	2011	$1,500	15	3	3	High
50_57FE	Fire Equipment	Air Cylinder:345	2012	$1,500	15	3	3	High
51_94FE	Fire Equipment	Air Cylinder:346	2013	$1,500	15	3	3	High
52_95FE	Fire Equipment	Air Cylinder:347	2014	$1,500	15	3	3	High
53_40FE	Fire Equipment	Air Cylinder:348	2015	$1,500	15	3	3	High
54_31FE	Fire Equipment	Air Cylinder:349	2011	$1,500	15	3	3	High
55_41FE	Fire Equipment	Air Cylinder:350	2011	$1,500	15	3	3	High
56_58FE	Fire Equipment	Air Cylinder:351	2010	$1,500	15	3	3	High
57_105FE	Fire Equipment	Air Cylinder:352	2011	$1,500	15	3	3	High
58_88FE	Fire Equipment	Air Cylinder:353	2012	$1,500	15	3	3	High
59_35FE	Fire Equipment	Air Cylinder:354	2012	$1,500	15	3	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
60_57FE	Fire Equipment	Air Cylinder:355	2013	$1,500	15	3	3	High
61_17FE	Fire Equipment	Air Cylinder:356	2014	$1,500	15	3	3	High
62_96FE	Fire Equipment	Air Cylinder:357	2015	$1,500	15	3	3	High
63_48FE	Fire Equipment	Air Cylinder:358	2016	$1,500	15	3	3	High
64_106FE	Fire Equipment	Air Cylinder:359	2017	$1,500	15	3	3	High
65_4FE	Fire Equipment	Air Cylinder:360	2018	$1,500	15	3	3	High
66_21FE	Fire Equipment	Bunker Gear #317 907001148 907001150	2009	$3,000	10	1	1	Very High
67_60FE	Fire Equipment	Bunker Gear #395 1307006351 1104007407	2009	$3,000	10	1	1	Very High
68_80FE	Fire Equipment	Bunker Gear #376 1104007399 3707960	2009	$3,000	10	1	1	Very High
69_51FE	Fire Equipment	Bunker Gear #386 1104007401 907001149	2009	$3,000	10	1	1	Very High
71_102FE	Fire Equipment	Bunker Gear #308	2011	$3,000	10	3	3	High
72_58FE	Fire Equipment	Bunker Gear #378 1104007403 1104007408	2011	$3,000	10	3	3	High
FE_122_1	Fire Equipment	Bunker Gear #351	2009	$3,000	10	1	1	Very High
77_9FVT	Fire Equipment	Ultralight MMR 2000	2004	$7,450	15	3	3	High
78_16FVT	Fire Equipment	Ultralight MMR 2000	2004	$7,450	15	3	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
79_57FVT	Fire Equipment	Ultralight MMR 2000	2004	$7,450	15	3	3	High
80_30FVT	Fire Equipment	Ultralight MMR 2000	2004	$7,450	15	3	3	High
69_41FVT	Fire Equipment	Ultralight MMR 2000	2005	$7,450	15	4	4	Medium
74_27FVT	Fire Equipment	Fire Hawk 2002	2005	$7,450	15	4	4	Medium
75_43FVT	Fire Equipment	Ultralight MMR 2000	2005	$7,450	15	4	4	Medium
76_67FVT	Fire Equipment	Ultralight MMR 2000	2005	$7,450	15	4	4	Medium
59_56FVT	Fire Equipment	Fire Hawk 2002	2006	$7,450	15	4	4	Medium
62_23FVT	Fire Equipment	Fire Hawk 2002	2006	$7,450	15	4	4	Medium
67_99FVT	Fire Equipment	Fire Hawk 2002	2006	$7,450	15	4	4	Medium
60_51FVT	Fire Equipment	Fire Hawk 2002	2007	$7,450	15	4	4	Medium
61_92FVT	Fire Equipment	Fire Hawk 2002	2007	$7,450	15	4	4	Medium
68_20FVT	Fire Equipment	Ultralight MMR 2000	2007	$7,450	15	4	4	Medium
70_84FVT	Fire Equipment	Fire Hawk 2002	2007	$7,450	15	4	4	Medium
71_45FVT	Fire Equipment	Fire Hawk 2002	2007	$7,450	15	4	4	Medium
72_79FVT	Fire Equipment	Fire Hawk 2002	2007	$7,450	15	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
73_30FVT	Fire Equipment	Fire Hawk 2002	2007	$7,450	15	4	4	Medium
63_86FVT	Fire Equipment	Fire Hawk M7	2013	$7,450	15	4	4	Medium
64_69FVT	Fire Equipment	Fire Hawk M7	2013	$7,450	15	4	4	Medium
65_29FVT	Fire Equipment	Fire Hawk M7	2013	$7,450	15	4	4	Medium
66_17FVT	Fire Equipment	Fire Hawk M7	2013	$7,450	15	4	4	Medium
67_17FVT	Fire Equipment	SCBA Masks	2005	$8,250	15	4	4	Medium
FE_Bas_1	Fire Equipment	Base Radio		$5,000		3	3	High
FE_Bas_2	Fire Equipment	Base Radio County		$5,000		3	3	High
FE_Ant_3	Fire Equipment	Antennae Roof		$600		3	3	High
FE_Ant_4	Fire Equipment	Antennae Tower		$11,400		3	3	High
FE_Ant_5	Fire Equipment	Antennae		$2,000		3	3	High
FE_Pan_6	Fire Equipment	Panda Vox Recorder Radio		$1,400		3	3	High
FE_Pan_7	Fire Equipment	Panda Vox Recorder		$5,700		3	3	High
FE_Blu_8	Fire Equipment	Blue tooth Headset		$2,200		3	3	High
8_94FE	Fire Equipment	Thermal Imaging Camera	2017	$6,000	10		3	High

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
300	Sidewalk	Watson Road Sidewalk	1990	$64,350	20	5	5	Medium
301	Sidewalk	Arkell Road Sidewalk	1990	$39,325	20	3	3	Medium
303	Sidewalk	Church Street	2000	$12,012	20	5	5	Medium
307	Sidewalk	Victoria Street	2000	$25,311	20	5	5	Medium
304	Sidewalk	Brock Road Sidewalk	2001	$131,131	20	4	4	Medium
305	Sidewalk	Badenoch Rd Sidewalk	2001	$58,773	20	5	5	Medium
306	Sidewalk	Watson Road Sidewalk	2012	$64,922	20	5	5	Medium
308	Sidewalk	Calfass Road		$11,440	20	5	5	Medium
309	Sidewalk	Queen Street		$128,700	20	5	5	Medium
310	Sidewalk	Main Street		$9,295	20	3	3	Medium
SL 286_F	Street Light Fixture	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$300	20	4	5	Medium
SL 287_F	Street Light Fixture	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$300	20	4	5	Medium
SL 293_F	Street Light Fixture	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$300	20	4	5	Medium
SL 288_F	Street Light Fixture	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$300	20	4	5	Medium
SL 289_F	Street Light Fixture	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$300	20	4	5	Medium
SL 290_F	Street Light Fixture	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$300	20	4	5	Medium
SL 291_F	Street Light Fixture	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$300	20	4	5	Medium
SL 292_F	Street Light Fixture	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$300	20	4	5	Medium
SL 311_F	Street Light Fixture	Wallpack Type 5 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 312_F	Street Light Fixture	Wallpack Type 5 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 313_F	Street Light Fixture	Wallpack Type 5 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 308_F	Street Light Fixture	Wallpack HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 309_F	Street Light Fixture	Wallpack HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 310_F	Street Light Fixture	Wallpack HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 314_F	Street Light Fixture	Wallpack HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 315_F	Street Light Fixture	Wallpack HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 318_F	Street Light Fixture	Wallpack HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 261_F	Street Light Fixture	Floodlight Type 1 HPS Lampheight: 25 Location: Overhead Concrete		$300	20	4	5	Medium
SL 262_F	Street Light Fixture	Floodlight Type 1 HPS Lampheight: 25 Location: Overhead Concrete		$300	20	4	5	Medium
SL 307_F	Street Light Fixture	Floodlight Type 2 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 305_F	Street Light Fixture	Floodlight LED Lampheight: 15 Location: Underground		$300	20	4	5	Medium
SL 306_F	Street Light Fixture	Floodlight LED Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 260_F	Street Light Fixture	Sentinel Type 1 HPS Lampheight: 25 Location: Overhead Concrete		$300	20	4	5	Medium
SL 317_F	Street Light Fixture	Sentinel Type 1 HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 166_F	Street Light Fixture	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$300	20	4	5	Medium
SL 167_F	Street Light Fixture	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$300	20	4	5	Medium
SL 168_F	Street Light Fixture	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$300	20	4	5	Medium
SL 169_F	Street Light Fixture	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$300	20	4	5	Medium
SL 170_F	Street Light Fixture	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$300	20	4	5	Medium
SL 171_F	Street Light Fixture	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$300	20	4	5	Medium
SL 150_F	Street Light Fixture	Decorative - Top Hat Type 1 HPS Lampheight: 20 Location: Underground Concrete		$300	20	4	5	Medium
SL 128_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 129_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 130_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 131_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 132_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 133_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 134_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 135_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 136_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 137_F	Street Light Fixture	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 138_F	Street Light Fixture	Decorative - Acorn Post Top Type 2 HPS Lampheight: 12 Location: Underground Metal		$300	20	4	5	Medium
SL 304_F	Street Light Fixture	Cobrahead Type 2 HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 316_F	Street Light Fixture	Cobrahead Type 2 HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 62_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 63_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 64_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 65_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 66_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 67_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 68_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 69_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 278_F	Street Light Fixture	Wallpack Type 1 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 279_F	Street Light Fixture	Wallpack Type 1 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 281_F	Street Light Fixture	Wallpack Type 1 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 282_F	Street Light Fixture	Wallpack Type 1 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 280_F	Street Light Fixture	Wallpack Type 2 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 283_F	Street Light Fixture	Wallpack Type 2 HPS Lampheight: 20 Location: Underground		$300	20	4	5	Medium
SL 284_F	Street Light Fixture	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$300	20	4	5	Medium
SL 285_F	Street Light Fixture	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$300	20	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 70_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 71_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 72_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 73_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 74_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 75_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 76_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 77_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 78_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 79_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 80_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 81_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 82_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 83_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 84_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 85_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 86_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 87_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 88_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 89_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 90_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 91_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 92_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 93_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 94_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 95_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 96_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 97_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 98_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 99_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 100_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 101_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 102_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 103_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 104_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 105_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 106_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 107_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 108_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 109_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 110_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 111_F	Street Light Fixture	Cobrahead HPS Lampheight: 35 Location: Overhead Wood		$300	20	3	5	Medium
SL 112_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 139_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 140_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 141_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 142_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 143_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 144_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 145_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 146_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 147_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 148_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 149_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 151_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 152_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 153_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 154_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 155_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 156_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 157_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 158_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 159_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 160_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 161_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 162_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 163_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 164_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 165_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 172_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 182_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 183_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 184_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 185_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 186_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 187_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 188_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 189_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 190_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 191_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 192_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 193_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 194_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 195_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 196_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 197_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 198_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 199_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 200_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 201_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 202_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 203_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 204_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 205_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 206_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 207_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 208_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 209_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 210_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 211_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 212_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 213_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 214_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 215_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 216_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 217_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 218_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 219_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 220_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 221_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 222_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 223_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	3	5	Medium
SL 224_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 225_F	Street Light Fixture	Cobrahead HPS Lampheight: 20 Location: Underground Wood		$300	20	4	5	Medium
SL 226_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	5	5	Medium
SL 227_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$300	20	4	5	Medium
SL 228_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 229_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 230_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 231_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 232_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 233_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 234_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 235_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 236_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 237_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 238_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 239_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 240_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 241_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 242_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 243_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 244_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 245_F	Street Light Fixture	Cobrahead HPS Lampheight: 30 Location: Overhead Wood		$300	20	5	5	Medium
SL 246_F	Street Light Fixture	Cobrahead HPS Lampheight: 30 Location: Overhead Wood		$300	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 247_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 248_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 249_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 250_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 251_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 252_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 253_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 254_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 255_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 256_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 257_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 258_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 259_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 263_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 264_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 265_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 266_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 267_F	Street Light Fixture	Cobrahead HPS Lampheight: 20 Location: Overhead Wood		$300	20	5	5	Medium
SL 268_F	Street Light Fixture	Cobrahead HPS Lampheight: 30 Location: Overhead Wood		$300	20	5	5	Medium
SL 269_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 270_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 271_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 272_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 273_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 274_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 275_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 276_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 277_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 294_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 295_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 296_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	4	5	Medium
SL 297_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 298_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 299_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 300_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 301_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 302_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	3	5	Medium
SL 303_F	Street Light Fixture	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$300	20	5	5	Medium
SL 1_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 2_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 3_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 4_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 5_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 6_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 7_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 8_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 9_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 10_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 11_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 12_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 13_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 14_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 15_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 16_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 17_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 18_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 19_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 20_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 21_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 22_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 23_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 24_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 25_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 26_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 27_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 28_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 29_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 30_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 31_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 32_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 33_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 34_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 35_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 55_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 56_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 57_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 58_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 59_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 60_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 61_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 36_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 37_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 38_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 39_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 40_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 41_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 42_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 43_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 44_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 45_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 46_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 47_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 48_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 49_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 50_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 51_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 52_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 53_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 54_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 113_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 114_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 115_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 116_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 117_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 118_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 119_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 120_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 121_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 122_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 123_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 124_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium
SL 125_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	4	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 126_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	5	5	Medium
SL 127_F	Street Light Fixture	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$300	20	3	5	Medium
SL 278_P	Street Light Pole	Wallpack Type 1 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 279_P	Street Light Pole	Wallpack Type 1 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 281_P	Street Light Pole	Wallpack Type 1 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 282_P	Street Light Pole	Wallpack Type 1 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 280_P	Street Light Pole	Wallpack Type 2 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 283_P	Street Light Pole	Wallpack Type 2 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 284_P	Street Light Pole	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$1,304	20	4	4	Medium
SL 285_P	Street Light Pole	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$1,304	20	4	4	Medium
SL 286_P	Street Light Pole	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$1,304	20	4	4	Medium
SL 287_P	Street Light Pole	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$1,304	20	4	4	Medium
SL 293_P	Street Light Pole	Wallpack Type 3 HPS Lampheight: 10 Location: Underground		$1,304	20	4	4	Medium
SL 288_P	Street Light Pole	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$1,304	20	4	4	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 289_P	Street Light Pole	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$1,304	20	4	4	Medium
SL 290_P	Street Light Pole	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$1,304	20	4	4	Medium
SL 291_P	Street Light Pole	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$1,304	20	4	4	Medium
SL 292_P	Street Light Pole	Wallpack Type 4 HPS Lampheight: 6 Location: Underground		$1,304	20	4	4	Medium
SL 311_P	Street Light Pole	Wallpack Type 5 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 312_P	Street Light Pole	Wallpack Type 5 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 313_P	Street Light Pole	Wallpack Type 5 HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 308_P	Street Light Pole	Wallpack HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 309_P	Street Light Pole	Wallpack HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 310_P	Street Light Pole	Wallpack HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 314_P	Street Light Pole	Wallpack HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 315_P	Street Light Pole	Wallpack HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 318_P	Street Light Pole	Wallpack HPS Lampheight: 20 Location: Underground		$1,304	20	4	4	Medium
SL 261_P	Street Light Pole	Floodlight Type 1 HPS Lampheight: 25 Location: Overhead Concrete		$4,027	20	4	4	Medium
SL 262_P	Street Light Pole	Floodlight Type 1 HPS Lampheight: 25 Location: Overhead Concrete		$4,027	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 307_P	Street Light Pole	Floodlight Type 2 HPS Lampheight: 20 Location: Underground		$4,027	20	4	4	Medium
SL 305_P	Street Light Pole	Floodlight LED Lampheight: 15 Location: Underground		$4,027	20	4	4	Medium
SL 306_P	Street Light Pole	Floodlight LED Lampheight: 20 Location: Underground		$4,027	20	4	4	Medium
SL 260_P	Street Light Pole	Sentinel Type 1 HPS Lampheight: 25 Location: Overhead Concrete		$1,304	20	4	4	Medium
SL 317_P	Street Light Pole	Sentinel Type 1 HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 166_P	Street Light Pole	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$4,027	20	4	4	Medium
SL 167_P	Street Light Pole	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$4,027	20	4	4	Medium
SL 168_P	Street Light Pole	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$4,027	20	4	4	Medium
SL 169_P	Street Light Pole	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$4,027	20	4	4	Medium
SL 170_P	Street Light Pole	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$4,027	20	4	4	Medium
SL 171_P	Street Light Pole	Decorative - Box Top Type 1 HPS Lampheight: 15 Location: Underground Metal		$4,027	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 150_P	Street Light Pole	Decorative - Top Hat Type 1 HPS Lampheight: 20 Location: Underground Concrete		$4,027	20	4	4	Medium
SL 128_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 129_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 130_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 131_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 132_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 133_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 134_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 135_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 136_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 137_P	Street Light Pole	Decorative - Acorn Post Top Type 1 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 138_P	Street Light Pole	Decorative - Acorn Post Top Type 2 HPS Lampheight: 12 Location: Underground Metal		$4,027	20	4	4	Medium
SL 304_P	Street Light Pole	Cobrahead Type 2 HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 316_P	Street Light Pole	Cobrahead Type 2 HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 62_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 63_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 64_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 65_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 66_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 67_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 68_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 69_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 70_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 71_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 72_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 73_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 74_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 75_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 76_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 77_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 78_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 79_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 80_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 81_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 82_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 83_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 84_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 85_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 86_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 87_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 88_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 89_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 90_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 91_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 92_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 93_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 94_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 95_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 96_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 97_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 98_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 99_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 100_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 101_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 102_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 103_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 104_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 105_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 106_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 107_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 108_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 109_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 110_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 111_P	Street Light Pole	Cobrahead HPS Lampheight: 35 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 112_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 139_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 140_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 141_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 142_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 143_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 144_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 145_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 146_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 147_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 148_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 149_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 151_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 152_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 153_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 154_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 155_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 156_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 157_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 158_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
SL 159_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 160_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 161_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 162_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 163_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 164_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 165_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 172_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 182_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 183_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 184_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 185_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 186_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 187_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 188_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 189_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 190_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 191_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 192_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 193_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 194_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 195_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 196_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 197_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 198_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 199_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 200_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 201_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 202_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 203_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 204_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 205_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 206_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 207_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 208_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 209_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 210_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 211_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 212_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 213_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 214_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 215_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 216_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 217_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 218_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 219_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 220_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 221_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 222_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 223_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	3	3	Medium
SL 224_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 225_P	Street Light Pole	Cobrahead HPS Lampheight: 20 Location: Underground Wood		$1,304	20	4	4	Medium
SL 226_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	5	5	Medium
SL 227_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Underground Concrete		$1,304	20	4	4	Medium
SL 228_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 229_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 230_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 231_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 232_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 233_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 234_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 235_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 236_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 237_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 238_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 239_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 240_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 241_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 242_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 243_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 244_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 245_P	Street Light Pole	Cobrahead HPS Lampheight: 30 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 246_P	Street Light Pole	Cobrahead HPS Lampheight: 30 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 247_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 248_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 249_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 250_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 251_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 252_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 253_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 254_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 255_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 256_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 257_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 258_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 259_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 263_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 264_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 265_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 266_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 267_P	Street Light Pole	Cobrahead HPS Lampheight: 20 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 268_P	Street Light Pole	Cobrahead HPS Lampheight: 30 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 269_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 270_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 271_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 272_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 273_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 274_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 275_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 276_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 277_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 294_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 295_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 296_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	4	4	Medium
SL 297_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 298_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 299_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 300_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 301_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 302_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	3	3	Medium
SL 303_P	Street Light Pole	Cobrahead HPS Lampheight: 25 Location: Overhead Wood		$1,304	20	5	5	Medium
SL 1_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 2_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 3_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 4_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 5_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 6_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 7_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 8_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 9_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 10_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 11_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 12_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 13_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 14_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 15_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 16_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 17_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 18_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 1 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 19_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 20_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 21_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 22_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 23_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 24_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 25_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 26_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 27_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 28_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 29_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 30_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 31_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 32_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 33_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 34_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 35_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 55_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 56_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 57_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 58_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 59_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 60_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 61_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 3 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 36_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 37_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 38_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 39_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 40_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 41_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 42_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 43_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 44_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 45_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 46_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 47_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 48_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 49_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 50_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 51_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 52_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 53_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 54_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 113_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 114_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 115_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 116_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 117_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
SL 118_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 119_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 120_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 121_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 122_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 123_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium
SL 124_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 125_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	4	4	Medium
SL 126_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	5	5	Medium
SL 127_P	Street Light Pole	Decorative - Victorian Lantern Post Top Type 2 HPS Lampheight: 14 Location: Underground Metal		$4,027	30	3	3	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
12001	Storm Water Management Ponds	Boreham Drive SWM Pond	1999	$13,860	50	4	4	Medium
12001 - 1	Storm Water Management Ponds	Boreham Drive SWM Tail Wall	1999	$2,000	50	4	4	Medium
12001 - 2	Storm Water Management Ponds	Boreham Drive SWM Pond Enclosure	1999	$7,860	50	4	4	Medium
12001 - 3	Storm Water Management Ponds	Boreham Drive SWM Outlet Device (Hicken Bottom)	1999	$2,000	20	4	4	Medium
12001 - 4	Storm Water Management Ponds	Boreham Drive SWM Headwall	1999	$2,000	50	4	4	Medium
12002	Storm Water Management Ponds	Daymond Drive SWM Pond	2005	$165,756	50	4	4	Medium
12002 - 1	Storm Water Management Ponds	Daymond Drive SWM Tail Wall	2005	$2,000	50	4	4	Medium
12002 - 2	Storm Water Management Ponds	Daymond Drive SWM Pond Enclosure	2005	$159,756	50	4	4	Medium
12002 - 3	Storm Water Management Ponds	Daymond Drive SWM Outlet Device (Hicken Bottom)	2005	$2,000	20	4	4	Medium
12002 - 4	Storm Water Management Ponds	Daymond Drive SWM Headwall	2005	$2,000	50	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
12003	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 6	2007	$258,420	50	4	4	Medium
12003 - 1	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 6 Tail Wall	2007	$2,000	50	4	4	Medium
12003 - 2	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 6 Pond Enclosure	2007	$252,420	50	4	4	Medium
12003 - 3	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 6 Outlet Device (Hicken Bottom)	2007	$2,000	20	4	4	Medium
12003 - 4	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 6 Headwall	2007	$2,000	50	4	4	Medium
12004	Storm Water Management Ponds	Kerr Crescent SWM Pond	1988	$150,000	50	1	1	High
12004 - 1	Storm Water Management Ponds	Kerr Crescent SWM Tail Wall	1988	$2,000	50	4	4	Medium
12004 - 2	Storm Water Management Ponds	Kerr Crescent SWM Pond Enclosure	1988	$144,000	50	4	4	Medium
12004 - 3	Storm Water Management Ponds	Kerr Crescent SWM Outlet Device (Hicken Bottom)	1988	$2,000	20	4	4	Medium
12004 - 4	Storm Water Management Ponds	Kerr Crescent SWM Headwall	1988	$2,000	50	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
12005	Storm Water Management Ponds	Telfer Glen SWM Pond	1990	$32,644	50	4	4	Medium
12005 - 1	Storm Water Management Ponds	Telfer Glen SWM Pond Tail Wall	1990	$2,000	50	4	4	Medium
12005 - 2	Storm Water Management Ponds	Telfer Glen SWM Pond Pond Enclosure	1990	$26,644	50	4	4	Medium
12005 - 3	Storm Water Management Ponds	Telfer Glen SWM Pond Outlet Device (Hicken Bottom)	1990	$2,000	20	4	4	Medium
12005 - 4	Storm Water Management Ponds	Telfer Glen SWM Pond Headwall	1990	$2,000	50	4	4	Medium
12006	Storm Water Management Ponds	Bridle Path SWM Ponds	1990	$134,146	50	4	4	Medium
12006 - 1	Storm Water Management Ponds	Bridle Path SWM Ponds Tail Wall	1990	$2,000	50	4	4	Medium
12006 - 2	Storm Water Management Ponds	Bridle Path SWM Ponds Pond Enclosure	1990	$128,146	50	4	4	Medium
12006 - 3	Storm Water Management Ponds	Bridle Path SWM Ponds Outlet Device (Hicken Bottom)	1990	$2,000	20	4	4	Medium
12006 - 4	Storm Water Management Ponds	Bridle Path SWM Ponds Headwall	1990	$2,000	50	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
12007	Storm Water Management Ponds	Carriage Lane SWM Pond	2000	$85,488	50	1	1	High
12007 - 1	Storm Water Management Ponds	Carriage Lane SWM Tail Wall	2000	$2,000	50	4	4	Medium
12007 - 2	Storm Water Management Ponds	Carriage Lane SWM Pond Enclosure	2000	$79,488	50	4	4	Medium
12007 - 3	Storm Water Management Ponds	Carriage Lane SWM Outlet Device (Hicken Bottom)	2000	$2,000	20	4	4	Medium
12007 - 4	Storm Water Management Ponds	Carriage Lane SWM Headwall	2000	$2,000	50	4	4	Medium
12008	Storm Water Management Ponds	Aberfoyle Business Park SWM Pond Block 3	1995	$73,227	50	5	5	Medium
12008 - 1	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 3 Tail Wall	1995	$2,000	50	5	5	Medium
12008 - 2	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 3 Pond Enclosure	1995	$67,227	50	5	5	Medium
12008 - 3	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 3 Outlet Device (Hicken Bottom)	1995	$2,000	20	5	5	Medium
12008 - 4	Storm Water Management Ponds	Aberfoyle Business Park SWM Block 3 Headwall	1995	$2,000	50	5	5	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
12009	Storm Water Management Ponds	Carroll Pond Cell 1 Pond	2011	$9,262	50	4	4	Medium
12009 - 1	Storm Water Management Ponds	Carroll Pond Cell 1 Tail Wall	2011	$2,000	50	4	4	Medium
12009 - 2	Storm Water Management Ponds	Carroll Pond Cell 1 Pond Enclosure	2011	$3,262	50	4	4	Medium
12009 - 3	Storm Water Management Ponds	Carroll Pond Cell 1 Outlet Device (Hicken Bottom)	2011	$2,000	20	4	4	Medium
12009 - 4	Storm Water Management Ponds	Carroll Pond Cell 1 Headwall	2011	$2,000	50	4	4	Medium
12010	Storm Water Management Ponds	Carroll Pond Cell 2 Pond	2010	$8,870	50	4	4	Medium
12010 - 1	Storm Water Management Ponds	Carroll Pond Cell 2 Tail Wall	2010	$2,000	50	4	4	Medium
12010 - 2	Storm Water Management Ponds	Carroll Pond Cell 2 Pond Enclosure	2010	$2,870	50	4	4	Medium
12010 - 3	Storm Water Management Ponds	Carroll Pond Cell 2 Outlet Device (Hicken Bottom)	2010	$2,000	20	4	4	Medium
12010 - 4	Storm Water Management Ponds	Carroll Pond Cell 2 Headwall	2010	$2,000	50	4	4	Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
12011	Storm Water Management Ponds	Carroll Pond Cell 3 Pond	2010	$4,435	50	4	4	Medium
12011 - 1	Storm Water Management Ponds	Carroll Pond Cell 3 Tail Wall	2010	$2,000	50	4	4	Medium
12011 - 2	Storm Water Management Ponds	Carroll Pond Cell 3 Pond Enclosure	2010	-$1,565	50	4	4	Medium
12011 - 3	Storm Water Management Ponds	Carroll Pond Cell 3 Outlet Device (Hicken Bottom)	2010	$2,000	20	4	4	Medium
12011 - 4	Storm Water Management Ponds	Carroll Pond Cell 3 Headwall	2010	$2,000	50	4	4	Medium
12012	Storm Water Management Ponds	Fox Run Drive SWM Pond 2		$165,756	50	3	3	High
12012 - 1	Storm Water Management Ponds	Fox Run Drive SWM 2 Tail Wall		$2,000	50	3	3	High
12012 - 2	Storm Water Management Ponds	Fox Run Drive SWM 2 Pond Enclosure		$159,756	50	3	3	High
12012 - 3	Storm Water Management Ponds	Fox Run Drive SWM 2 Outlet Device (Hicken Bottom)		$2,000	20	3	3	High
12012 - 4	Storm Water Management Ponds	Fox Run Drive SWM 2 Headwall		$2,000	50	3	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
12013	Storm Water Management Ponds	Fox Run Drive SWM Pond 1		$165,000	50	1	1	High
12013 - 1	Storm Water Management Ponds	Fox Run Drive SWM 1 Tail Wall		$2,000	50	1	1	High
12013 - 2	Storm Water Management Ponds	Fox Run Drive SWM 1 Pond Enclosure		$159,000	50	1	1	High
12013 - 3	Storm Water Management Ponds	Fox Run Drive SWM 1 Outlet Device (Hicken Bottom)		$2,000	20	1	1	High
12013 - 4	Storm Water Management Ponds	Fox Run Drive SWM 1 Headwall		$2,000	50	1	1	High
12014	Storm Water Management Ponds	Morriston Pond		$12,418	50	3	3	High
12014 - 1	Storm Water Management Ponds	Morriston Pond Tail Wall		$2,000	50	3	3	High
12014 - 2	Storm Water Management Ponds	Morriston Pond Pond Enclosure		$6,418	50	3	3	High
12014 - 3	Storm Water Management Ponds	Morriston Pond Outlet Device (Hicken Bottom)		$2,000	20	3	3	High
12014 - 4	Storm Water Management Ponds	Morriston Pond Headwall		$2,000	50	3	3	High

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
12015	Storm Water Management Ponds	Morriston Park Pond		$165,756	50	3	3	High
12015 - 1	Storm Water Management Ponds	Morriston Park Pond Tail Wall		$2,000	50	3	3	High
12015 - 2	Storm Water Management Ponds	Morriston Park Pond Pond Enclosure		$159,756	50	3	3	High
12015 - 3	Storm Water Management Ponds	Morriston Park Pond Outlet Device (Hicken Bottom)		$2,000	20	3	3	High
12015 - 4	Storm Water Management Ponds	Morriston Park Pond Headwall		$2,000	50	3	3	High
SW_201_SURFACE	Storm Sewer	Storm Sewer Carriage Lane	2000	$104,428	50			Medium
18_SWO_201_SURFACE	Storm Sewer Outflow	Carriage Lane Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
19_SWO_201_SURFACE	Storm Sewer Outflow	Carriage Lane Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
20_SWO_201_SURFACE	Storm Sewer Outflow	Carriage Lane Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
21_SWO_201_SURFACE	Storm Sewer Outflow	Carriage Lane Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
22_SWO_201_SURFACE	Storm Sewer Outflow	Carriage Lane Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
23_SWO_201_SURFACE	Storm Sewer Outflow	Carriage Lane Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
24_SWO_201 _SURFACE	Storm Sewer Outflow	Carriage Lane Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
18 _ SWI_201_SU RFACE	Storm Sewer Inlet	Carriage Lane Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
19 _ SWI_201_SU RFACE	Storm Sewer Inlet	Carriage Lane Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
20 _ SWI_201_SU RFACE	Storm Sewer Inlet	Carriage Lane Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
21 _ SWI_201_SU RFACE	Storm Sewer Inlet	Carriage Lane Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
22 _ SWI_201_SU RFACE	Storm Sewer Inlet	Carriage Lane Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
23 _ SWI_201_SU RFACE	Storm Sewer Inlet	Carriage Lane Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
24 _ SWI_201_SU RFACE	Storm Sewer Inlet	Carriage Lane Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
SW_202_SUR FACE	Storm Sewer	Storm Sewer Cassin Court	2007	$13,487	50			Medium
1_SWO_202_ SURFACE	Storm Sewer Outflow	Cassin Court Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
2_SWO_202_ SURFACE	Storm Sewer Outflow	Cassin Court Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
3_SWO_202_SURFACE	Storm Sewer Outflow	Cassin Court Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
5_SWO_202_SURFACE	Storm Sewer Outflow	Cassin Court Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
6_SWO_202_SURFACE	Storm Sewer Outflow	Cassin Court Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
8_SWO_202_SURFACE	Storm Sewer Outflow	Cassin Court Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
9_SWO_202_SURFACE	Storm Sewer Outflow	Cassin Court Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
10_SWO_202_SURFACE	Storm Sewer Outflow	Cassin Court Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
1 _ SWI_202_SURFACE	Storm Sewer Inlet	Cassin Court Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
2 _ SWI_202_SURFACE	Storm Sewer Inlet	Cassin Court Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
3 _ SWI_202_SURFACE	Storm Sewer Inlet	Cassin Court Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
5 _ SWI_202_SURFACE	Storm Sewer Inlet	Cassin Court Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
6 _ SWI_202_SURFACE	Storm Sewer Inlet	Cassin Court Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
8 _ SWI_202_SURFACE	Storm Sewer Inlet	Cassin Court Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
9 _ SWI_202_SURFACE	Storm Sewer Inlet	Cassin Court Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
10 _ SWI_202_SURFACE	Storm Sewer Inlet	Cassin Court Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
SW_28_SURFACE	Storm Sewer	Storm Sewer Victoria Street And Church Street	2000	$28,406	50			Medium
42_SWO_28_SURFACE	Storm Sewer Outflow	Victoria Street And Church Street Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
43_SWO_28_SURFACE	Storm Sewer Outflow	Victoria Street And Church Street Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
44_SWO_28_SURFACE	Storm Sewer Outflow	Victoria Street And Church Street Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
45_SWO_28_SURFACE	Storm Sewer Outflow	Victoria Street And Church Street Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
46_SWO_28_SURFACE	Storm Sewer Outflow	Victoria Street And Church Street Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
42 _ SWI_28_SURFACE	Storm Sewer Inlet	Victoria Street And Church Street Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
43 _ SWI_28_SURFACE	Storm Sewer Inlet	Victoria Street And Church Street Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
44 _ SWI_28_SURFACE	Storm Sewer Inlet	Victoria Street And Church Street Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
45 _ SWI_28_SURFACE	Storm Sewer Inlet	Victoria Street And Church Street Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
46 _ SWI_28_SURFACE	Storm Sewer Inlet	Victoria Street And Church Street Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
SW_51_SURFACE	Storm Sewer	Storm Sewer Old Brock Road	2000	$407,604	50			Medium
36_SWO_51_SURFACE	Storm Sewer Outflow	Old Brock Road Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
37_SWO_51_SURFACE	Storm Sewer Outflow	Old Brock Road Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
38_SWO_51_SURFACE	Storm Sewer Outflow	Old Brock Road Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
36 _ SWI_51_SURFACE	Storm Sewer Inlet	Old Brock Road Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
37 _ SWI_51_SURFACE	Storm Sewer Inlet	Old Brock Road Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
38 _ SWI_51_SURFACE	Storm Sewer Inlet	Old Brock Road Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
SW_46_SURFACE	Storm Sewer	Storm Sewer Gilmour Road	2007	$36,873	50			Medium
40_SWO_46_SURFACE	Storm Sewer Outflow	Gilmour Road Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
41_SWO_46_SURFACE	Storm Sewer Outflow	Gilmour Road Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
40 _ SWI_46_SURFACE	Storm Sewer Inlet	Gilmour Road Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
41 _ SWI_46_SURFACE	Storm Sewer Inlet	Gilmour Road Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
SW_203_SURFACE	Storm Sewer	Storm Sewer Daymond Drive	2007	$31,584	50			Medium
4_SWO_203_SURFACE	Storm Sewer Outflow	Daymond Drive Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
7_SWO_203_SURFACE	Storm Sewer Outflow	Daymond Drive Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
11_SWO_203_SURFACE	Storm Sewer Outflow	Daymond Drive Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
12_SWO_203_SURFACE	Storm Sewer Outflow	Daymond Drive Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
13_SWO_203_SURFACE	Storm Sewer Outflow	Daymond Drive Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
14_SWO_203_SURFACE	Storm Sewer Outflow	Daymond Drive Storm Sewer Storm Sewer Outflow	2007	$5,000	50			Medium
4 _ SWI_203_SURFACE	Storm Sewer Inlet	Daymond Drive Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
7 _ SWI_203_SURFACE	Storm Sewer Inlet	Daymond Drive Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
11 _ SWI_203_SURFACE	Storm Sewer Inlet	Daymond Drive Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
12 _ SWI_203_SURFACE	Storm Sewer Inlet	Daymond Drive Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
13 _ SWI_203_SURFACE	Storm Sewer Inlet	Daymond Drive Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
14 _ SWI_203_SURFACE	Storm Sewer Inlet	Daymond Drive Storm Sewer Storm Sewer Inlet	2007	$3,724	50			Medium
SW_205	Storm Sewer	Storm Sewer Fox Run Drive	2000	$34,422	50			Medium
15_SWO_205	Storm Sewer Outflow	Fox Run Drive Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
16_SWO_205	Storm Sewer Outflow	Fox Run Drive Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
15 _ SWI_205	Storm Sewer Inlet	Fox Run Drive Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
16 _ SWI_205	Storm Sewer Inlet	Fox Run Drive Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
SW_204_SURFACE	Storm Sewer	Storm Sewer Bridle Path	1990	$175,848	50			Medium
25_SWO_204_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
26_SWO_204_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
27_SWO_204_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
28_SWO_204_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
29_SWO_204_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
30_SWO_204_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
31_SWO_204_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
25 _ SWI_204_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
26 _ SWI_204_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
27 _ SWI_204_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
28 _ SWI_204_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
29 _ SWI_204_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
30 _ SWI_204_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
31 _ SWI_204_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
SW_185_SURFACE	Storm Sewer	Storm Sewer Bridle Path	1990	$59,269	50			Medium
32_SWO_185_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
33_SWO_185_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
34_SWO_185_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
35_SWO_185_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
47_SWO_185_SURFACE	Storm Sewer Outflow	Bridle Path Storm Sewer Storm Sewer Outflow	1990	$5,000	50			Medium
32 _ SWI_185_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
33 _ SWI_185_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
34 _ SWI_185_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
35 _ SWI_185_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
47 _ SWI_185_SURFACE	Storm Sewer Inlet	Bridle Path Storm Sewer Storm Sewer Inlet	1990	$3,724	50			Medium
SW_50_SURFACE	Storm Sewer	Storm Sewer Cockburn Street	2000	$18,328	50			Medium
39_SWO_50_SURFACE	Storm Sewer Outflow	Cockburn Street Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
39 _ SWI_50_SURFACE	Storm Sewer Inlet	Cockburn Street Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
SW_206	Storm Sewer	Storm Sewer Fox Run Drive	2000	$18,565	50			Medium

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
17_SWO_206	Storm Sewer Outflow	Fox Run Drive Storm Sewer Storm Sewer Outflow	2000	$5,000	50			Medium
17 _ SWI_206	Storm Sewer Inlet	Fox Run Drive Storm Sewer Storm Sewer Inlet	2000	$3,724	50			Medium
SW_27B	Storm Sewer	Storm Sewer Calfass Road	2016	$13,144	50			Medium
1_SWO_27B	Storm Sewer Outflow	Fox Run Drive Storm Sewer Storm Sewer Outflow	2016	$5,000	50			Medium
1_SWI_27B	Storm Sewer Inlet	Fox Run Drive Storm Sewer Storm Sewer Inlet	2016	$3,724	50			Medium
1__BP_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
2_BP_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
3_BP_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
4_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
5_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
6_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
7_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
8_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
9_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
10_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
11_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
12_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
13_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
14_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
15_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
16_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
17_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
18_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
19_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
20_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
21_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
22_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
23_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
24_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
25_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
26_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
27_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
28_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
29_ST_Spruce	StreetTree	Bridal Path Spruce	1998	$354	50			Low
1_ST_Spruce	StreetTree	Carriage Lane Spruce	2003	$354	50			Low
2_ST_Spruce	StreetTree	Carriage Lane Spruce	2003	$354	50			Low
3_ST_Spruce	StreetTree	Carriage Lane Spruce	2003	$354	50			Low
1_ST_Locust	StreetTree	Fox Run Drive Locust	1993	$354	50			Low
2_ST_Locust	StreetTree	Fox Run Drive Locust	1993	$354	50			Low
3_ST_Locust	StreetTree	Fox Run Drive Locust	1993	$354	50			Low
4_ST_Locust	StreetTree	Fox Run Drive Locust	1993	$354	50			Low
5_ST_Locust	StreetTree	Fox Run Drive Locust	1993	$354	50			Low
6_ST_Locust	StreetTree	Fox Run Drive Locust	1993	$354	50			Low
7_ST_Locust	StreetTree	Fox Run Drive Locust	1993	$354	50			Low
8_ST_Locust	StreetTree	Fox Run Drive Locust	1993	$354	50			Low
1_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
2_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
3_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
4_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
5_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
6_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
7_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
8_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low

Asset Number	**Asset Class**	**Description**	**Acquisition Date**	**Replacement Cost**	**L.E**	**Condition Index**	**Condition**	**Risk**
9_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
10_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
11_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
12_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
13_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
14_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
15_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
16_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
17_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
18_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
19_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
20_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
21_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
22_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
23_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
24_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
25_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
26_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
27_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
28_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
29_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
30_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
31_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
32_ST_AutumnB	StreetTree	Morriston Autum Brilliance	2016	$624	50			Low
1_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
2_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
3_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
4_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
5_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
6_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
7_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
8_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
9_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
10_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
11_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
12_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
13_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
14_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
15_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
16_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
17_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
18_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
19_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
20_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
21_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
22_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
23_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
24_ST_Flame	StreetTree	Morriston Flame	2016	$624	50			Low
1_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
2_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
3_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
4_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
5_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
6_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
7_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
8_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
9_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low

Asset Number	Asset Class	Description	Acquisition Date	Replacement Cost	L.E	Condition Index	Condition	Risk
10_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
11_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
12_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
13_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
14_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
15_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
16_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
17_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
18_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
19_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
20_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
21_ST_Picea_Pung	StreetTree	Morriston Picea Pungens	2016	$449	50			Low
1_ST_QM	StreetTree	Morriston Quercus macrocarpa	2016	$724	50			Low
2_ST_QM	StreetTree	Morriston Quercus macrocarpa	2016	$724	50			Low
3_ST_QM	StreetTree	Morriston Quercus macrocarpa	2016	$724	50			Low
4_ST_QM	StreetTree	Morriston Quercus macrocarpa	2016	$724	50			Low

20.6 Comments from the Public

-----Original Message-----

From: Allan Gregg [redacted]

Sent: Wednesday, February 6, 2019 11:54 AM

[redacted]

Subject: Township of Puslinch Asset Management Plan - Allan Comments

Good morning

Thank you for hosting the Public meeting last night. Compliments to You Mayor Seeley for setting and enforcing the way the meeting was to run. Thanks Jessica for the heads up about the meeting and Mathew for your follow up note.

It appeared that Gravel Roads has a separate project being considered at the direction of Council so I did not continue to question the Consultants last night.

However, I would like to restate my concerns with the proposed Puslinch Asset Management document as presented last night;

*   It appears that certain assumptions were made regarding gravel roads

o   "As per the proposed service level policy all gravel roads have been assumed to have a PCL score of 90. This assumption is based strictly off staff understanding of the gravel surface"   See 6.11 (Attached)

*   It appears that "the Township does NOT have a formal policy for documenting gravel road condition" See 6.10 (Attached)

*   It appears that Gravel Roads are deemed to be Good. See 7.4 Page 65 66 70 (Attached)

*   It appears that Carter Road has a "Acquisition date 2003, Replacement Year 2034, Replacement cost 328113.2899, Condition 4 with Risk High" see page 276 (Attached)

This data and lack of data along with the conditions of gravel roads in the Township leads me to believe that the value and the condition of the Gravel Roads in the document is over stated. If correct then the cost to the Township to bring the roads up to the stated value will cost the township more money and a need to restate the financials in the Puslinch Asset Management document as presented last night.

Further I have concerns with the UEM Proposed Level of Service: Gravel Roads See 5.2 (Attached) 1.With the lack of data, as stated by Consultant Wayne Wood, setting the criteria for consideration of "surface treatment including asphalt and/or reconstruction" is not based on facts 2.No other UEM Proposed Level of Service of Policy has the mandate of "if all of the following criteria are met"

It appears that the UEM Proposed Level of Service for Gravel Roads is written to be very restrictive to limit the Township to entertain surfacing gravel road. I would suggest that the criteria be removed from the proposal at this time. Pending the results of the Gravel Roads Project set by Council the criteria should be set at a later date.

Here are my requests;

Please

- Comment on my concerns
- Pass on this document to other council members
- Clarify what "Acquisition date 2003" for Carter Road means on page 276
- Add my comments to the Public Meeting recorded notes
- When completed please send me the Public Meeting notes
- Advise when the completed report will be ready for review and when it will go to council for final approval.
- Advise how I would get the details (Mandate, scope and timelines etc.) on the Mayor referenced Gravel Road Council directed project

In addition am I to email with Township Staff rather than You - not sure of the protocol- please advise.

Thank You.

Gregg

From: Margaret Hauwert [redacted]

Sent: Thursday, February 7, 2019 11:20 AM

To: Nina Lecic [redacted]

Subject: budget

Questions for capital budget

1. Why are the roads in such poor shape all of a sudden, have they not been properly maintained over the last couple years?

2. I do not want the township to borrow any money?

3. Has council looked into how many firefighters do we have and is it too much?

4. Has council looked into how many people are on the payroll and maybe it is too much?

These are some of my concerns after looking at recommendations by the asset manager presentation.

Margaret Hauwert

[redacted]

Attachment B

The Township of Puslinch Asset Management Policy

Purpose

An Asset Management Policy formalizes the Township of Puslinch commitment to asset management, aligns its asset management actions with strategic goals and objectives, and provides direction to guide Council and staff in carrying out its business. Such a policy will support the Township in focusing its infrastructure efforts on managing risks, addressing priorities, and meeting short and long-term needs within the bounds of possible funding.

Vision

The Township's vision is to proactively manage its assets to best serve the Township's objectives, including:

- Prioritizing the need for existing and future assets to effectively deliver services,
- Supporting sustainability and economic development, and
- Maintaining prudent financial planning and decision making.

Objectives

The objectives of this policy are to:

- Provide a consistent framework for implementing asset management throughout the Township in compliance with Regulation 588/17.
- Demonstrate transparent, accountable, and informed decision-making that considers the Township's strategic plans, budget, service levels and risks.

Strategic Alignment

The Township adopted in principle a Community Based Strategic Plan, a Master Fire Plan, a Parks and Recreation Master Plan, a Community Improvement Plan and an Asset Management Plan. These plans were designed to meet the legislative requirements and work together to achieve the Township's mission of providing innovation and excellence in service delivery. Spending requirements defined in the budgeting process and in long-term financial planning will reflect the objectives of these plans.

All of the Township's plans rely to some extent on the physical assets owned by the Township and the commitment of staff to ensure their strategic use. This includes the long-term maintenance, repair and replacement of existing assets along with the acquisition of new assets to meet the evolving needs of the Township.

Asset Management Planning therefore will not occur in isolation from other municipal goals, plans and policies.

Stakeholder Engagement

The Township recognizes the importance of stakeholder engagement as an integral component of a comprehensive Asset Management Plan. The Township fosters informed dialogue with all stakeholders by:

- Providing residents and other stakeholders served by the Township opportunities to provide input; and
- Coordinating Asset Management Planning with other infrastructure owning government agencies and bodies.

Guiding Principles

The Infrastructure for Jobs and Prosperity Act, 2015 establishes principles to guide Asset Management Planning. The Township will strive, where possible, to incorporate the following principles into decisions respecting infrastructure planning and investment:

- **Forward looking:** Take a long-term view while considering demographic and economic trends in the County.
- **Budgeting and planning:** Take into account any applicable budgets or fiscal plans.
- **Prioritizing:** Clearly identify infrastructure priorities which will drive investment decisions.
- **Economic development:** Promote economic competitiveness, productivity, job creation, and training opportunities.
- **Transparency:** Promote an open and transparent decision-making process through the sharing, posting or access to information subject to any restrictions or prohibitions on the collection, use or disclosure of information.
- **Consistency:** Ensure the delivery of core public services such as Roads, Infrastructure and Fire.
- **Environmentally conscious:** Consider the impact of infrastructure on the environment and climate change. Endeavour to make use of acceptable recycled aggregates.
- **Health and safety:** ensure that the health and safety of workers involved in the construction and maintenance of infrastructure assets is protected.
- **Community focused:** Consider the community benefits arising from an infrastructure project such as improvements to public space within the Township and promoting accessibility. The Township shall coordinate planning for asset management when municipal infrastructure assets connect or are interrelated with the County and neighboring Municipalities.

- **Innovation:** foster innovation by creating opportunities to make use of innovative technologies, services, and practices, particularly where doing so would utilize technology, techniques, and practices developed in Ontario.
- **Integration:** where relevant and appropriate, be mindful and consider the principles and content of non-binding provincial or municipal plans and strategies established under an Act or otherwise, in planning and making decisions surrounding the infrastructure that supports them.

Community Planning

Asset Management Planning will align with the County of Wellington Official Plan. The Township will achieve this by consulting with those responsible for managing the services to analyze the future costs and viability of projected changes.

Climate Change

The Township where applicable and appropriate will consider designing infrastructure to be resilient to the effects of climate change and support disaster planning to facilitate business continuity.

Scope and Capitalization Thresholds

The Township will use a service-based (qualitative) perspective when applying this policy to municipal assets, rather than a monetary value (quantitative). The capitalization threshold developed for financial reporting will not be the guide in selecting assets covered by the Asset Management Planning process.

Financial Planning and Budgeting

The Township will integrate Asset Management Planning into the annual capital budget, operating budget, and its long-term financial plan. The Asset Management Plan will be used as a resource in order to:

- Identify all potential revenues and costs (including operating, maintenance, replacement and decommissioning) associated with forthcoming infrastructure asset decisions;
- Evaluate the validity and need of each significant new capital asset, including considering the impact on future operating costs; and Incorporate new revenue tools and alternative funding strategies where possible.

The department level budget submission will be reviewed and evaluated by the CAO and Director of Finance in the preparation of the Township`s annual budget. Service area personnel will reference the Asset Management Plan for their area in order to look up forecasted spending needs identified in the plan, verify progress made on the Plan to identify potential gaps, prioritize spending needs and recent developments. Finance staff will be involved in the

Asset Management Planning process to coordinate the information from service personnel in the preparation of the budget submission.

Governance and Continuous Improvement

Council is entrusted with the responsibility of overseeing, on behalf of citizens, a large range of services provided through a diverse portfolio of assets. Council, having stewardship responsibility, is the final decision maker on all matters related to asset management in the Township. The Council and staff are committed to the success of Asset Management Planning. The following details the responsibilities of the key stakeholders within the Township:

Council:

- Approve by resolution the Asset Management Plan and its updates every five years;
- Conduct an annual review of the Asset Management Plan on or before July 1st of every year, that includes:
    - Progress on ongoing efforts to implement the Asset Management Plan;
    - Consideration of the Asset Management Policy;
    - Any factors affecting the ability of the Township to implement its Asset Management Plan;
    - Consultation with staff;
    - Support efforts to improve and implement the Asset Management Plan.

CAO:

- Maintain compliance with the Asset Management Policy and Provincial Asset management regulations.

Senior Management:

- Oversee Asset Management Planning activities that fall within their service area.

TOWNSHIP OF
PUSLINCH
EST. 1850

REPORT ADM-2019-017

TO: Mayor and Members of Council

FROM: Karen M. Landry, CAO/Clerk

MEETING DATE: April 17, 2019

SUBJECT: Provincial Modernization Grant
File: H08SHA and F11MIN

RECOMMENDATIONS

THAT Report ADM-2019-017 regarding Provincial Modernization Grant be received; and

THAT following approval by all member municipal Councils, the County Chief Administrative Officer and member municipal Chief Administrative Officers engage a consultant for the preparation of a municipal services review as outlined in Report ADM-2019-017; and

THAT the Chief Administrative Officers report on the progress made to their respective Councils; and

That two (2) joint meetings of the member Municipal Councils and the County of Wellington Council be held in Centre Wellington's Fergus recreational facility; and

That the County of Wellington act as Treasurer for the municipal services review project; and

That the Township transfer $100,000 of the Provincial Modernization Grant funds to the County of Wellington for the municipal services review project; and

That the Township set aside $200,000 of the Provincial Modernization Grant funds in the Operating Carry-forward Discretionary Reserve for costs associated with the implementation of the approved municipal services review recommendations; and

That the remaining funds of $269,599 be set aside in the Asset Management Discretionary Reserve to fund the joint acquisition of asset management software and to retain a two-year Senior Financial Analyst contract position to assist with the implementation of Ontario Regulation 588/17 and the Township's Asset Management Program.

Background

In 1998, the County commenced the implementation of the Kitchen-Armstrong Report, which re-structured the 21 municipalities and re-aligned several municipal services and responsibilities.

The resulting structure is what the County and its municipalities still operate within (with some minor modifications.) The Kitchen-Armstrong Report was completed over the course of two months and built on the work of the County Restructuring Committee.

The strength of the Kitchen-Armstrong Report and the success of its implementation came from it being a locally driven initiative. Unlike other jurisdictions, where change was reluctantly embraced, the Wellington study was inspired by the Province's encouragement of fewer municipalities and politicians, but was led, supported and promoted by prominent local and County Councillors.

Provincial Modernization Grant

On March 20th the Minister of Municipal Affairs and Housing, the Honourable Steve Clark sent letters to the heads of 405 municipalities advising of a one-time distribution of funds ($200M) to assist, "small and rural municipalities' efforts to become more efficient and reduce expenditure growth in the longer term." Wellington County is to receive $725,000; in total, the County and its seven municipalities will receive over $4.9M.

In his letter, Minister Clark indicated that the grant is unconditional, and, "it is intended to help modernize service delivery and reduce future costs through investments in projects such as: service delivery reviews, development of shared services agreements and capital investments." This falls in line with the Province's expectation stated in the opening paragraph of the Minister's letter that, "the province has undertaken a line-by-line review of our own expenditures, and we have been clear that we expect our partners, including municipalities, to take steps to become more efficient as well."

Purpose

The purpose of this report is to provide Council with recommendations regarding the use of the Provincial Modernization Grant.

On Friday, March 22nd the Chief Administrative Officers' (CAOs) of the County had its quarterly meeting, and the recent announcement of funding was discussed. The consensus was, given the current climate of re-organization, change and review, that the County and its municipalities need to consider how to best respond to the Minister's challenge as expressed in his March 20th correspondence. The CAOs had a follow-up meeting on April 8th to discuss the local landscape of services, and agreements in order to develop a recommended course of action which can be applied County-wide, and put before each Council for review (and approval.)
Given the current review of the Regions and two Counties, it is prudent to recommend action to address the Provincial expectation of reviewing our systems to find cost saving efficiencies. To make best use of staff time and the grant funding, and to provide an objective, third party review, it is recommended that an outside firm be engaged to perform the work and make cost saving suggestions for local service delivery and operation.

The CAOs concurred that:

- the County will contribute its entire grant amount of $725,000 to the study and each of the seven municipalities will contribute $100,000, for a total project budget of $1,425,000;
- an RFP or RFI process will be used to select a consultant, using the County's purchasing process and policies;
- the steering committee selecting the consultant and facilitating their work will be comprised of the CAOs;
- emphasis will be placed on the consultant's capacity for financial analysis and demonstrated municipal experience;
- municipal services will be reviewed with respect to being shared through agreement, uploaded or downloaded, extended or eliminated;
- omitted services will be those uploaded following the Kitchen-Armstrong review (ie. waste management, policing, and library) and Provincially mandated services (ie. Housing, childcare, welfare and long term care);
- the consultant will be required to interview all CAOs, all managers directing specific services, and the seven Mayors;
- the consultant will attend two joint meetings of all Wellington Councils – the first to outline the review's workplan, and the second to deliver the report and recommendations;
- the service review should be considered the first phase of the process, the second phase being the implementation of approved service changes; the need for additional phases may be identified through the consultant's review;
- stakeholders may be involved during the implementation phase in order to refine results; and,
- completion of the review, and finalization of recommendations will be scheduled for consideration during 2020 budget processes (Fall of 2019).

The local CAOs further concurred that they would each set aside $200,000 of the funds for implementation of the approved municipal services review recommendations.
Township staff recommend that the remaining funds of $269,599 be set aside in the Asset Management Discretionary Reserve to fund the joint acquisition of asset management software and to retain a two-year Senior Financial Analyst contract position to assist with the implementation of Ontario Regulation 588/17 and the Township's Asset Management Program.

Financial Implications

Discussed throughout the Report.

Applicable Legislation and Requirements

Not applicable

PLANNING REPORT
for the TOWNSHIP OF PUSLINCH

Prepared by the County of Wellington Planning and Development Department

COUNCIL DATE: April 17, 2019
TO: Karen Landry, CAO/Clerk
Township of Puslinch
FROM: Jameson Pickard, Senior Policy Planner
County of Wellington
SUBJECT: **Our Corridor Community Improvement Plan Amendment**

Recommendation

THAT staff be directed to prepare a draft amendment to the Our Corridor Community Improvement Plan to include provisions from the County of Wellington's Invest Well Community Improvement Programme to allow County participation in local community improvement initiatives.

AND THAT staff be directed to hold the necessary public meeting(s) at the appropriate time(s).

Purpose

The purpose of this report is to seek direction from Council to amend the Township's Community Improvement Plan (CIP) to include provisions from the County of Wellington's Invest Well Community Improvement Programme. This amendment will introduce the necessary framework into the Township's CIP so that County Council may provide grants and loans to Puslinch for the purpose of carrying out community improvement projects.

Background

In 2015, Wellington County began a process to look at how it might strategically provide funding through community improvement planning activities across its seven member municipalities.

On January 28, 2016, County Council adopted Official Plan Amendment 96, which enabled the County to make grants or loans to local municipalities to assist in the implementation of CIPs. More recently the County's Economic Development Department has developed the Invest Well Community Improvement Programme, which outlines the County's involvement in community improvement initiatives.

Together these strategic actions have created a framework for the County of Wellington to act as a partner with member municipalities in local community improvement.

Invest Well Community Improvement Programme

The Invest Well Community Improvement Programme establishes a framework that will allow the County to participate financially in local grant and loan programmes aimed at revitalizing, beautifying, and attracting investment in Wellington. The programme sets out financial and non-financial incentives that may be available to owners/tenants of land and buildings that are eligible and have been approved for an incentive programme through a member municipality's CIP. A full copy of the County of Wellington's Invest Well Community Improvement Programmes is available through the following link: **https://www.wellington.ca/en/business/resources/2016EcDev/MeansBusiness/FINAL-DRAFT-Invest-Well-CIP_SEPT_20_COUNCIL-ENDORSED.pdf**

Community Improvement Plan Amendment

In order for the County of Wellington to participate in eligible community improvement projects, the Township's CIP needs to be amended to include provisions for County participation. The proposed amendment would modify Section 7- Financial Incentive Programs – of the Township's CIP to include an additional section outlining financial incentives programmes offered by the County of Wellington.

Under the Planning Act, the process to amend the Township's CIP is similar to an Official Plan amendment and includes providing appropriate notices and holding required public meetings. Through this amendment process the Township will be required to consult with the Ministry of Municipal Affairs on the proposed changes. Township Council is the approval authority and will adopt the amendment once it is satisfied with the proposed changes.

The CIP amendment will become final once adopted and the 20 day appeal period passes with no appeals. Attachment 1 provides an overview of the CIP amendment process.

Conclusion

The proposed amendment aligns well with the Township's current CIP policies, as it identifies County participation as a high priority and anticipates an amendment of this nature to the Plan.

Once implemented, eligible community improvement projects may be able to seek additional financial and non-financial assistance from the County of Wellington.

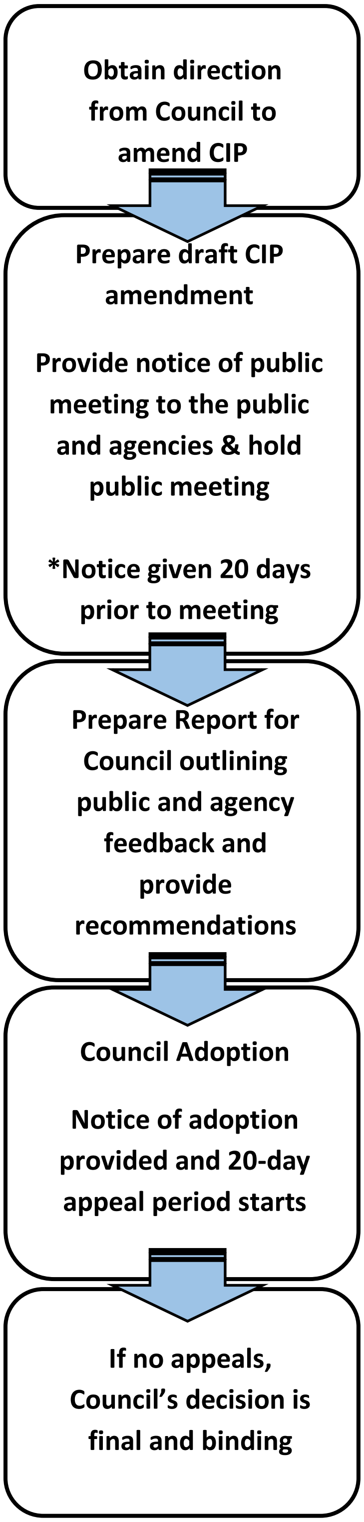
Respectfully Submitted,
County of Wellington Planning and Development Department

Jameson Pickard

Jameson Pickard, B.URPL
Senior Policy Planner

Attachment 1 CIP Amendment Process

ATTACHMENT # 1 **Community Improvement Plan Amendment Process**



REPORT BLDG-2019-004

TO: Mayor and Members of Council

FROM: Gerald Moore, Chief Building Official

MEETING DATE: April 17, 2019

SUBJECT: Building Department Monthly Update- March 2019

RECOMMENDATION

That Report BLDG-2019-004 with respect to the Building Department Monthly Update- March 2019 be received for information.

DISCUSSION

Purpose

The purpose of this report is to provide Council with an update of the activities in the Building Department for March 2019.

Background

The purpose of this report is to provide Council with a summary of the Building Department's activities for the month of March 2019.

Financial Implications

The Building Code Act requires that the total amount of building permit fees meets the total costs for the municipality to administer and enforce the Building Code Act and Regulations. Building permit fees were established to fully recover the Township's cost of providing building permit services, including an allocation of administrative overhead/indirect costs. Any surplus revenue from building permit fees is transferred to a restricted reserve, to be drawn upon in years of declining building activity.

APPLICABLE LEGISLATION AND REQUIREMENTS

Building Code Act, 1992, S.O. 1992, c. 23

ATTACHMENTS

Schedule A – March 2019 Monthly report

Township of Puslinch

Permit Comparison Summary

Issued For Period MAR 1,2019 To MAR 31,2019

	Previous Year			Current Year		
	Permit Count	Fees	Value	Permit Count	Fees	Value
Bylaw						
Pool Enclosure Permit	5	1,050.00	217,500.00	0	0.00	0.00
Commercial/Industrial						
Commercial - No Occupancy Required	1	34,412.00	3,100,000.00	0	0.00	0.00
Commercial - Occupancy Required	0	0.00	0.00	1	21,710.00	3,050,000.00
Demolition						
Demolition Permit	1	156.00	5,000.00	1	156.00	10,000.00
New Residence						
Residential - Occupancy Required	5	33,762.96	5,800,000.00	2	20,045.32	1,550,000.00
Other						
Solar Permit	1	416.00	25,600.00	0	0.00	0.00
Tent Permit	1	260.00	10,000.00	1	260.00	10,000.00
Other Residential						
Accessory/Farm Buildings	2	547.79	187,000.00	2	1,112.45	437,578.00
Detached Garage	2	2,308.80	125,000.00	0	0.00	0.00
Residential - No Occupancy Required	0	0.00	0.00	1	884.00	85,000.00
Septic						
Sewage Disposal System Permit	7	4,368.00	177,000.00	2	1,248.00	71,500.00

	Previous Year	Current Year
Total Permits Issued	25	10
Total Dwelling Units Created	4	2
Total Permit Value	9,647,100.00	5,214,078.00
Total Permit Fees	77,281.55	45,415.77
Total Compliance Letters Issued	3	1
Total Compliance Letter Fees	225.00	76.31

Inspection Summary

Ward	Permit Inspections	Other Roll Inspections
000	221	0
Total	221	0

Permit Charge	Amount
Accessory/Farm Buildings	1,112.45
Commercial - Occupancy Require	21,710.00
Demolition Permit	156.00
Residential - No Occupancy Req	884.00
Residential - Occupancy Requir	20,045.32
Sewage Disposal System Permit	1,248.00
Tent Permit	260.00

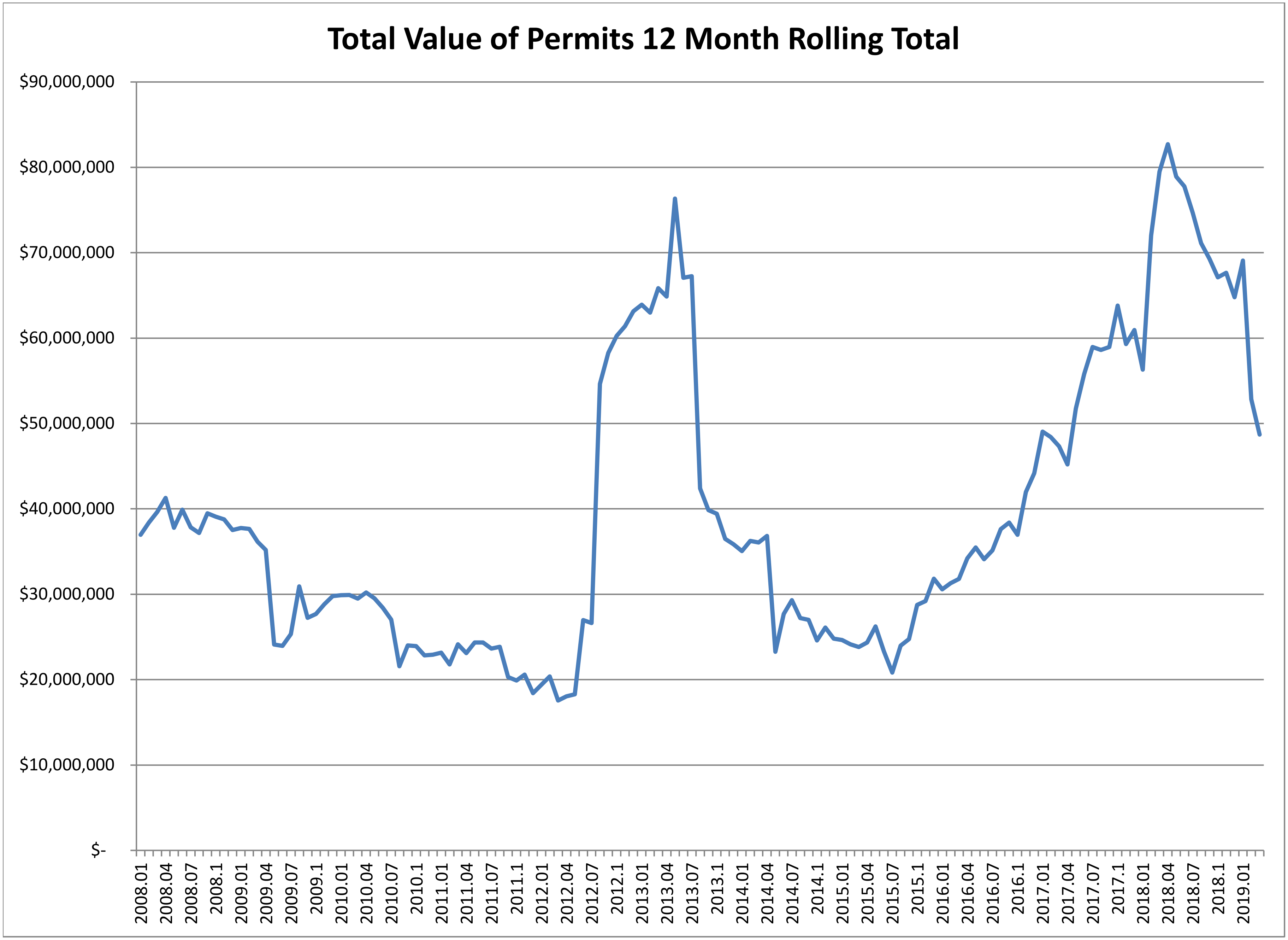
Township of Puslinch

Permit Comparison Summary

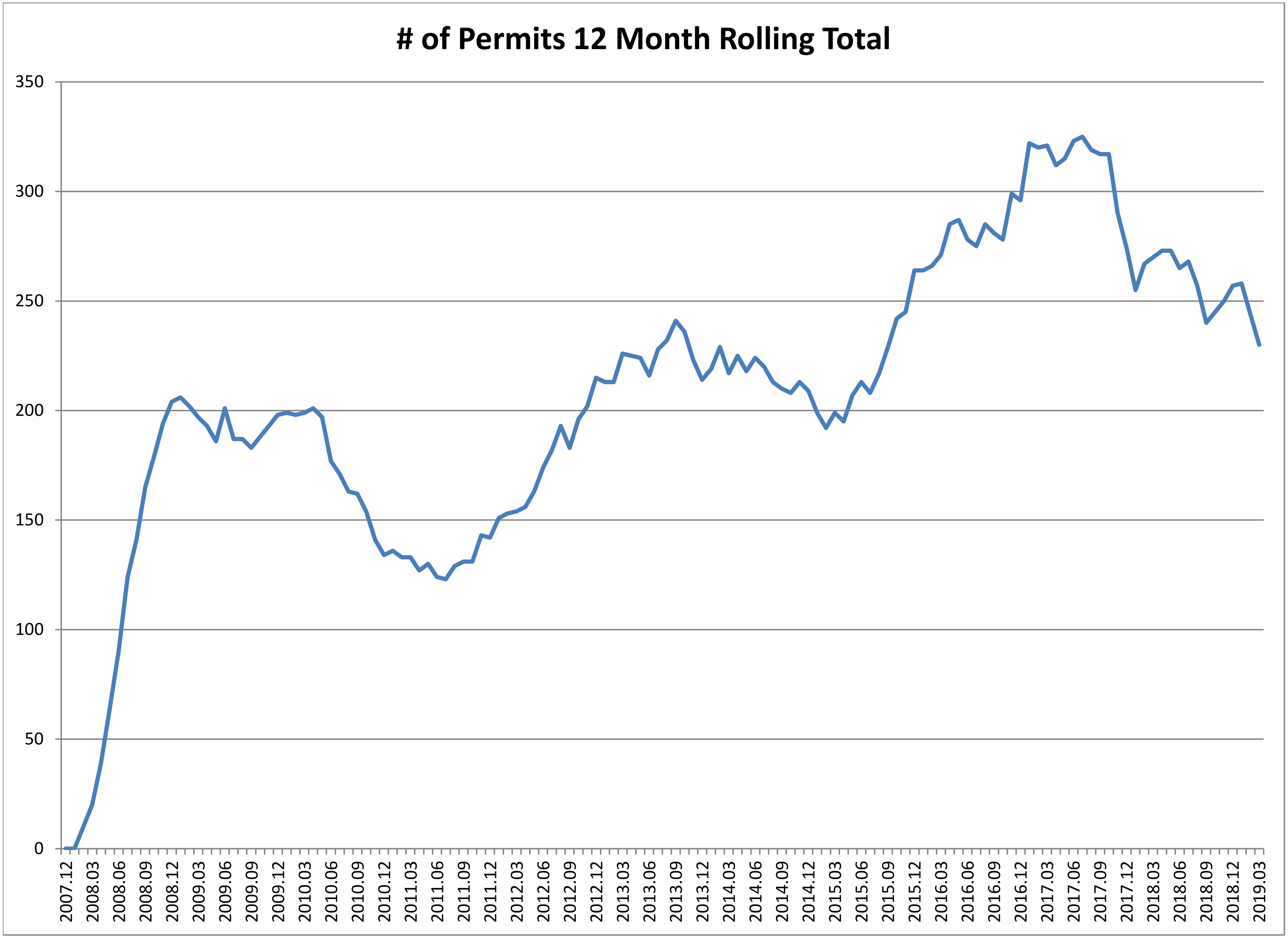
Issued For Period MAR 1,2019 To MAR 31,2019

Total	45,415.77

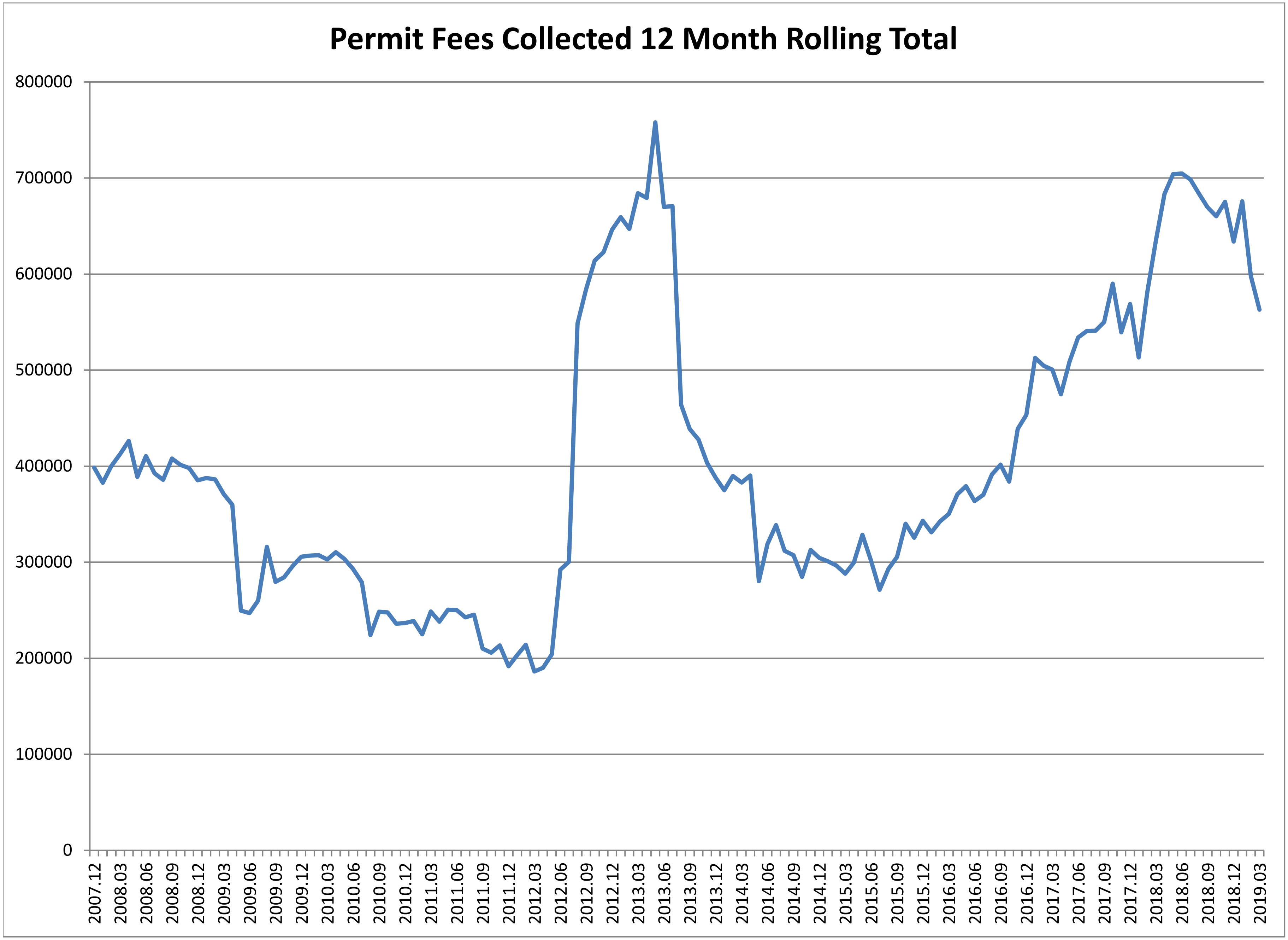
Note: The Graphs Below only Include Septic Permits in 2012 and beyond



Note: The Graphs Below only Include Septic Permits in 2012 and beyond



Note: The Graphs Below only Include Septic Permits in 2012 and beyond



TOWNSHIP OF
PUSLINCH
EST. 1850

REPORT PD-2019-004

TO: Mayor and Members of Council

FROM: Lynne Banks, Development and Legislative Coordinator

MEETING DATE: April 17, 2019

SUBJECT: Amending Site Plan Agreement – 2120826 Ontario Ltd.
20 Brock Road North
L04ONT – 2120826 Ontario Ltd.

RECOMMENDATION

That Report PD-2019-004 regarding an Amending Site Plan Agreement with 2120826 Ontario Ltd. described as Part Lot 20, Concession 7, being Part 1 on Reference Plan 61R-8086 and Part 2 on Reference Plan 61R-20548 be received; and

That Council pass a By-law to authorize the entering into of an amending Site Plan Agreement with 2120826 Ontario Ltd.

Background:

In 2008 Council authorized entering into a Site Plan Agreement (the “2008 Agreement”) for the property known municipally as 20 Brock Road North (the “subject property”) for the purpose of a commercial building. In 2016, Council approved entering into an amending Site Plan Agreement (the “2016 Agreement”) for the purpose of a building addition.

When the 2016 Agreement was entered into there were outstanding deficiencies from the 2008 Agreement that were to be completed prior to building permits being issued. In 2018 the owner decided not to build the addition to the warehouse and requested that his Letter of Credit be returned.

The Township’s engineer advised that the Letter of Credit can be reduced and enough securities should be retained to cover the outstanding deficiencies related to the 2008 Agreement in the amount of $21,625.00 with a further $6,000.00 to be retained to cover the relocation of the connector for the Township’s fire department which was not originally installed in the location as indicated on the approved plans for the 2008 Agreement. The

Township's engineer has estimated that the $6,000.00 to be retained will cover the cost of the relocation. Further, the Township's solicitor has prepared a draft amending agreement that would be registered on title to the lands since the Township will no longer hold securities for specific works included in the 2016 Agreement that is currently registered on title.

Purpose:

The amending agreement will be registered on title to the subject property and the retained securities will be reduced from the current amount of $103,573.00 to the total amount of $27,625.00 inclusive of the cost to relocate the Township's fire department connector.

Financial Implications

The financial implications have been noted above.

Applicable Legislation and Requirements

Municipal Act, 2001, S.O. 2001, c. 25

Applicable Legislation and Requirements:

Township of Puslinch Site Plan Control By-law 16/08

Township of Puslinch Zoning By-law 19/85

Attachments:

Draft By-law

ATTACHMENT “A”

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

BY-LAW NUMBER XXX-2019

BEING A BY-LAW T0 AUTHORIZE THE ENTERING INTO OF AN
AMENDING SITE PLAN AGREEMENT WITH
2120826 Ontario Ltd. – 20 Brock Road North

WHEREAS the *Planning Act*, R.S.O. 1990, P.13, as amended, authorizes the entering into of agreements to ensure that development proceeds in accordance with approved plans and drawings;

AND WHEREAS the *Planning Act,* R.S.O. 1990, c.P.13, authorizes the entering into of agreements to ensure the provision of any and all facilities, works or matters and maintenance;

AND WHEREAS Council for the Corporation of the Township of Puslinch deems it expedient to enter into an Amending Site Plan Agreement with 2120826 Ontario Ltd.;

NOW THEREFORE the Council of the Corporation of the Township of Puslinch enacts as follows:

1. **THAT** the Corporation of the Township of Puslinch enter into an Amending Site Plan Agreement with 2120826 Ontario Ltd. for lands municipally known as 20 Brock Road North, Township of Puslinch.

2. **THAT** the Mayor and Clerk are hereby authorized to execute the said Amending Site Plan Agreement and the Mayor and Clerk are hereby authorized to execute all ancillary documents related thereto.

READ A FIRST, SECOND AND THIRD TIME AND FINALLY PASSED THIS 1ST DAY OF MAY, 2019.

____
James Seeley, Mayor

____
Karen Landry, CAO/Clerk

TOWNSHIP OF
PUSLINCH
EST. 1850

REPORT PW-2019-001

TO: Mayor and Members of Council

FROM: Don Creed, Director of Public Works and Parks

MEETING DATE: April 17, 2019

SUBJECT: Tender Results for the 2019 Annual Road Rehabilitation
File: F18ROA

RECOMMENDATIONS

That Report PW-2019-001 regarding the Tender Results for the 2019 Annual Road Rehabilitation be received; and

That the tender for the 2019 Annual Road Rehabilitation be awarded to Capital Paving Inc. at their tendered amount of $1,182,414 inclusive of the non-refundable portion of HST; and

That the excess funds of $51,029 be allocated to emergency works required for Culvert of Cook's Mill Race, Asset No. 2002; and

That an additional amount of $8,971 be funded from the Public Works Replacement and Restoration of Aging Infrastructure Discretionary Reserve for the emergency works required for Culvert of Cook’s Mill Race, Asset No. 2002; and

That Council authorizes the Mayor and Clerk to sign the required contract documents.

Background

The 2019 Capital Budget includes the following pulverize, repave and drainage projects for the 2019 Annual Road Rehabilitation contract:

Description	Asset No.	Budget Amount
Concession 4- Sideroad 12 North to Country Road 35	58	$168,000
Concession 4- Sideroad 10 North to Sideroad 12 North and one small culvert replacement	57	$112,000
Victoria Road South- County Road 36 (Badenoch Street) to entrance to Aberfoyle Pit #2	124 and 125A	$510,000
Concession 1 -County Road 35 to Sideroad 20 South and two small culvert replacements	15	$303,000
Concession 2 - Sideroad 10 South to County Road 32	32	$233,400

A public tender for the 2019 Capital Projects was advertised on the Township of Puslinch website and Biddinggo.com for three weeks and local contractors were made aware that the tender was available. The tender closed on April 2, 2019.

As the result of a call for tenders, three (3) bids were received as follows (attached as Schedule A):

Cox Construction
Capital Paving Inc.
E & E Seegmiller

After a review of the submitted bids, staff are recommending the contract for the 2019 Annual Road Rehabilitation be awarded to Capital Paving Inc., the lowest compliant bid submitted which aligns with GM BluePlan's recommendation attached as Schedule B to this Report. The successful bid conforms to the specifications as requested in the tender document.

Purpose

The purpose of this report is to seek Council's approval to award the tender for the 2019 Annual Road Rehabilitation to Capital Paving Inc. As the tender amount exceeds $500,000, Council authorization is required in accordance with the Purchasing & Procurement of Goods and Services By-law 60/08. Furthermore, the purpose of the report is to allocate surplus funds form the allocation of this tender to the emergency works required for the Culvert of Cook's Mill Race.

Financial Implications

The 2019 Capital Budget includes $1,326,400 for the 2019 Annual Road Rehabilitation. This amount is funded as follows:

Taxation Levy	$629,419
OCIF Formula Based Grant	$169,421
Restricted Reserves	$299,560
Discretionary Reserve (Aggregate Levy)	$228,000

Total	$1,326,400

There are sufficient funds to proceed with the work based on the breakdown of costs as detailed below:

Contract Tender Price (excluding taxes)	$1,161,959
Add: Non-refundable portion of HST	$20,455
Add: Engineering	$92,957(estimated)
Total Cost	$1,275,371

The Township has obtained an estimate for emergency works required for Culvert of Cook's Mill Race, Asset No. 2002 amounting to $60,000. It is recommended that the surplus funds of $51,029 be allocated to this project. It is recommended that an additional amount of $8,971 be funded from the Public Works Replacement and Restoration of Aging Infrastructure Discretionary Reserve to complete the emergency works.

Applicable Legislation and Requirements

The works for the above projects has been procured in accordance with the Township's Purchasing and Procurement of Goods and Services By-law 60/08.

Attachments

Schedule A: Public Tender Opening Results

Schedule B: GMBluePlan Recommendation Report

TOWNSHIP OF
PUSLINCH
EST. 1850

Public Tendering Opening Results

Project Name: Tender for the 2019 Annual Road Rehabilitation

Closing Date: April 2, 2019, 12:00 P.M. Council Chambers

No.	Bidder	Date Tender Received	Amount of Tender including all taxes
1	Capital Paving Inc	April 2, 2019	$ 1,313,013.65
2	Cox Construction	April 2, 2019	$ 1,365,456.97
3	E & E Seegmiller	April 2, 2019	$ 1,921,030.51
4			
5			
6			

GM BluePlan
ENGINEERING

PEOPLE | ENGINEERING | ENVIRONMENTS

April 4, 2019
Our File: 119024

Township of Puslinch
7404 Wellington Road 34
Puslinch, ON N0B 2J0

Attn: Karen Landry
CAO/Clerk

Re: Township of Puslinch, 2019 Road Rehabilitation and Culvert Upgrades, Contract PW19-100
Review of Tenders

Dear Karen,

Tenders for the above-noted project were received at the offices of the Township of Puslinch, 7404 Wellington Road 34, Puslinch, Ontario, and opened publicly on Tuesday, April 2, 2019 at 12:10pm. A total of three bid packages were received and have been analyzed for completeness and correctness. All three packages included a properly signed and sealed form of tender, signed and sealed addenda (Nos. 1 – 3), an agreement to bond, and a $25,000 bid bond or certified cheque.

Results of the tender submissions are summarized as follows:

Order	Bidder	Sub-Total	HST	Total Price
1.	Capital Paving Inc.	$1,161,958.98	$151,054.67	$1,313,013.65
2.	Cox Construction Ltd.	$1,208,369.00	$157,087.97	$1,365,456.97
3.	E&E Seegmiller Ltd.	$1,700,027.00	$221,003.51	$1,921,030.51

We note that one bid, E&E Seegmiller Ltd., did not provide a signed and sealed Addendum No. 3. Based on discussions with Township staff present at the tender opening, and in consideration of the information provided in this addendum, the Township accepted the bid submission from E&E Seegmiller Ltd. and their price was read aloud during the tender opening.

All tenders have been checked for errors, omissions, qualifications and obvious imbalances. For your reference, attached is a spreadsheet comparing all of the unit and total prices received from bidders.

One mathematical error was found in the submission by Capital Paving Inc., whereby the total price for Item B.6 did not correspond to the unit bid price and estimated quantity. We consider this a clerical error as the unit rate provided by Capital Paving Inc. is impractical given the work required for this item. We have confirmed with Capital Paving Inc. in a telephone conversation and email that the total price for Item B.6 is the correct price, and the unit bid price was back-calculated from the total amount incorrectly. Capital Paving Inc.'s total bid price remains as quoted in the submission, and this clerical error had no effect on the ranking for the bids.

One mathematical error was found in the submission by Cox Construction Ltd., whereby the total price for Item E.11 did not correspond to the unit bid price and estimated quantity. This error did not affect the total submitted bid or the ranking of the ranking for the bids.

We recommend that the contract for this work be awarded to the low bidder, Capital Paving Inc. At this time, we also suggest that the second ranked bidder (Cox Construction Ltd.) be advised that their surety deposit will be held until a contract is executed with the low bidder.

Please advise us of your decision to award this contract so we can review with the successful contractor and request the official documents for inclusion in the executable contracts to be signed by the Township and contractor.

We trust you will find the above to be in order. Should you have any questions or concerns, please do not hesitate to contact us.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED
Per:

Matt Scott, P.Eng.
Encl.

Cc: Steve Conway, GM BluePlan Engineering Limited (steve.conway@gmblueplan.ca)
Don Creed, Township of Puslinch (dcreed@puslinch.ca)
Mike Fowler, Township of Puslinch (mfowler@puslinch.ca)

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH
PLANNING & DEVELOPMENT ADVISORY COMMITTEE
MARCH 12, 2019
7:00 PM
COUNCIL CHAMBERS

MINUTES

MEMBERS PRESENT
Councillor John Sepulis, Chair
Deep Basi
Dan Kennedy
Dennis O'Connor
Paul Sadhra

MEMBERS ABSENT
None

OTHERS IN ATTENDANCE
Lynne Banks, Development and Legislative Coordinator

1 - 5. COMMITTEE OF ADJUSTMENT

- See February 26, 2019 Committee of Adjustment minutes.

6. OPENING REMARKS

The meeting was called to order at 8:05 p.m. The Chair advised that the following portion of the Committee meeting will be reviewing and commenting on development planning applications. The Chair further indicated that there were no applications to be heard for this meeting.

7. DISCLOSURE OF PECUNIARY INTEREST

None

8. APPROVAL OF MINUTES

Moved by: Dennis O'Connor Seconded by: Deep Basi

That the Minutes of the Planning & Development Advisory Committee Meeting held Tuesday, February 26, 2019, be amended as follows:

11(b). Severance Application B141/18 (D10/ONT) – 2443109 Ontario Inc., Part Lot 25, Concession 7, north west of MacLean Road West and Brock Road South, Puslinch.

- To be changed from "That the Owner receive approved zoning compliance for the severed lands from the Township of Puslinch for the reduced lot frontage" to read "That the owner receive approved zoning compliance for the severed lands from the Township of Puslinch for the reduced lot size".

Moved by: Dennis O'Connor Seconded by: Deep Basi
CARRIED

9. APPLICATION FOR SITE PLAN URBAN DESIGN REVIEW

- None

10. ZONING BY-LAW AMENDMENT

- None

11. LAND DIVISION

- None

12. OTHER MATTERS

- The committee members requested that they receive updated identification cards with the new logo.

13. CLOSED MEETING

- None

14. NEXT MEETING

- Next Regular Meeting Tuesday, April 9, 2019 @ 7:00 p.m.

15. ADJOURNMENT

Moved by: Deep Basi Seconded by: Dan Kennedy

That the Planning & Development Advisory Committee is adjourned at 8:07 p.m.

CARRIED

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH
COMMITTEE OF ADJUSTMENT
MARCH 12, 2019
7:00 PM
COUNCIL CHAMBERS

MINUTES

MEMBERS PRESENT
Councillor John Sepulis, Chair
Deep Basi
Dan Kennedy
Dennis O'Connor
Paul Sadhra

MEMBERS ABSENT
None

OTHERS IN ATTENDANCE
Lynne Banks, Development and Legislative Coordinator

1. OPENING REMARKS

The meeting was called to order at 7:00 pm. The Chair advised that the following portion of the Committee meeting will be reviewing and commenting on development planning applications. The Chair further indicated there were no applications to be heard for this meeting.

2. DISCLOSURE OF PECUNIARY INTEREST

- None

3. APPROVAL OF MINUTES

Moved by: Dennis O'Connor Seconded by: Deep Basi

That the Minutes of the Committee of Adjustment meetings held Tuesday, February 26, 2019 be adopted.

CARRIED

4. APPLICATIONS FOR MINOR VARIANCE OR PERMISSION under section 45 of the Planning Act to be heard by the Committee this date:

- None.

5. OTHER MATTERS

5a. Committee of Adjustment Member Training Video

- Attending members viewed the videos provided by Ontario Association of Committee of Adjustment.
- It was requested that the secretary/treasurer send digital copies to the committee members.

6. ADJOURNMENT

Moved by: Dan Kennedy ` Seconded by: Dennis O'Connor

The Committee of Adjustment meeting adjourned at 8:05 p.m.

CARRIED

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

BY-LAW NUMBER 024-2019

Being a By-law to provide for the appointment of a Municipal Law Enforcement Officer (Blair Lance) for the Corporation of the Township of Puslinch, and to repeal By-law Number 054-2017.

WHEREAS Section 9 of the *Municipal Act*, *2001*, S.O. 2001 c. 25, as amended, provides that a municipality has the capacity, rights, powers and privileges of a natural person for the purpose of exercising its authority;

AND WHEREAS Section 227 of the Municipal Act, S.O. 2001, c. 25, authorizes a Council to pass a by-law to appoint such officers and employees as may be necessary for the purposes of the Corporation, for carrying into effect the provisions of any by-law of Council;

AND WHEREAS Section 15 of the *Police Services Act* R.S.O. 1990, c. P.15, as amended, authorizes the appointment of Municipal Law Enforcement Officers who shall be peace officers for the purpose of enforcing the by-laws of the municipality;

NOW THEREFORE the Council of the Corporation of the Township of Puslinch hereby enacts as follows:

1. **THAT** Blair Lance be appointed as a Municipal Law Enforcement Officer for the Township of Puslinch;
2. **AND THAT** By-law 054-2017 be hereby repealed;
3. **AND THAT** this By-law shall come into full force and effect on the day it is passed.

READ A FIRST, SECOND AND THIRD TIME AND FINALLY PASSED THIS 17th DAY OF APRIL 2019.

James Seeley, Mayor

Karen M. Landry, CAO/Clerk

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

BY-LAW NUMBER 025-2019

Being a by-law to confirm the proceedings of the Council of the Corporation of the Township of Puslinch at its Regular meeting held on April 17, 2019.

WHEREAS by Section 5 of the *Municipal Act, 2001, S.O. 2001, c.25* the powers of a municipal corporation are to be exercised by its Council;

AND WHEREAS by Section 5, Subsection (3) of the *Municipal Act,* a municipal power including a municipality's capacity, rights, powers and privileges under section 8, shall be exercised by by-law unless the municipality is specifically authorized to do otherwise;

AND WHEREAS it is deemed expedient that the proceedings of the Council of the Corporation of the Township of Puslinch at its Regular meeting held on April 17, 2019 be confirmed and adopted by By-law;

NOW THEREFORE the Council of the Corporation of the Township of Puslinch hereby enacts as follows:

1) The action of the Council of the Corporation of the Township of Puslinch, in respect of each recommendation contained in the reports of the Committees and each motion and resolution passed and other action taken by the Council at said meeting are hereby adopted and confirmed.

2) The Head of Council and proper official of the Corporation are hereby authorized and directed to do all things necessary to give effect to the said action of the Council.

3) The Head of Council and the Clerk are hereby authorized and directed to execute all documents required by statute to be executed by them, as may be necessary in that behalf and the Clerk authorized and directed to affix the seal of the said Corporation to all such documents.

READ A FIRST, SECOND AND THIRD TIME AND FINALLY PASSED THIS 17th DAY OF APRIL 2019.

James Seeley, Mayor

Karen Landry, C.A.O./Clerk