

REGIONAL MUNICIPALITY OF DURHAM

DURHAM YORK ENERGY CENTRE: 2018 ANNUAL GROUNDWATER AND SURFACE WATER MONITORING REPORT

RWDI #1604066

April 24, 2019

SUBMITTED TO

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**RE: 2018 Annual Groundwater and Surface Water Monitoring Report
Durham York Energy Centre
RFP-528-2016
RWDI Reference No. 1604066**

Dear Mr. Anello,

RWDI AIR Inc. (RWDI) is pleased to provide this 2018 Annual Groundwater and Surface Water Monitoring Report for the Durham York Energy Centre (DYEC).

The 2018 Annual Groundwater and Surface Water Monitoring Report provides details of the monitoring program completed in 2018 for DYEC and an interpretation of the 2018 monitoring data, including our conclusions and recommendations. Relevant 2018 and historical technical data are appended.

In November 2010, the Ministry of the Environment (MOE) issued the Technical Guidance Document entitled "*Monitoring and Reporting for Waste Disposal Sites, Groundwater and Surface Water*" (MOE, 2010). Appended to this report is a completed Monitoring and Screening Checklist from the above Technical Guidance Document, which provides certification of the Competent Environmental Practitioner (CEP). The Monitoring and Screening Checklist is provided in **Appendix F**.

We trust that this 2018 Annual Groundwater and Surface Water Monitoring Report for DYEC provides sufficient information for your requirements. Should there be any questions or comments, please contact us.

Sincerely,

RWDI

A handwritten signature in black ink, appearing to read 'Philippe E. Janisse'.

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Attach.



EXECUTIVE SUMMARY

The Regional Municipality of Durham (hereinafter “Region”) and The Regional Municipality of York own the Durham York Energy Centre (DYEC), which is located in the Municipality of Clarington, Ontario. DYEC is located at municipal address 1835 Energy Dr. in Courtice, Ontario (hereinafter the “Site”).

DYEC is a thermal treatment energy from waste facility and is approved to process up to 140,000 tonnes of solid, non-hazardous, municipal waste per year. Covanta operates DYEC, which began operation in February 2015 when the first load of waste was received.

Operating requirements for DYEC are governed by the Ministry of Environment, Conservation and Parks (MECP) Environmental Assessment (EA) Notice of Approval (File No. 04-EA-02-08) (hereinafter “EA Approval”) and the Multi-Media Environmental Compliance Approval (ECA) Number 7306-8FDKNX, issued on June 28, 2011, and amended to March 14, 2016 (Notice No. 5) (hereinafter “ECA”).

The EA Approval, ECA, and the MECP-approved Groundwater and Surface Water Monitoring Plan, prepared by Stantec Consulting Ltd. and dated September 14, 2011, outline the groundwater and surface water monitoring and reporting requirements for DYEC. This 2018 Annual Groundwater and Surface Water Monitoring Report has been prepared in accordance with Condition 20.8 of the EA Approval, Condition 15 of the ECA, and the Groundwater and Surface Water Monitoring Plan to provide details of the monitoring program completed in 2018.

With MECP approval via letter dated May 17, 2016, the routine surface water monitoring program (i.e., placement and monitoring of sondes in Tooley Creek) for DYEC has been suspended due to construction activities for the Highway 401/Courtice Road interchange. The MECP approved the suspension of the sondes placement and monitoring until the interchange construction activities are complete.

Based on the findings presented in this report, the following conclusions are provided.

- Based on the 2018 groundwater elevations, the shallow and deeper groundwater flow direction at the Site was interpreted to be toward the southwest, with minor flow alterations as a result of the influences from the trunk sewer.
- For the groundwater sampling program completed for DYEC in 2018, quality assurance and quality control (QA/QC) measures indicated that the detected constituent concentrations were accurate and reflected actual conditions at the time of sample collection.



- The concentrations of the salt related parameters chloride and sodium within the groundwater at upgradient monitoring well MW2B and at internal assessment monitoring well MW5B have generally increased since 2014/2015. The concentrations of chloride and sodium within the groundwater at crossgradient monitoring well MW1 slightly increased between 2014 and 2015 and have since been generally stable. The beginning of the increasing trend of the salt related parameter concentrations within MW1, MW2B, and MW5B coincides with the approximate time of construction of Energy Dr. north and west of the Site, as well as the on-Site roadways and parking lot. As such, the increasing concentrations of the relevant parameters are interpreted to be attributed to the application of de-icing salt during the winter season to Energy Dr., Osborne Rd., and/or the on-Site roadways/parking lot. It is noted that the 2018 and historical concentrations of chloride and sodium within the groundwater at MW1, MW2B, and MW5B have satisfied their respective Ontario Drinking Water Standard (ODWS) criterion.
- Within the groundwater at downgradient monitoring well MW4, the concentrations of the salt related parameters chloride, sodium, calcium, magnesium, and potassium were generally stable since monitoring began at this monitoring well until distinctly increasing in 2016. The concentrations of these parameters were elevated again in August and November 2018. For each parameter, the concentration detected in November 2018 represents the maximum concentration detected within the groundwater at MW4 to-date.
 - The detected salt related parameter concentrations within the groundwater at MW4 are interpreted to be attributed to the application of de-icing salt to Energy Dr., Osborne Rd., the nearby off-Site roadway to the Courtyce Water Pollution Control Plant (WPCP), and/or the on-Site roadways/parking lot. It is noted that, at the internal assessment and downgradient monitoring locations MW5 and MW3, respectively, which are in closer proximity to the DYEC facility than MW4, the concentrations of the salt related parameters have been consistently less than the elevated concentrations detected within MW4. As such, there is no indication that the noted concentrations of the salt related parameters detected within the groundwater at MW4 have migrated downgradient within the shallow groundwater as a result of DYEC waste treatment operations.
 - It is noted that elevated chloride and sodium concentrations, as well as the concentrations of other salt related parameters (i.e., calcium, potassium and magnesium), are commonly elevated in groundwater where a monitoring well is situated near roads that are surface treated with brine or salt for dust control or de-icing. It is expected that the concentrations of the salt related parameters will continue to fluctuate and/or increase over time with the continued practice of roadway and/or parking lot de-icing. As only salt related parameters show elevated concentrations compared to concentrations for metal parameters within the groundwater, no remedial action is warranted to address the noted concentrations for the salt related parameters.



- For the 2018 monitoring events, the groundwater analytical results for the required parameters of analysis satisfied their respective ODWS, except for select salt related parameters within the groundwater at monitoring well MW4. For the salt related parameters, only chloride and sodium have an ODWS. In August and November 2018, the concentration of chloride (765 and 1,160 mg/L, respectively) was greater than its ODWS (250 mg/L). In November 2018 the concentration of sodium (293 mg/L) was also greater than its ODWS (200 mg/L). Based on the interpreted groundwater flow direction and the analytical results for chloride and sodium at downgradient monitoring wells in closer proximity to the DYEC facility, there is no indication that the elevated 2018 concentrations of chloride and sodium within the groundwater at MW4 migrated downgradient as a result of DYEC waste treatment operations. As discussed, the elevated concentrations of chloride and sodium detected at MW4 in 2018 are interpreted to be attributed to the application of de-icing salt. Therefore, no remedial actions are warranted to address the noted chloride and sodium concentrations.
- Overall, based on a review of 2018 and historical groundwater analytical results for the Site, the data suggests that DYEC waste treatment operations have not had an adverse effect on groundwater quality at the Site.
- With MECP approval, the routine surface water monitoring program (i.e., placement and monitoring of sondes in Tooley Creek) for DYEC was suspended until the Highway 401/Courtice Road interchange construction activities are complete. As construction activities were not completed prior to or during the 2018 monitoring period, the routine surface water monitoring program for DYEC outlined in the Groundwater and Surface Water Monitoring Plan was not required to be completed in 2018.

Based on the findings of the 2018 monitoring program, the following recommendations are provided for your consideration.

- Groundwater monitoring at the Site should continue in 2019, in accordance with the MECP-approved Groundwater and Surface Water Monitoring Plan. As discussed in **Section 1.2.1.1**, the Regional Municipalities of Durham and York have requested that the Groundwater and Surface Water Monitoring Plan be amended to reduce the frequency of groundwater monitoring from three (3) times per year to once per year. Until confirmation and approval of the request is granted by the MECP, the groundwater sampling frequency will remain unchanged.
- The MECP approved the suspension of the routine surface water monitoring program for DYEC (i.e., placement and monitoring of sondes in Tooley Creek) until the Highway 401/Courtice Road interchange construction activities are complete. Based on the construction status of the Highway 401/Courtice Road interchange as of the date of this report, it is not anticipated that construction will be completed until at least 2020. As such, the routine surface water monitoring program should not be completed in 2019.



- The rapid increase of the concentrations of salt related parameters within the groundwater at MW4 suggests that stormwater and/or shallow groundwater influenced by de-icing salt may be entering the well casing directly. As such, it is recommended that MW4 is inspected with a down-well closed-circuit television (CCTV) camera to visually assess the integrity of the monitoring well and to determine if the monitoring well installation may be compromised.
- The concentrations of salt related parameters chloride, sodium, calcium, magnesium, and potassium within the groundwater at the Site should continue to be evaluated on an ongoing basis to verify that the concentrations of these parameters continue to be attributable to the effects of roadway and parking lot de-icing practices and not to DYEC waste treatment operations.



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1 INTRODUCTION

The Regional Municipality of Durham (hereinafter “Region”) and The Regional Municipality of York own the Durham York Energy Centre (DYEC), which is located in the Municipality of Clarington, Ontario. DYEC is a thermal treatment energy from waste facility and is operated by Covanta.

DYEC began operation in February 2015 when the first load of waste was received. DYEC is approved to process up to 140,000 tonnes of solid, non-hazardous, municipal waste per year.

Operating requirements for DYEC are governed by the Ministry of Environment, Conservation and Parks (MECP) Environmental Assessment (EA) Notice of Approval (File No. 04-EA-02-08) (hereinafter “EA Approval”) and the Environmental Compliance Approval (ECA) Number 7306-8FDKNX, issued on June 28, 2011, and amended to March 14, 2016 (Notice No. 5) (hereinafter “ECA”). The EA Approval, as well as the ECA and its supporting documents, are posted on DYEC’s website and can be accessed at the following link: www.durhamyorkwaste.ca. The DYEC Surface Water Monitoring Program Change Request Letter, dated April 29, 2016, as well as the MECP Approval Letter, dated May 17, 2016, are provided in **Appendix A-1, Appendix A**.

The EA Approval, ECA, and the MECP-approved *Durham-York Energy Centre Groundwater and Surface Water Monitoring Plan*, prepared by Stantec Consulting Ltd. and dated September 14, 2011, outline the groundwater and surface water monitoring and reporting requirements for DYEC. The groundwater and surface water monitoring programs for DYEC are outlined in the Groundwater and Surface Water Monitoring Plan (Stantec, 2011). The Groundwater and Surface Water Monitoring Plan was prepared in accordance with Condition 20 of the EA Approval and Condition 7(14) of the ECA.

This 2018 Annual Groundwater and Surface Water Monitoring Report has been prepared in accordance with Condition 20.8 of the EA Approval, Condition 15 of the ECA, and the Groundwater and Surface Water Monitoring Plan to provide details of the monitoring program completed in 2018.

RWDI AIR Inc. (RWDI) was retained by the Region to complete the groundwater monitoring and the 2018 Annual Groundwater and Surface Water Monitoring Report for DYEC. This report is organized in consideration of historical reporting frameworks including, but not limited to, site geologic details, to maintain a level of consistency and provide a familiarity to reviewers whereby historical reports can be easily referenced to this report.



1.1 Location

DYEC is located at municipal address 1835 Energy Dr. in Courtice, Ontario (Site). The Site is situated in the southwest corner of the Energy Dr. and Osborne Rd. intersection, southeast of the Courtice Rd. interchange of Highway 401. The area of the Site is approximately 12.1 hectares.

A Site Location Map that identifies the location of the Site and surrounding area features is provided in **Figure 1**. A Site Plan that identifies detailed information of the Site, such as monitoring locations, is provided in **Figure 2**.

1.2 Monitoring and Reporting Program Objectives and Requirements

1.2.1 Groundwater Monitoring Objective

The principal objectives of the 2018 monitoring and reporting programs for DYEC are as noted below.

- To evaluate groundwater and surface water quality at and nearby the Site and assess the potential for impacts to nearby water resources as a result of DYEC operations.
- To determine whether remedial actions are required in consideration of monitoring findings.
- To assess the adequacy of the existing monitoring program with respect to evaluating the potential for impacts at nearby water resources.
- To provide a report presenting the findings of the monitoring program to the Region, whereby the report will be provided to the MECP and posted on the DYEC website (www.durhamyorkwaste.ca).

The primary aspects of the environmental monitoring and reporting programs are data collection, analysis, and interpretation. This 2018 Annual Groundwater and Surface Water Monitoring Report documents the data collected as part of the 2018 monitoring program and the 2018 data was interpreted in consideration of historical data. In accordance with the Groundwater and Surface Water Monitoring Plan, groundwater results from 2018 were compared to the Ontario Drinking Water Standards (ODWS), per the *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines* (MOE, 2006).

Unprocessed waste is stored indoors in a sealed concrete pit, set 5.5 metres below grade, which does not allow leachate from the waste to come into contact with groundwater. Ash is transported to a dedicated storage building with concrete floors using fully enclosed conveyors, and subsequently removed for off-Site disposal. The primary means by which groundwater could potentially become affected would be through an upset condition at the facility. The primary purpose of the groundwater monitoring program is to provide an early warning if a potential effect was to occur (Stantec, 2011).



1.2.1.1 Changes to the Groundwater Monitoring Plan

In a letter to the MECP dated January 9, 2019, the Regional Municipalities of Durham and York (hereinafter “Regions”) requested a change to the Groundwater and Surface Water Monitoring Plan for DYEC. The DYEC facility design includes engineering controls and operating procedures for the protection of groundwater. As presented in Annual Reports for DYEC since 2012, monitoring results to date have demonstrated the effectiveness of the groundwater protection measures and have shown no adverse impacts to groundwater from DYEC waste treatment operations. As such, the Regions requested that the Groundwater and Surface Water Monitoring Plan be amended to reduce the required groundwater monitoring frequency from three (3) times per year to once per year, commencing in 2019. Subject to MECP approval, groundwater sampling would occur once per year in the fall. Until confirmation and approval of the request is granted by the MECP, the groundwater sampling frequency will remain unchanged. A copy of the letter from the Regions to the MECP is provided in **Appendix A-1, Appendix A**.

1.2.2 Surface Water Monitoring Objective

DYEC is a Zero Process Water Discharge Facility (Stantec, 2011). DYEC is designed such that there will be no discharge of water from inside the facility buildings other than sanitary sewer discharges from the washrooms. Stormwater drainage from outdoor surfaces, such as rooftops, driveways, and landscaped areas, are collected in two (2) stormwater management ponds (SWMPs). Discharge from the on-site SWMPs is conveyed westward via an existing swale within the CN Rail right-of-way prior to discharging into a small tributary of Tooley Creek approximately 700 metres southwest of the Site. The primary purpose of the surface water monitoring program is to monitor the effectiveness of stormwater management controls in mitigating adverse impacts to Tooley Creek receiving waters (Stantec, 2011).

1.2.2.1 Changes to the Surface Water Monitoring Plan

In a letter to the MECP dated April 29, 2016, the Regions requested a change to the Groundwater and Surface Water Monitoring Plan for DYEC. The surface water monitoring program outlined in the Groundwater and Surface Water Monitoring Plan outlines that sondes are required to be placed in Tooley Creek upstream and downstream of the drainage swale that receives stormwater flow from DYEC to monitor select parameters. The section of Tooley Creek where the sondes should be placed was scheduled for realignment as part of construction by the Ministry of Transportation to improve the Highway 401/Courtice Road interchange. The construction activity and creek re-alignment was anticipated to cause significant disruption and prevent the placement of the sondes in the creek. As such, the Regions requested that the requirement to place the sondes in Tooley Creek be suspended until the interchange construction activities are complete. In a letter response dated May 17, 2016, from the MECP to the Regions, the MECP approved the suspension of the sondes placement and monitoring until the interchange construction activities are completed.



The MECP noted that surface water monitoring completed to-date has indicated that DYEC is not having an adverse effect on Tooley Creek. It is noted that remedial activities in accordance with the Monitoring Plan are still required to be completed for surface water, if required. A copy of the letters from the Regions and the MECP are provided in **Appendix A-2, Appendix A.**

1.3 Assumptions and Limitations

Historical data collected by others has been relied upon by RWDI for the purposes of preparing this 2018 Annual Groundwater and Surface Water Monitoring Report. RWDI has assumed that the information provided was factual and accurate as presented.

2 PHYSICAL SETTING

2.1 Geology and Hydrogeology

The Site is located in the physiographic region defined as the Iroquois Plain (Chapman and Putnam, 1984). In the vicinity of the Site, the Iroquois Plain is comprised of silty lacustrine deposits and tills. Mapping by the Ontario Geological Survey indicates that the Site is underlain by Newmarket Till, which is described as a dense till comprised of clayey silt and sand till (Stantec, 2011). The layer of Newmarket Till is estimated to be between 20 and 25 metres in depth. The Newmarket Till is underlain by an approximately 5 metre thick layer of intertill sediment, including both Thorncliffe and Scarborough formations, which is underlain by Whitby shale bedrock (Stantec, 2011).

As part of a geotechnical investigation completed by Jacques Whitford at the Site in 2008, 17 boreholes were advanced (Stantec, 2011). The boreholes were advanced to depths ranging from 5 to 12 metres below ground surface (BGS). The subsurface stratigraphy encountered at the boreholes generally included topsoil up to approximately 0.6 metres in depth, which was underlain by dense to very dense silty sand. Bedrock was not encountered during the advancement of the boreholes. As part of a geotechnical investigation conducted on the adjacent Courtice Water Pollution Control Plant (WPCP) property, which is located approximately 75 metres southwest of the Site, bedrock was encountered during borehole drilling at a depth of approximately 16 metres (Stantec, 2011).

Generally, ground surface elevations in the area of the Site gradually decrease from northeast to southwest toward Lake Ontario, which is located approximately 450 metres south of the Site. In the vicinity of the Site, ground surface elevations generally range from approximately 95 metres above sea level (ASL) to 102 metres ASL.

Regionally, shallow groundwater flow near the Site is anticipated to reflect surface topography and generally flow in a northeast to southwest direction toward Lake Ontario. Shallow groundwater flow may be influenced by local features including, but not limited to, Tooley Creek and its tributaries, surface water ponds and ditches, and underground utilities. Deep groundwater flow near the Site is anticipated to reflect bedrock topography and flow in a southerly direction toward Lake Ontario.



2.2 Surface Water Features

The Site is located within the Tooley Creek watershed and is located in the Central Lake Ontario Conservation Authority (CLOCA) jurisdiction. On-Site surface water features include SWMPs in the southwest (West SWMP) and southeast (East SWMP) corners of the Site. The nearest natural surface water body to the Site is a tributary of Tooley Creek, located approximately 150 metres northwest of the Site. At its nearest point, Tooley Creek is located approximately 700 metres southwest of the Site. The Tooley Creek watershed has an approximate length of (5) kilometres from its headwaters near Highway 2 to its discharge point at Lake Ontario (Stantec, 2011). Lake Ontario is located approximately 450 metres south of the Site.

3 DESCRIPTION OF MONITORING PROGRAM

The 2018 groundwater and surface water monitoring program for DYEC included groundwater monitoring only. As noted in **Section 1.2.2.1**, the surface water monitoring program for DYEC (i.e., placement and monitoring of sondes in Tooley Creek) has been suspended until the Highway 401/Courtice Road interchange construction activities are complete.

The groundwater monitoring program generally consists of the measurement of groundwater levels and the collection of groundwater samples for the relevant monitoring locations. The required monitoring locations, sampling frequency, and parameters of analysis are outlined in the Groundwater and Surface Water Monitoring Plan. Monitoring locations for the Site are shown in **Figure 2**.

3.1 Monitoring Locations

3.1.1 Groundwater

A total of eight (8) groundwater monitoring wells are installed at five (5) monitoring locations at the Site. Construction details for the monitoring wells are presented in **Table B-1, Appendix B**, as well as in the borehole logs provided in **Appendix B**. The locations for the monitoring wells are shown in **Figure 2**.

Two (2) monitoring wells, one (1) shallow and one (1) deep, are installed at different depths at locations MW2, MW3, and MW5. The shallow well is designated with the postscript "B" (e.g., MW2B) and the deeper well is designated with the postscript "A" (e.g., MW1A). It is noted that monitoring wells MW3A/B were decommissioned in September 2013 due to infrastructure construction activities in the area. MW3A/B were replaced in March 2014 in a nearby location and designated as MW3A-R and MW3B-R, respectively.



As discussed in **Section 4.2**, the groundwater elevations have changed as a result of the influence on the groundwater flow due to the presence of the trunk sewer installed to the west of the Site. As a result of the groundwater flow pattern change, the following summary is provided that details the monitoring wells' current assigned positions (e.g., downgradient) with respect to the DYEC facility.

- MW1 is located within the northwest corner of the Site and is crossgradient of DYEC.
- MW2A/B are located within the northeast corner of the Site and are upgradient of DYEC.
- MW3A-R/B-R are located within the southwest corner of the Site and are downgradient of DYEC.
- MW4 is located within the southeast corner of the Site and is downgradient of DYEC.
- MW5A/B are located within the central area of the Site and are internal assessment monitoring wells for DYEC.

Historically, groundwater monitoring location MW1 was noted to be upgradient of DYEC, and groundwater monitoring location MW5 was considered downgradient of the DYEC. As a result of the trunk sewer installation, which required the relocation of groundwater monitoring location MW3, the aforementioned groundwater monitoring locations MW1 and MW5 are now interpreted as presented above.

3.2 Monitoring Frequency

3.2.1 Groundwater

The Groundwater and Surface Water Monitoring Plan requires that groundwater monitoring events are completed three (3) times per year in the spring, summer, and fall. As discussed in **Section 1.2.1.1**, the Regions have requested that the Groundwater and Surface Water Monitoring Plan be amended to reduce the frequency of groundwater monitoring from three (3) times per year to once per year. Until confirmation and approval of the request is granted by the MECP, the groundwater sampling frequency will remain unchanged.

In 2018, the monitoring events were completed between April 20 and 23, between August 16 and 17, and between November 6 and 7. Each monitoring event included the measurement of groundwater levels and collection of groundwater samples at the relevant monitoring locations.

As discussed further in **Section 3.4**, the groundwater sample collection procedure for each monitoring well was initiated on the first day of each monitoring event in 2018. If discontinuous flow was observed while purging groundwater from a monitoring well (i.e., the monitoring well was purged "dry"), sample collection was only completed after a period of recovery (next day at a minimum).



3.3 Field and Laboratory Parameters and Analysis

3.3.1 Groundwater

In 2018, the field parameters temperature, pH, electrical conductivity (EC), and oxidation-reduction potential (ORP) were analyzed and recorded at the time of sample collection for each monitoring well and event.

Collected groundwater samples were submitted to Eurofins Scientific (Eurofins) in Ottawa, Ontario, for analysis of the required parameters noted in the summary below. Eurofins is a Canadian Association for Laboratory Accreditation (CALA) certified environmental laboratory. The required parameters for laboratory analysis are outlined in the Groundwater and Surface Water Monitoring Plan.

Parameter Group	Parameters
Major Anions	Carbonate, Bicarbonate, Chloride, Sulphate
Major Cations	Calcium, Magnesium, Potassium, Sodium
Metals	Boron, Cadmium, Cobalt, Lead, Mercury

3.4 Monitoring and Sampling Procedures

3.4.1 Groundwater

3.4.1.1 Groundwater Level Measurements

Groundwater levels were manually measured at the accessible monitoring wells at the Site during each monitoring event. The liquid levels for each monitoring well were measured using an electric contact meter with an accuracy of 10 millimetres. The meter was decontaminated between monitoring wells with an anionic detergent and rinsed with distilled water to mitigate the potential for cross-contamination between sampling/monitoring points.

The groundwater levels measured in 2018 and historically are presented in **Table C-1, Appendix C**, and plotted in **Figures C-1 to C-3, Appendix C**. Shallow groundwater flow contours are shown in **Figure 2**.



3.4.1.2 Groundwater Sampling

Groundwater samples were collected using dedicated inertial-lift pumps and tubing. Prior to monitoring well purging, the static groundwater level was measured and the groundwater volume within the well casing was calculated. The monitoring well was then purged with the dedicated inertial-lift pump until three (3) volumes were removed, or until a discontinuous flow of groundwater was observed.

The monitoring wells were each purged on the first day of each monitoring event in 2018. Sampling was completed after the removal of three (3) static volumes of groundwater or following a period of recovery (next day at a minimum) after producing discontinuous flow. It is noted that for select monitoring wells and events in 2018, where purging produced discontinuous flow (i.e., the monitoring well was purged 'dry'), multiple days of recovery were required such that sufficient groundwater volume was available for sample collection. At the time of sample collection, field indicator parameters temperature, pH, EC, and ORP were recorded onto dedicated field forms. The 2018 groundwater field analytical results are presented in **Table D-1, Appendix D**.

The groundwater samples were collected directly into bottles provided by the laboratory. Groundwater sample aliquots collected for metals analysis were filtered in the field using 45 micrometre in-line disposable filters.

Collected samples were submitted to Eurofins for analysis. The 2018 groundwater analytical results are presented in **Table D-2, Appendix D**. It is noted that the dates presented in **Tables D-1 and D-2, Appendix D**, represent the actual date of sample collection for the relevant monitoring well. Laboratory Certificates of Analysis are provided in **Appendix E**.

3.5 Quality Assurance and Quality Control for Sampling and Analysis

In accordance with the Groundwater and Surface Water Monitoring Plan, for each groundwater monitoring event completed in 2018 one (1) field-prepared duplicate sample was collected during the sample collection procedure for a select monitoring well as a quality assurance and quality control (QA/QC) measure.

The field duplicate samples and their respective original sample collected in 2018 are presented in the summary below.

Monitoring Event	Duplicate Sample ID	Original Sample ID
April 23, 2018	MW8002	MW5B
August 17, 2018	GW8002	MW5B
November 7, 2018	GW8002	MW5B



4 MONITORING RESULTS AND EVALUATION

4.1 Quality Assurance and Quality Control

QA/QC measures for the groundwater monitoring program completed for DYEC in 2018 included field-prepared duplicate samples, laboratory duplicates, laboratory spiked samples, as well as percent recovery of analysis and data review.

The laboratory analyzed several control samples to verify that their analytical equipment was functioning properly and reporting results accurately at the time of analysis for the samples collected at the Site. The control samples had an expected target value, which was compared against pre-determined data quality objectives. For the laboratory control samples, the results were within acceptable laboratory data quality criteria.

For the field-prepared duplicate samples, the analytical results for the required parameters of analysis were evaluated for the relative percent difference (RPD) of parameter concentrations using the USEPA National Functional Guidelines (US EPA 540-R-10-011) as a general QA/QC RPD screening mechanism. The RPD screening mechanism is such that for concentrations greater than five (5) times the laboratory reportable detection limit (RDL), a concentration difference of less than or equal to 20% is deemed acceptable. For concentrations less than or equal to five (5) times the RDL, a concentration difference of equal to or less than the RDL is deemed acceptable. Where a calculated RPD is outside of the tolerance of the general QA/QC RPD screening mechanism, the results for the required parameters of analysis are evaluated against the applicable performance standards for sample duplicates noted in Tables 5.1 to 5.15 of the *Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*, prepared by the Ministry of the Environment (MOE), dated March 9, 2004, and amended July 1, 2011. For the results found to be outside of the tolerance of each QA/QC evaluation, a laboratory data quality review (DQR) of the results is requested such that the concentrations are accurate as presented and are within acceptable laboratory data quality criteria.

4.1.1 Groundwater QA/QC

For each of the 2018 monitoring events, QA/QC evaluations were completed for the analytical results of the original samples and their respective duplicate samples, as outlined in **Section 3.5**. The analytical results of the original and duplicate samples collected for each monitoring event satisfied the criteria of the QA/QC evaluations. Therefore, the results of the evaluations indicated that the concentrations for the original samples were accurate as presented and acceptable for interpretive purposes.

In summary, acceptable QA/QC data for the field-prepared duplicate samples, laboratory duplicates, laboratory spiked samples, as well as percent recovery of analysis indicated that the detected parameter concentrations were accurate and reflected actual conditions at the time of sample collection.



4.2 Groundwater Levels and Flow

Groundwater levels have been measured in the groundwater monitoring wells at the Site since December 2011. The 2018 and historical groundwater level data are summarized in **Table C-1, Appendix C**. Hydrographs of the groundwater elevations at the Site are plotted in **Figures C-1 to C-3, Appendix C**. Monitoring well locations are shown in **Figure 2**. It is noted that, for the purposes of comparing groundwater levels and evaluating the groundwater flow direction at the Site, the top of each monitoring well riser pipe has been surveyed to an assumed Site datum.

The groundwater elevations measured at the Site have remained generally consistent since monitoring began at each monitoring well, with exceptions noted below for monitoring wells MW1 and MW4. Overall, the groundwater elevations for each monitoring well have been generally stable or have fluctuated, with no consistent increasing or decreasing trends over time. The fluctuating groundwater elevations are attributed to prolonged periods of precipitation (e.g., elevation increase in April due to a wet spring season) or lower than normal precipitation (e.g., elevation decrease in August due to a dry summer season).

At crossgradient monitoring well MW1, the groundwater elevation decreased more than 5 metres between the July 2013 and April 2014 monitoring events. This decrease is attributed to the presence of a trunk sewer to the west of the Site, where the groundwater preferentially flows toward the more porous backfill material used around the trunk sewer (i.e., the trunk sewer behaves like a French drain). Between April 2014 and April 2015, following the installation of the trunk sewer, the groundwater elevation at MW1 recovered by approximately 2.6 metres. Since April 2015, the groundwater elevation at MW1 has generally fluctuated with no consistent increasing or decreasing trend over time.

At downgradient monitoring well MW4, the groundwater elevation decreased by approximately 2 metres between the March and November 2012 monitoring events. This decrease is interpreted to be attributed to the construction of the East SWMP during the aforementioned period. Since November 2012, the groundwater elevation at MW4 has fluctuated and remained slightly higher than, the base elevation of the East SWMP.

Based on the 2018 groundwater elevations, the shallow groundwater flow direction at the Site was interpreted to be toward the southwest. Contour mapping of the shallow groundwater elevations and the interpreted groundwater flow direction, based on the April 2018 groundwater elevations, is presented in **Figure 2**. The interpreted groundwater flow regime presented in **Figure 2** is consistent with results from August and November 2018 and with results from previous years. The deep groundwater monitoring network at the Site is not sufficient to map groundwater contours across the Site, however, the deeper groundwater flow direction at the Site in 2018 was also interpreted to be toward the southwest.



Each of the monitoring wells at the Site are positioned in overburden. For the nested groundwater monitoring wells at the Site, the midpoints of the screen intervals for the deep monitoring wells (MW2A, MW3A-R, and MW5A) are approximately 2.6 to 3.1 metres deeper than the midpoints of the screen intervals for their respective shallow monitoring well counterpart. For the nested monitoring well locations, the vertical hydraulic gradients were calculated for the 2018 and historical data. The calculated vertical hydraulic gradients are presented in **Table C-2, Appendix C**.

The hydraulic gradients calculated for the 2018 groundwater elevations were generally consistent with historical results. In 2018, downward gradients were observed between the shallow and deep monitoring wells at MW2 and MW3 in April, August, and November. Between the shallow and deep monitoring wells at monitoring nest MW5, a slight upward gradient was observed in April and slight downward gradients were observed in August and November. The vertical gradients in 2018 ranged between 0.01 metres per metre in an upward direction at MW5 in April and 0.32 metres per metre in a downward direction at MW2 in April. Groundwater movement through the overburden at the Site has historically been generally downward at MW2 and MW3 with occasional upward gradients. At MW5, the vertical hydraulic gradient has historically been even (i.e., 0.0 metres per metre) and fluctuates between slight upward and slight downward gradients.

4.3 Groundwater Quality

The 2018 groundwater field analytical results are tabulated in **Table D-1, Appendix D**. The 2018 and historical groundwater laboratory analytical results are tabulated in **Table D-2, Appendix D**. Laboratory Certificates of Analysis are provided in **Appendix E**.

4.3.1 Concentration Trends

Concentration vs. time plots for chloride, sodium, sulphate, calcium, magnesium, potassium, boron, and bicarbonate are presented in **Figures D-1 to D-8, Appendix D**, respectively. As shown in **Figures D-1 to D-8**, the concentrations of each relevant parameter have remained generally stable or have fluctuated since monitoring began at each monitoring well, with exceptions noted below.

- As shown in **Figure D-1** and **D-2**, the concentrations of salt related parameters chloride and sodium, respectively, within the groundwater at upgradient monitoring well MW2B have generally increased since 2014. It is noted that, although they remain elevated, the concentrations of chloride and sodium within the groundwater at MW2B decreased in August and November 2018 compared to their respective historical upper limit concentrations detected in April 2018. The concentrations of chloride and sodium within the groundwater at internal assessment monitoring well MW5B have also generally increased since 2014. Within the groundwater at crossgradient monitoring well MW1 the concentrations of chloride and sodium slightly increased between 2014 and 2015 and have since been generally stable. The beginning of the increasing trend of chloride and sodium concentrations within the groundwater at MW1, MW2B, and MW5B coincides with the approximate time of construction of Energy Dr. north and west of the Site, as well as the on-Site roadways and parking lot.



As such, the increasing concentrations of the salt related parameters are attributed to the application of de-icing salt during the winter season to Energy Dr., Osborne Rd., and/or the on-Site roadways/parking lot. It is noted that the 2018 and historical concentrations of chloride and sodium within the groundwater at MW1, MW2B, and MW5B have satisfied their respective ODWS criterion.

- As shown in **Figure D-1**, the concentration of the salt-related parameter chloride within the groundwater at downgradient monitoring well MW4 was generally stable since monitoring began until distinctly increasing in November 2016. The concentration of chloride was elevated again in November 2017, as well as in August and November 2018. As shown in **Figures D-2, D-4, D-5, and D-6**, the concentrations of additional salt related parameters sodium, calcium, magnesium, and potassium, respectively, within the groundwater at monitoring well MW4, were also generally stable until distinctly increasing in November 2017. The concentrations of these parameters were also elevated in August and November 2018. For the salt related parameters, only chloride and sodium have an ODWS. In August and November 2018, the concentration of chloride [765 and 1,160 milligrams per litre (mg/L), respectively], was greater than its ODWS (250 mg/L). In November 2018 the concentration of sodium (293 mg/L) was also greater than its ODWS (200 mg/L).
- The internal assessment and downgradient monitoring locations MW5 and MW3, respectively, are in closer proximity to the DYEC facility than MW4. As shown in **Figures D-1, D-2, D-4, D-5, and D-6**, the concentrations of the salt related parameters have been consistently less than the elevated concentrations detected within MW4. As such, there is no indication that the noted concentrations of the salt related parameters detected within MW4 have migrated downgradient within the shallow groundwater as a result of DYEC waste treatment operations. Therefore, the detected salt related parameter concentrations at MW4 are interpreted to be attributed to the application of de-icing salt to Energy Dr., Osborne Rd., the nearby off-Site roadway to the Courtice WPCP, and/or the on-Site roadways/parking lot.

In summary, since groundwater monitoring began at the Site in 2011, concentrations of most required parameters of analysis in the shallow and deep groundwater monitoring wells have generally fluctuated or been stable with no apparent increasing or decreasing trend, exclusive of those trends outlined above. The concentrations of the salt related parameters chloride, sodium, calcium, magnesium, and potassium detected within groundwater, each cross-gradient and downgradient of DYEC, are not attributable to DYEC waste treatment operations, but are the result of the application of de-icing salt to Energy Dr., Osborne Rd., the nearby off-Site roadway to the Courtice WPCP, and/or the on-Site roadways/parking lot.



It is noted that elevated chloride concentrations, as well as the concentrations of the other salt related parameters sodium, calcium, potassium and magnesium, are commonly elevated in groundwater where a monitoring well is situated near roads or parking lots that are surface treated with brine or salt for dust control or de-icing. It is expected that the concentrations of the salt related parameters will continue to fluctuate and/or increase over time with the continued practice of roadway and/or parking lot de-icing. As only salt related parameters show elevated concentrations compared to concentrations for metal parameters within the groundwater, no remedial action is warranted to address the noted concentrations for the salt related parameters.

The rapid increase of the concentrations of salt related parameters within the groundwater at MW4 suggests that stormwater and/or shallow groundwater influenced by de-icing salt may be entering the well casing directly. As such, it is recommended that MW4 is inspected with a down-well closed-circuit television (CCTV) camera to visually assess the integrity of the monitoring well and to determine if the monitoring well installation may be compromised. The findings of the inspection would be used to determine if potential repairs, replacement, and/or relocation for MW4 are warranted.

4.4 Regulatory Criteria

In accordance with the Groundwater and Surface Water Monitoring Plan for DYEC, groundwater quality at the Site is required to be evaluated by comparing the groundwater quality data to the respective criteria provided in the *Technical Support Document for Ontario Drinking Water, Standards, Objectives, and Guidelines* (MOE, 2006). These standards are collectively referred to as the ODWS. For the required parameters of analysis, their respective ODWS are presented in **Table D-2, Appendix D**.

It is noted that the aesthetic objective for sodium is 200 mg/L. However, as indicated in the ODWS (MOE, 2006), the local Medical Officer of Health should be notified when the sodium concentration (in drinking water) exceeds 20 mg/L so that this information may be communicated to local physicians for their use in notifying patients on sodium restricted diets. Groundwater is not used as a drinking water source at or downgradient of DYEC and therefore, the aesthetic objective of 200 mg/L for sodium is utilized to assess the overall groundwater quality.

For the 2018 monitoring events, the groundwater analytical results for the required parameters of analysis satisfied their respective ODWS, except for the results summarized below.

Monitoring Well	Monitoring Event	Parameter	ODWS (mg/L)	Analytical Result (mg/L)
MW4	August 17, 2018	Chloride	250	765
	November 7, 2018	Chloride	250	1,160
		Sodium	200	293

Note: 1) mg/L denotes milligrams per litre.



As discussed in **Section 4.3**, based on the interpreted groundwater flow direction and the analytical results for chloride and sodium at downgradient monitoring wells in closer proximity to the DYEC facility, there is no indication that the elevated 2018 concentrations of chloride and sodium within the groundwater at MW4 migrated downgradient as a result of DYEC waste treatment operations. The elevated concentrations of chloride and sodium detected at MW4 in 2018 are interpreted to be attributed to the application of de-icing salt. Therefore, no remedial actions are warranted to address the noted chloride and sodium concentrations.

Based on a review of 2018 and historical groundwater analytical results for the Site, the data suggests that DYEC waste treatment operations have not had an adverse effect on groundwater quality at the Site. As discussed, the elevated concentrations of chloride and sodium at monitoring well MW4 in 2018 are interpreted to be attributed to the application of de-icing salt. For the remaining monitoring wells and parameters, there are not any trends of concern that would suggest an impending exceedance of an ODWS within the downgradient groundwater quality at the Site as a result of DYEC waste treatment operations.

As discussed, it is recommended that MW4 be inspected to visually assess the integrity of the monitoring well and to determine if the integrity of the monitoring well installation is compromised. The concentrations of chloride and sodium at MW4 should also continue to be monitored during subsequent monitoring events to evaluate the concentration trends over time.

5 CONTINGENCY MEASURES

In accordance with Condition 17 of the EA Approval, a Spill Contingency and Emergency Response Plan has been developed for the Site. The Spill Contingency and Emergency Response Plan documents remedial actions that are required in the event of a spill or upset condition (Stantec, 2011). It is the understanding of RWDI that a spill or upset condition requiring remedial action did not occur at the Site in 2018.

6 2019 MONITORING PROGRAM

The proposed 2019 monitoring program considers the findings of this report and the MECP approved Groundwater and Surface Water Monitoring Plan for the Site. Details of the monitoring programs for the Site, including analytes, are summarized in **Section 3** of this report. The groundwater monitoring locations for the Site are shown in **Figure 2**.

As discussed in **Section 1.2.1.1**, the Regions have requested that the Groundwater and Surface Water Monitoring Plan be amended to reduce the frequency of groundwater monitoring from three (3) times per year to once per year. Until confirmation and approval of the request is granted by the MECP, the groundwater sampling frequency will remain unchanged.



As discussed in **Section 1.2.2.1**, with MECP approval, the routine surface water monitoring program for DYEC (i.e., placement and monitoring of sondes in Tooley Creek) has been suspended until the Highway 401/Courtice Road interchange construction activities are complete. Based on the construction status of the Highway 401/Courtice Road interchange as of the date of this report, it is not anticipated that construction will be completed until at least 2020. As such, the routine surface water monitoring program for DYEC outlined in the Groundwater and Surface Water Monitoring Plan should not be completed in 2019.

An annual monitoring report that details the findings of the 2019 monitoring period will be prepared and submitted to the MECP by April 30, 2020. The annual report should be prepared in consideration of historical report submissions while acknowledging the purpose and objectives of the monitoring program, which are summarized in **Section 1.2** of this report.

7 CONCLUSIONS

Based on the findings presented in this report, the following conclusions are provided.

- Based on the 2018 groundwater elevations, the shallow and deeper groundwater flow direction at the Site was interpreted to be toward the southwest, with minor flow alterations as a result of the influences from the trunk sewer.
- For the groundwater sampling program completed for DYEC in 2018, QA/QC measures indicated that the detected constituent concentrations were accurate and reflected actual conditions at the time of sample collection.
- The concentrations of the salt related parameters chloride and sodium within the groundwater at upgradient monitoring well MW2B and at internal assessment monitoring well MW5B have generally increased since 2014/2015. The concentrations of chloride and sodium within the groundwater at crossgradient monitoring well MW1 slightly increased between 2014 and 2015 and have since been generally stable. The beginning of the increasing trend of the salt related parameter concentrations within MW1, MW2B, and MW5B coincides with the approximate time of construction of Energy Dr. north and west of the Site, as well as the on-Site roadways and parking lot. As such, the increasing concentrations of the relevant parameters are interpreted to be attributed to the application of de-icing salt during the winter season to Energy Dr., Osborne Rd., and/or the on-Site roadways/parking lot. It is noted that the 2018 and historical concentrations of chloride and sodium within the groundwater at MW1, MW2B, and MW5B have satisfied their respective ODWS criterion.



- Within the groundwater at downgradient monitoring well MW4, the concentrations of the salt related parameters chloride, sodium, calcium, magnesium, and potassium were generally stable since monitoring began at this monitoring well until distinctly increasing in 2016. The concentrations of these parameters were elevated again in August and November 2018. For each parameter, the concentration detected in November 2018 represents the maximum concentration detected within the groundwater at MW4 to-date.
 - The detected salt related parameter concentrations within the groundwater at MW4 are interpreted to be attributed to the application of de-icing salt to Energy Dr., Osborne Rd., the nearby off-Site roadway to the Courtice WPCP, and/or the on-Site roadways/parking lot. It is noted that, at the internal assessment and downgradient monitoring locations MW5 and MW3, respectively, which are in closer proximity to the DYEC facility than MW4, the concentrations of the salt related parameters have been consistently less than the elevated concentrations detected within MW4. As such, there is no indication that the noted concentrations of the salt related parameters detected within the groundwater at MW4 have migrated downgradient within the shallow groundwater as a result of DYEC waste treatment operations.
 - It is noted that elevated chloride and sodium concentrations, as well as the concentrations of other salt related parameters (i.e., calcium, potassium and magnesium), are commonly elevated in groundwater where a monitoring well is situated near roads that are surface treated with brine or salt for dust control or de-icing. It is expected that the concentrations of the salt related parameters will continue to fluctuate and/or increase over time with the continued practice of roadway and/or parking lot de-icing. As only salt related parameters show elevated concentrations compared to concentrations for metal parameters within the groundwater, no remedial action is warranted to address the noted concentrations for the salt related parameters.
- For the 2018 monitoring events, the groundwater analytical results for the required parameters of analysis satisfied their respective ODWS, except for select salt related parameters within the groundwater at monitoring well MW4. For the salt related parameters, only chloride and sodium have an ODWS. In August and November 2018, the concentration of chloride (765 and 1,160 mg/L, respectively) was greater than its ODWS (250 mg/L). In November 2018 the concentration of sodium (293 mg/L) was also greater than its ODWS (200 mg/L). Based on the interpreted groundwater flow direction and the analytical results for chloride and sodium at downgradient monitoring wells in closer proximity to the DYEC facility, there is no indication that the elevated 2018 concentrations of chloride and sodium within the groundwater at MW4 migrated downgradient as a result of DYEC waste treatment operations. As discussed, the elevated concentrations of chloride and sodium detected at MW4 in 2018 are interpreted to be attributed to the application of de-icing salt. Therefore, no remedial actions are warranted to address the noted chloride and sodium concentrations.



- Overall, based on a review of 2018 and historical groundwater analytical results for the Site, the data suggests that DYEC waste treatment operations have not had an adverse effect on groundwater quality at the Site.
- With MECP approval, the routine surface water monitoring program (i.e., placement and monitoring of sondes in Tooley Creek) for DYEC was suspended until the Highway 401/Courtice Road interchange construction activities are complete. As construction activities were not completed prior to or during the 2018 monitoring period, the routine surface water monitoring program for DYEC outlined in the Groundwater and Surface Water Monitoring Plan was not required to be completed in 2018.

8 RECOMMENDATIONS

Based on the findings of the 2018 monitoring program, the following recommendations are provided for your consideration.

- Groundwater monitoring at the Site should continue in 2019, in accordance with MECP-approved Groundwater and Surface Water Monitoring Plan. As discussed in **Section 1.2.1.1**, the Regions have requested that the Groundwater and Surface Water Monitoring Plan be amended to reduce the frequency of groundwater monitoring from three (3) times per year to once per year. Until confirmation and approval of the request is granted by the MECP, the groundwater sampling frequency will remain unchanged.
- The MECP approved the suspension of the routine surface water monitoring program for DYEC (i.e., placement and monitoring of sondes in Tooley Creek) until the Highway 401/Courtice Road interchange construction activities are complete. Based on the construction status of the Highway 401/Courtice Road interchange as of the date of this report, it is not anticipated that construction will be completed until at least 2020. As such, the routine surface water monitoring program should not be completed in 2019.
- The rapid increase of the concentrations of salt related parameters within the groundwater at MW4 suggests that stormwater and/or shallow groundwater influenced by de-icing salt may be entering the well casing directly. As such, it is recommended that MW4 is inspected with a down-well CCTV camera to visually assess the integrity of the monitoring well and to determine if the monitoring well installation may be compromised.
- The concentrations of salt related parameters chloride, sodium, calcium, magnesium, and potassium within the groundwater at the Site should continue to be evaluated on an ongoing basis to verify that the concentrations of these parameters continue to be attributable to the effects of roadway and parking lot de-icing practices and not to DYEC waste treatment operations.



9 STUDY LIMITATIONS AND USE OF REPORT

This report was prepared using scientific principles and professional judgment in assessing available facts and presenting subjective interpretations. The professional judgments presented within this document are based on available facts within the limits of the existing information, budgeted scope of work, and schedule. It is RWDI's intent that the professional judgment and interpretive conclusions be utilized as guidance and not be necessarily construed as a firm course of action, unless explicitly stated otherwise. We make no warranties, expressed or implied, including without limitation, or warranties as to merchantability or fitness of the property for a particular purpose. The information presented in this report is not to be construed as legal advice.

RWDI relied on information obtained from Site representatives, independent sources, and other historical documentation as referenced in this report. The accuracy and completeness of third party sources was not verified. It is noted that regulatory guidelines, standards, and related documents as they may be referenced in this report are subject to interpretation and may change over time.

This report was prepared for the exclusive use of the Regional Municipality of Durham, The Regional Municipality of York, and the Ministry of the Environment, Conservation and Parks. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. RWDI accepts no responsibility for damages, if any, suffered by any third party as result of decisions made or actions based on this report.

10 CLOSURE

We trust that this 2018 Annual Groundwater and Surface Water Monitoring Report, prepared in accordance with Condition 20.8 of the Environmental Assessment Notice of Approval and Condition 15 of the Environmental Compliance Approval Number 7306-8FDKNX for the Durham York Energy Centre in the Municipality of Clarington, Ontario, is satisfactory for your requirements. Should there be any questions or comments, please contact us.

Sincerely,

RWDI

Report Prepared By:

A handwritten signature in black ink, appearing to read 'Andy de Jong'.

Andy de Jong, M.A.Sc., P.Eng.
Senior Engineer

A handwritten signature in black ink, appearing to read 'Philippe E. Janisse'.

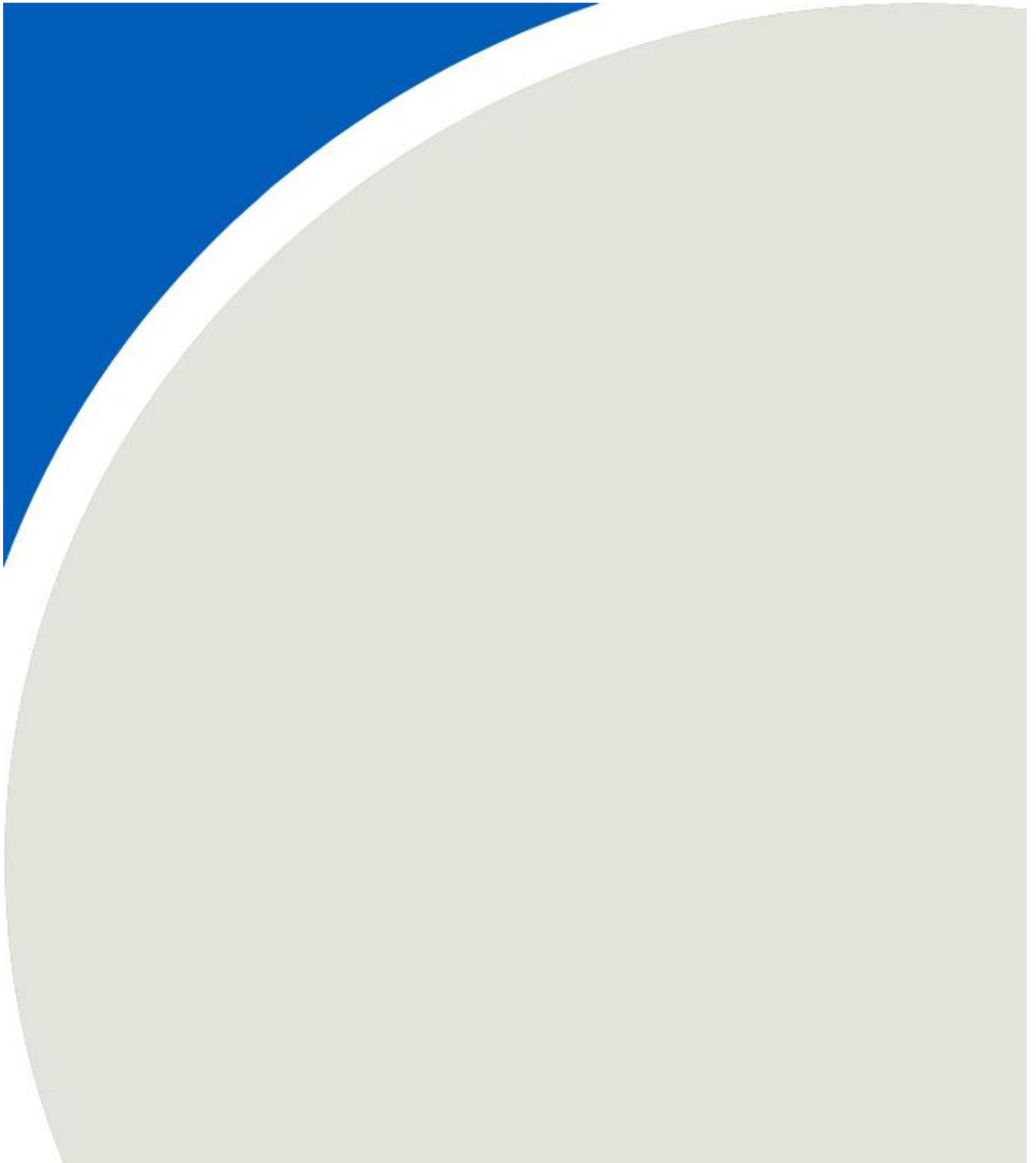
Philippe E. Janisse, B.Sc., P.Geo.
Project Manager | Sr. Geoscience Specialist

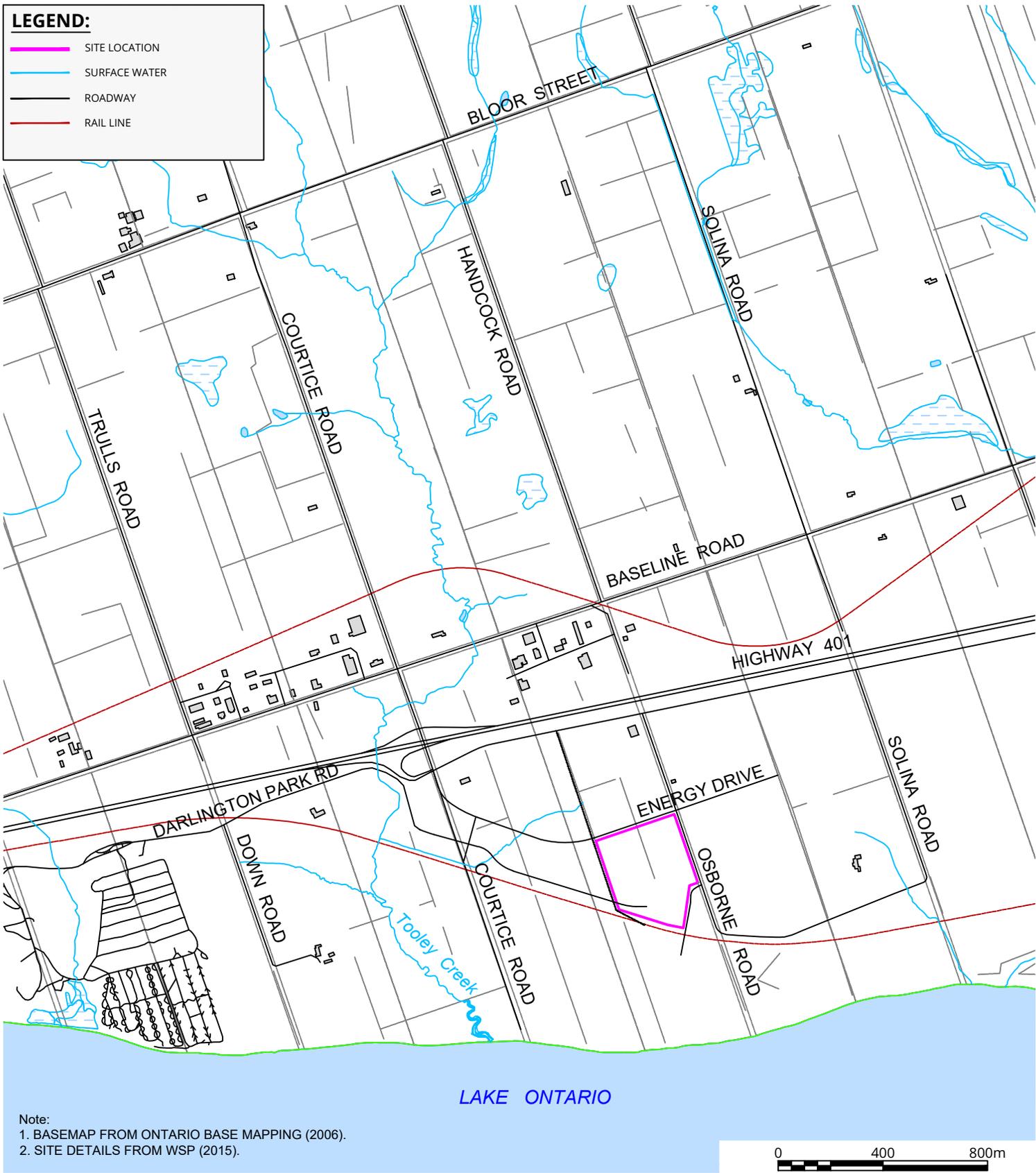


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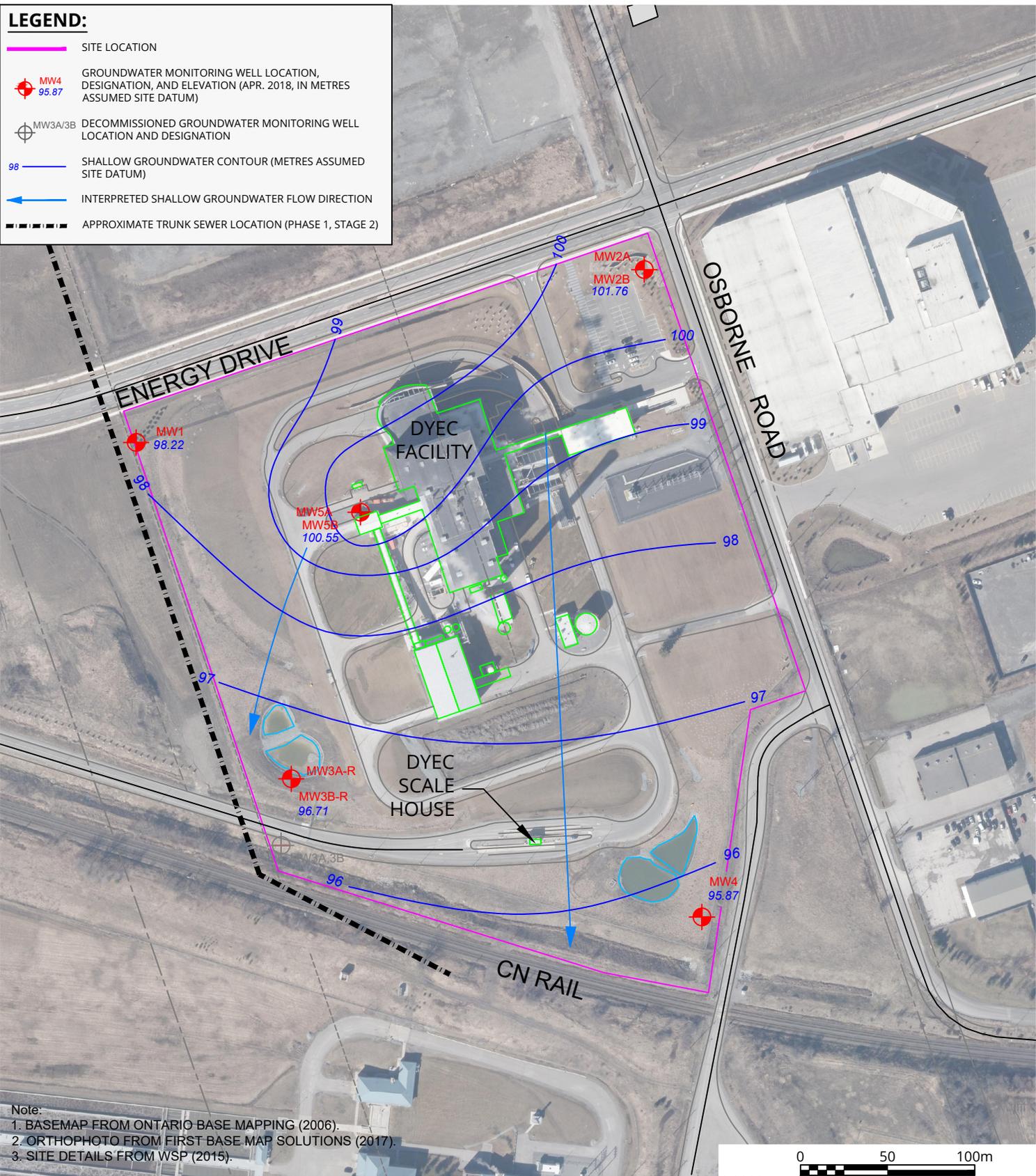
FIGURES





Note:
 1. BASEMAP FROM ONTARIO BASE MAPPING (2006).
 2. SITE DETAILS FROM WSP (2015).

SITE LOCATION MAP DURHAM YORK ENERGY CENTRE 2018 ANNUAL GROUNDWATER AND SURFACE WATER MONITORING REPORT THE REGIONAL MUNICIPALITY OF DURHAM	True North 	Drawn by: YL Figure: 1	
		Approx. Scale: 1:20,000	
	Project # 1604066	Date Revised: Jan. 15, 2019	



Note:
 1. BASEMAP FROM ONTARIO BASE MAPPING (2006).
 2. ORTHOPHOTO FROM FIRST BASE MAP SOLUTIONS (2017).
 3. SITE DETAILS FROM WSP (2015).

SITE PLAN
 DURHAM YORK ENERGY CENTRE
 2018 ANNUAL GROUNDWATER AND SURFACE WATER MONITORING REPORT

THE REGIONAL MUNICIPALITY OF DURHAM



Project # 1604066

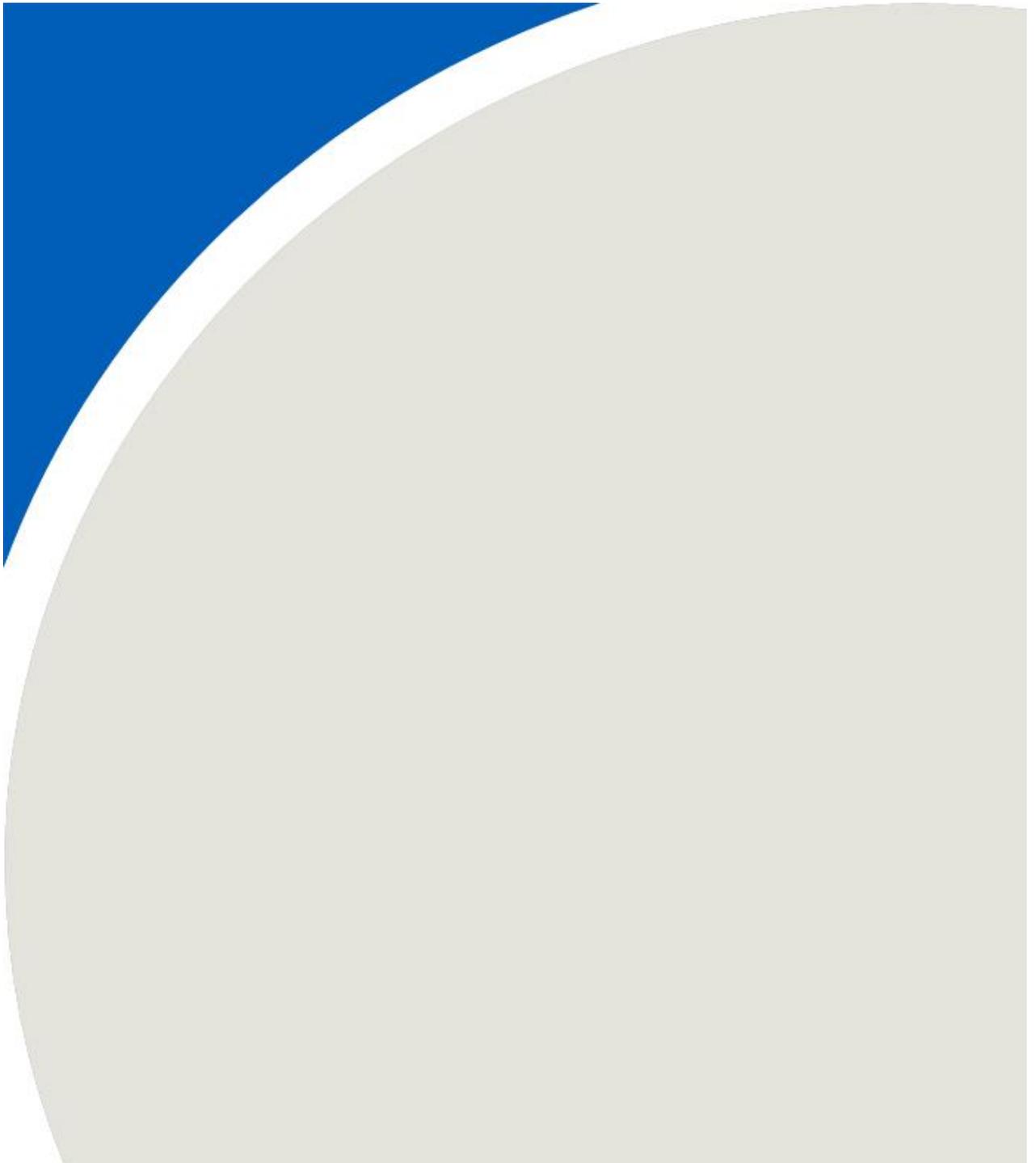
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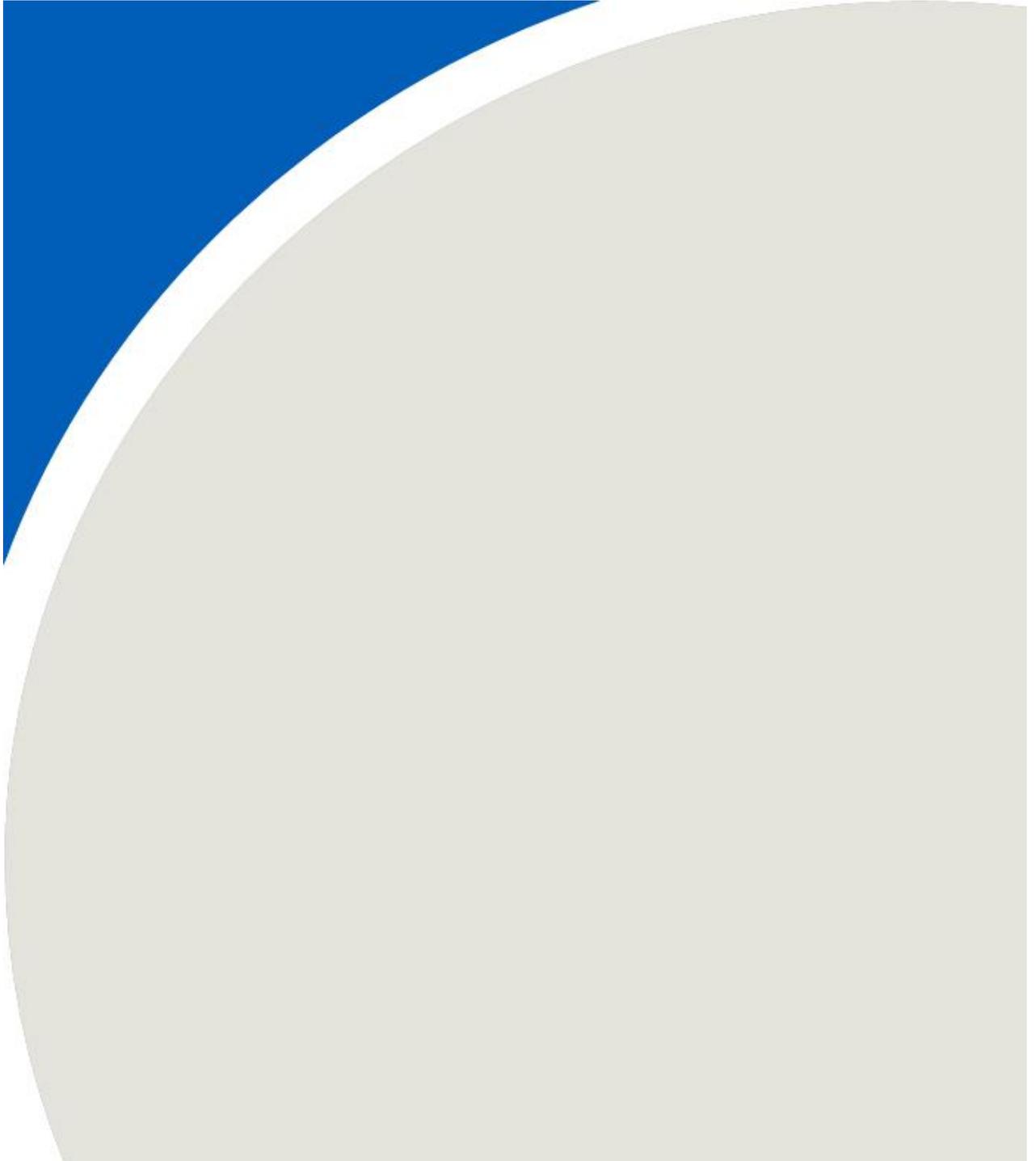
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Date Revised: Jan. 15, 2019	



APPENDIX A



APPENDIX A-1



If you require this information in an accessible format, please contact The Regional Municipality of Durham at 1-800-372-1102 ext. 3560.



January 9, 2019

Lisa Trevisan, Director, Central Region
Ministry of the Environment, Conservation and Parks
Place Nouveau
5775 Yonge Street, Floor 8
North York, ON M2M 4J1

Dear Ms. Trevisan:

**RE: Durham York Energy Centre
Groundwater and Surface Water Monitoring Plan
Request to Amend Groundwater Monitoring Frequency
Environmental Compliance Approval 7(14)
MECP File #: EA-08-02**

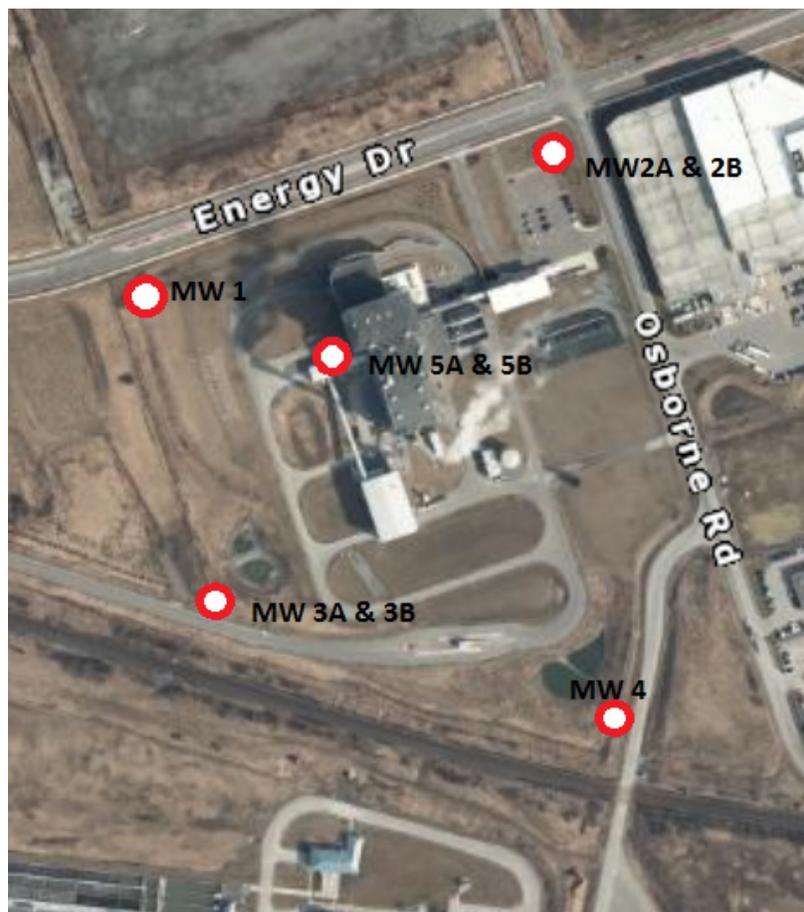
In accordance with Condition 20.4 of the Notice of Approval to Proceed with the Undertaking (Environmental Assessment (EA) Approval) and Condition 7(14) of the Environmental Compliance Approval (ECA), the Regional Municipality of Durham and the Regional Municipality of York (the Regions) have undertaken groundwater monitoring at the Durham York Energy Centre (DYEC) in accordance with the approved Groundwater and Surface Water Monitoring Plan (the Monitoring Plan). Sampling commenced in December 2011, prior to the start of facility construction, and has continued through facility construction and more than three years of DYEC operations. Sampling occurs three times per year in the spring, summer, and fall, and the results of the monitoring program are summarized in annual reports to the Ministry of Environment, Conservation and Parks (MECP).

As summarized in these annual reports, the groundwater monitoring program has shown no adverse impacts from DYEC operations. The Regions therefore propose that the Monitoring Plan be amended to reduce the required groundwater monitoring frequency from three times per year to once per year commencing in 2019. In accordance with Condition 20.5 of the EA Approval, amendments to the Monitoring Plan may be approved by the Director of the MECP Central Region Office. The Regions' rationale for requesting this change is summarized in the following sections.

Summary of Groundwater Monitoring Results

Groundwater is monitored at eight monitoring wells installed in five locations. The locations of the monitoring wells (MW) are shown on Figure 1 below. Based on observed water elevations in these wells, the direction of groundwater flow is interpreted to be toward the southwest. Borehole logs for the monitoring wells confirm that the facility is constructed on silty glacial till soils. Rising head tests performed at the time of monitoring well installation showed hydraulic conductivities ranging from a low of 1.6×10^{-8} m/s at MW3A to a high of 9.0×10^{-7} m/s at MW2A. Based on these hydraulic conductivities and the horizontal hydraulic gradients observed on the site, it is anticipated that groundwater will travel at a rate of approximately one metre per year or less. In the event that a groundwater contamination issue was to develop at the site, the low rate of groundwater flow would limit the rate of contaminant dispersion and provide the Regions with ample opportunity to undertake remediation.

Figure 1: DYEC Monitoring Well Locations



Analytical results for the required groundwater monitoring parameters have shown no significant trends since monitoring began in December 2011 with the exception of some de-icing salt influence observed at MW1, MW2B, MW4, and MW5B. Each of these wells are located directly adjacent to and downgradient from paved surfaces where road salt has been applied during winter months. The highest impacts have been observed at MW4, which reported a chloride concentration of 765 mg/L and a sodium concentration of 148 mg/L in August 2018. However, it should be noted that, while concentrations of salt-related constituents are elevated, concentrations of heavy metals and other contaminants typically associated with waste processing are not elevated. Further, it should be noted that MW3A and MW3B, which are located closer to the waste processing area than MW4, and more directly downgradient, do not currently report elevated concentrations of any monitoring parameter.

Groundwater analytical results to date show no significant seasonal trends and suggest that DYEC operations have not had an adverse effect on groundwater quality at the site. Graphs showing a seasonal comparison of parameter concentrations at each monitoring well are enclosed for reference.

Groundwater Protection Measures

Many design features were incorporated into the DYEC to protect groundwater. These features include the following:

- The DYEC is a zero-process water discharge facility.
- The refuse pit is constructed using one metre thick concrete conforming to Canadian Standards Association (CSA) A23.1 Class C-1 performance standards, which applies to structurally reinforced concrete that is exposed to chlorides at a wide range of temperature conditions.
- The refuse pit is lined on the exterior with a sodium bentonite waterproofing membrane to prevent leakage of water into or out of the pit.
- Refuse pit construction includes PVC water stops in the construction joints which form a continuous, watertight barrier that prevents the passage of fluid.
- Diesel tanks are of double-walled construction with leak detection system and are checked daily per the DYEC Containment Protocol.
- A containment dyke surrounds the ammonia tank. Daily general inspection of the ammonia tank for leaks and annual calibrations of the ammonia alarm are safeguards included in the DYEC Containment Protocol.

The DYEC also has an approved Spill Contingency and Emergency Response Plan in place which details the actions to be taken and the measures in place to mitigate on-site spills.

In conclusion, the DYEC facility design includes rigorous engineering controls and operating procedures to ensure groundwater protection. Monitoring results to date have demonstrated the effectiveness of these groundwater protection measures and have confirmed the absence of any impacts to groundwater resulting from waste processing operations. The Regions consider the risk associated with reducing the frequency of groundwater monitoring to once per year to be low.

Subject to MECP approval, the Regions would continue to sample groundwater once per year in the fall, commencing in 2019. There would be no other changes to groundwater monitoring parameters or procedures and the Regions would continue to provide an annual report by April 30 of each year for the monitoring results in the previous calendar year.

If you require any further information, please contact Mr. Gioseph Anello, Manager of Waste Planning and Technical Services, at 905-668-7711 extension 3445.

Sincerely,

Mirka Januszkiewicz, P.Eng.
Director, Waste Management Services

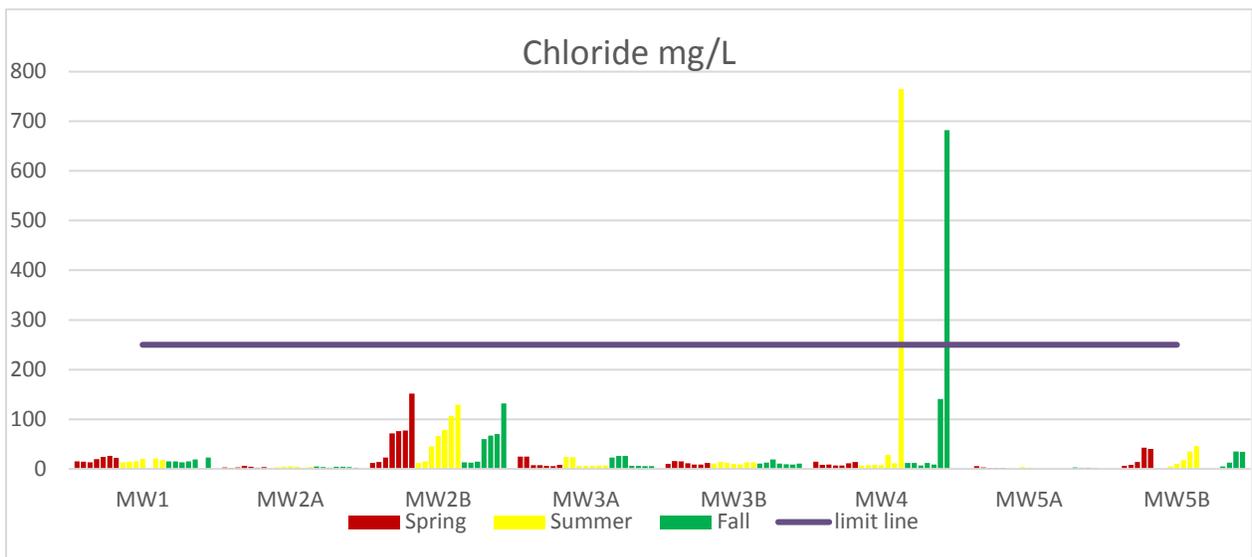
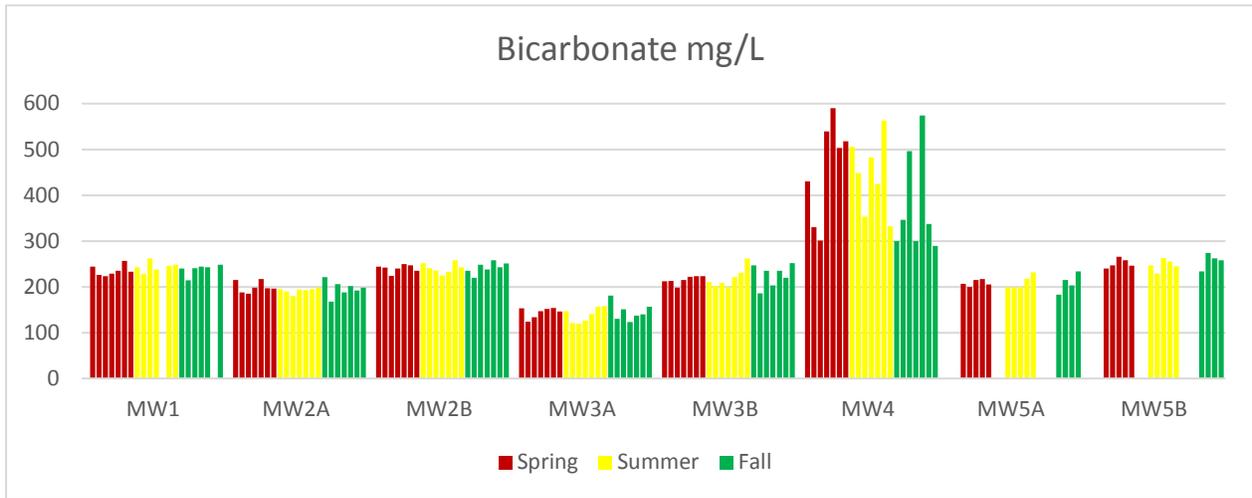
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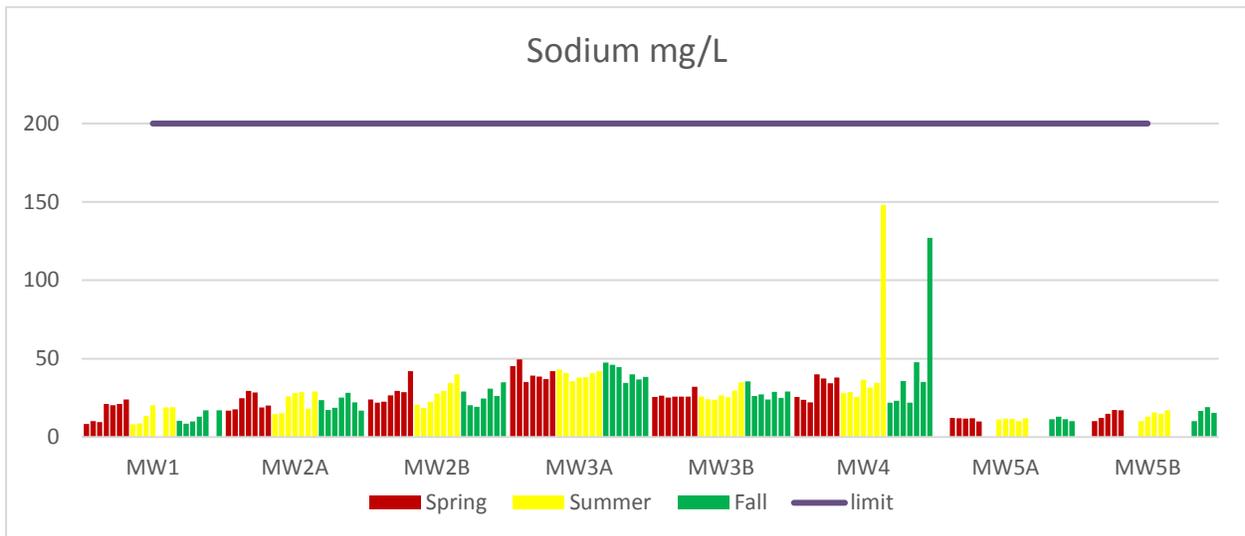
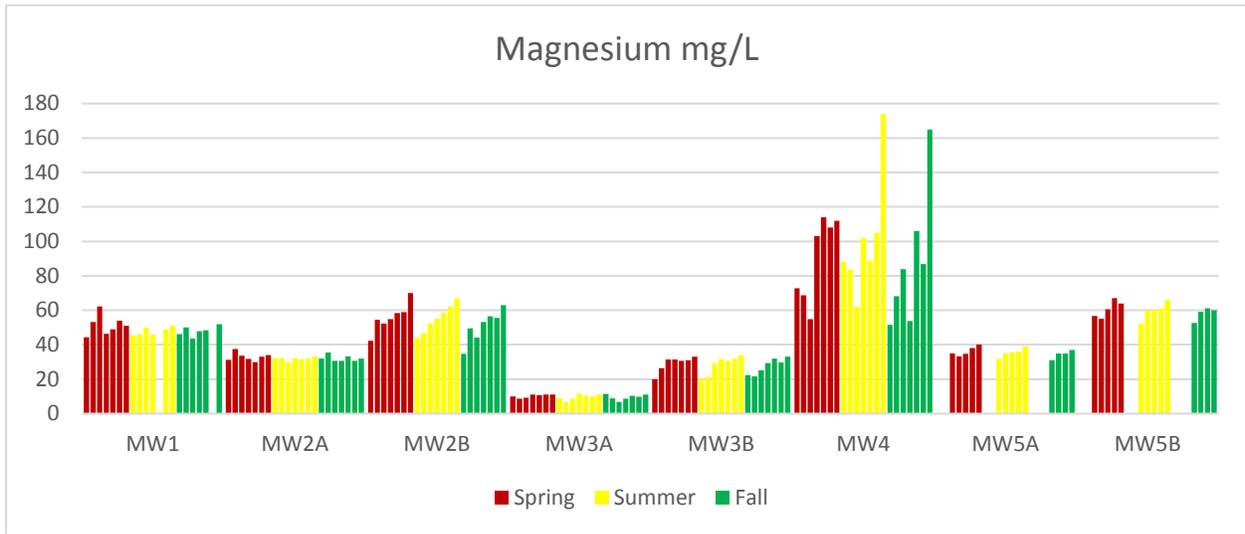
- c. M. Mahmood, Manager, Environmental Approvals, MECP
- A. Cross, Manager, Environmental Assessments, MECP
- C. Dugas, Manager, York Durham District Office, MECP
- L. Hussain, Manager, Technical Support Section, MECP
- T. Belayneh, Senior Water Scientist, Surface Water Unit, MECP
- P. Dunn, Senior Environmental Officer, MECP
- P. Martin, Supervisor, Air, Pesticides and Environmental Planning, MECP
- G. Battarino, Special Project Officer, Project Coordination, MECP
- E. O'Leary, Environmental Resource Planner and EA Coordinator, Air, Pesticides
and Environmental Planning, MECP
- A. Huxter, Environmental Specialist, Covanta
Energy from Waste Advisory Committee (EFWAC)
- C. Raynor, Regional Clerk, The Regional Municipality of York
- R. Walton, Regional Clerk, The Regional Municipality of Durham

Enclosure

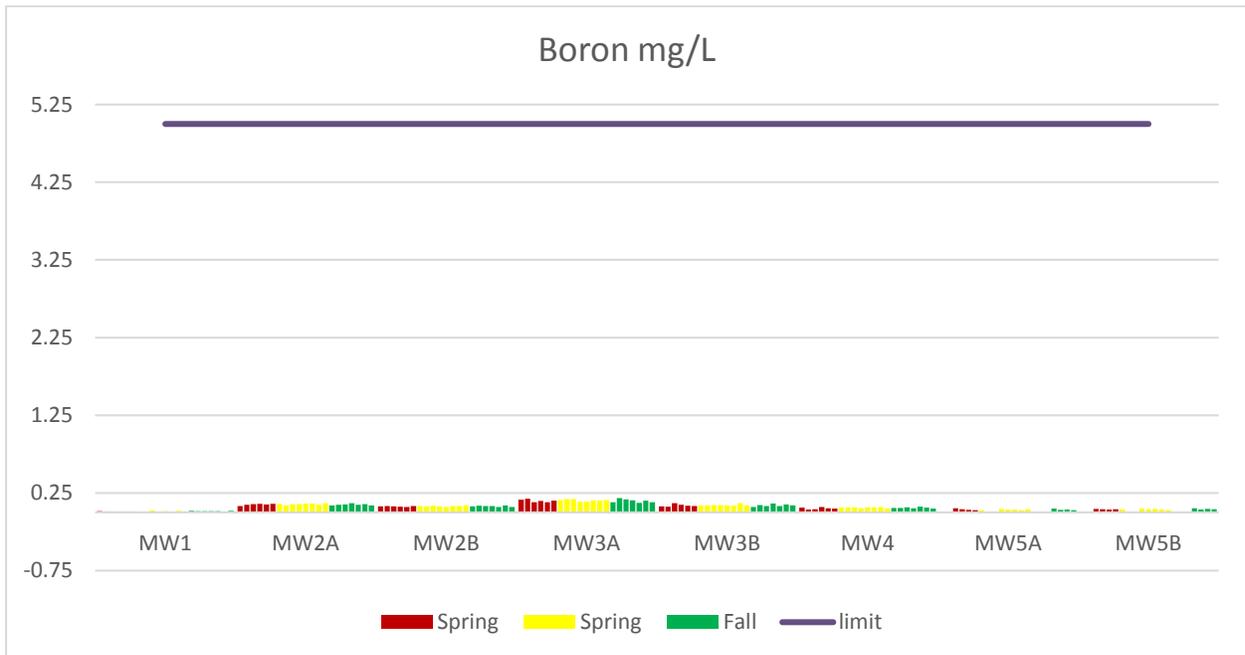
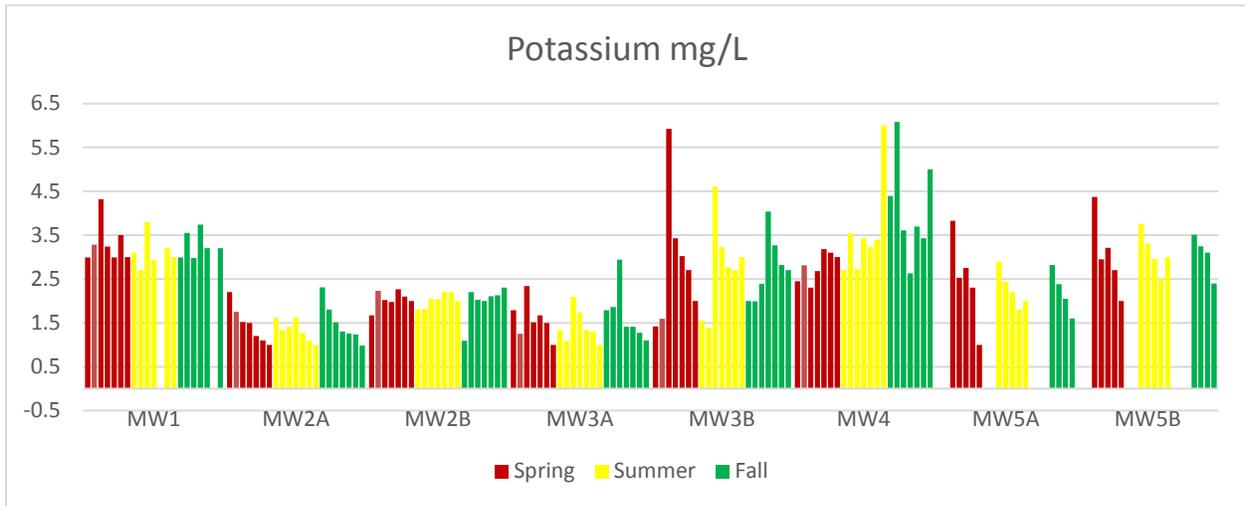
Seasonal Comparisons of Parameter Concentrations at Monitoring Wells: MW1, MW2A, MW2B, MW3A, MW3B, MW4, MW5A, and MW5B for the Durham York Energy Centre



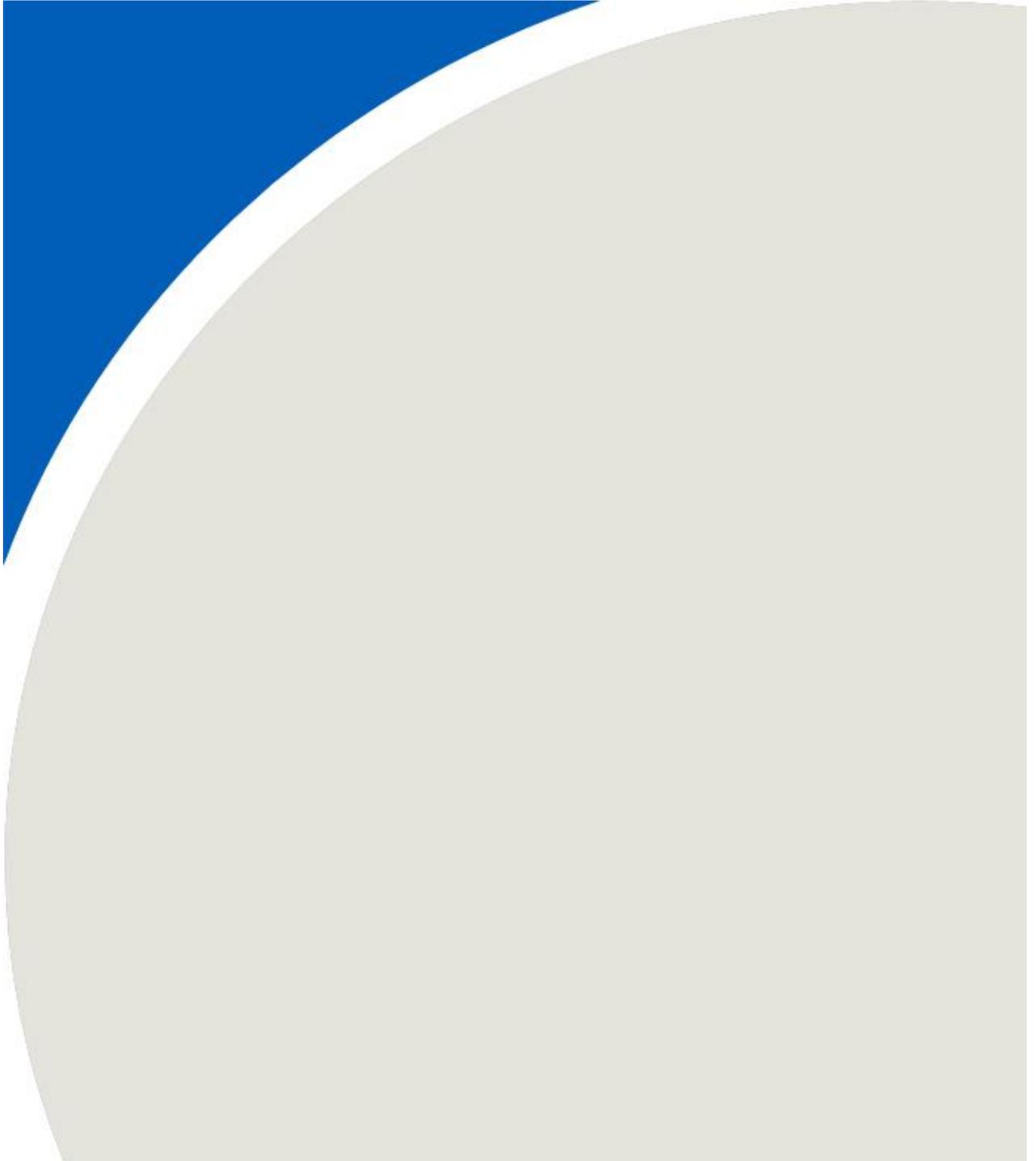
Seasonal Comparisons of Parameter Concentrations at Monitoring Wells: MW1, MW2A, MW2B, MW3A, MW3B, MW4, MW5A, and MW5B for the Durham York Energy Centre



Seasonal Comparisons of Parameter Concentrations at Monitoring Wells: MW1, MW2A, MW2B, MW3A, MW3B, MW4, MW5A, and MW5B for the Durham York Energy Centre



APPENDIX A-2



If this information is required in an accessible format, please contact The Regional Municipality of Durham at 1-800-372-1102 extension 3560.



April 29, 2016

Dolly Goyette, Director, Central Region
Ministry of the Environment and Climate Change
Place Nouveau
5775 Yonge Street, Floor 8
North York, ON M2M 4J1

Dear Ms. Goyette:

**RE: Durham York Energy Centre (DYEC)
Groundwater and Surface Water Monitoring Plan
MOECC File No.: EA-08-02**

In accordance with Condition 20.5 of the Notice of Approval to Proceed with the Undertaking (Environmental Assessment (EA) Approval) and Condition 7(14) of the Environmental Compliance Approval (ECA), the Regional Municipality of Durham and the Regional Municipality of York (Regions) are requesting a change to the Groundwater and Surface Water Monitoring Plan for the Durham York Energy Centre (DYEC).

Section 3.4.2 of the Groundwater and Surface Water Monitoring Plan requires the placement of multi-meter sondes at two locations in Tooley Creek, and the consideration of additional monitoring and sampling that may be conducted at the facility in the event of a spill or other process upset that has the potential to affect surface water quality.

The sondes are placed in the creek each spring to monitor temperature, pH, turbidity and electrical conductivity upstream and downstream of the drainage swale that receives stormwater flow from the facility.

The section of Tooley Creek where the sondes are to be placed will be re-aligned beginning early 2016 as part of construction by the Ministry of Transportation to improve the Highway 401/Courtice Road interchange. The construction activity and creek re-alignment will cause significant disruption and prevent the placement of the sondes in the creek for up to three years.

The Regions are requesting that the requirement in the surface water monitoring program to place the sondes in the creek be suspended until the interchange construction activities are completed. All previous surface water monitoring demonstrates that the DYEC is not having an adverse effect on Tooley Creek. The remaining monitoring and reporting requirements in the EA Approval and ECA will continue to ensure that the potential for any off-site impact to surface water is minimized.

The Regions and Covanta Durham York Renewable Energy (Covanta) will follow the remaining requirement in Section 3.4.2 of the monitoring plan regarding additional monitoring and sampling that may be conducted in the event of a spill or other process upset that has the potential to affect surface water quality.

The Regions and Covanta will also continue the inspection schedule for the facility and stormwater management system, and the implementation of the Spill Contingency and Emergency Response Plan.

We are available to discuss this issue further with the Ministry of the Environment and Climate Change (MOECC) and await your decision in this matter. If you require any further information, please contact Mr. Gioseph Anello, Manager of Waste Planning and Technical Services, at 905-668-7711 extension 3445.

Sincerely,

Mirka Januszkiewicz, P.Eng.
Director, Waste Management

The Regional Municipality of Durham
905.668.4113 ext. 3464
Mirka.Januszkiewicz@durham.ca

Laura McDowell, P.Eng.
Director, Environmental Promotion
and Protection

The Regional Municipality of York
905.830.4444 ext. 5077
Laura.McDowell@york.ca

- c. K. Hedley, Director, Environmental Approvals Branch, MOECC
C. Dugas, Manager, York Durham District Office, MOECC
R. Lashbrook, Manager, Technical Support Section, MOECC
T. Belayneh, Group Leader, Surface Water, MOECC
S. Thomas, Issues Project Coordinator, York Durham District Office, MOECC
P. Dunn, Senior Environmental Officer, York Durham District Office, MOECC
P. Martin, Supervisor (Acting), Air, Pesticides, and Environmental Planning, MOECC
E. O'Leary, Environmental Resource Planner & EA Coordinator, Air, Pesticides, and
Environmental Planning, MOECC
G. Battarino, Project Officer, Project Coordination, MOECC

Ministry
of the Environment
and Climate Change
Central Region Office
5775 Yonge Street
8th Floor
North York ON M2M 4J1
Tel.: 416 326-6700
Fax: 416-325-5345

Ministère
de l'Environnement et de l'Action
en matière de changement climatique
Région Central
5775, rue Yonge
8^e étage
North York (Ontario) M2M 4J1
Tél: (416) 326-6700
Télé: (416) 326-6345



May 17, 2016

Mirka Januszkiewicz, P. Eng
Director, Waste Management
The Regional Municipality of Durham
605 Rossland Road East
Whitby ON L1N 6A3

Laura McDowell, P.Eng
Director, Environmental Promotion and Protection
The Regional Municipality of York
17250 Yonge Street
Newmarket ON L3Y 6Z1

Dear Ms. Januszkiewicz and Ms. McDowell,

**RE: Durham York Energy Centre (DYEC)
Requested change to Surface Water Monitoring Program**

In your letter dated April 29, 2016, the Regional Municipalities of Durham and York (Regions) requested that the requirement in the DYEC Groundwater and Surface Water Monitoring Plan to place continuous surface water monitoring equipment (sondes) in Tooley Creek be suspended until Hwy 401/Courtice Road interchange construction is completed.

Ministry staff have confirmed with the Ministry of Transportation that the section of Tooley Creek where the sondes are placed each spring will be significantly disturbed (re-aligned) and access will be restricted for at least 3 years during the interchange construction. The construction will prevent the placement of the sondes and affect the reliability of any surface water monitoring in the creek downstream of the construction.

The ministry's review of surface water monitoring results, to date, indicates that the DYEC is not having an adverse effect on Tooley Creek. The remaining monitoring, inspection and spill contingency and emergency response requirements for the facility will continue to ensure that the potential for any off-site impact to surface water is controlled.

In accordance with Condition 20.5 of the Notice to Proceed with the Undertaking and Condition 7(14) of the Environmental Compliance Approval, I am granting your request to suspend the placement of the sondes in Tooley Creek until such time as the interchange construction activities are completed.

Sincerely,

A handwritten signature in black ink, appearing to read "Dolly Goyette".

Dolly Goyette
Director, Central Region
Ministry of the Environment and Climate Change

- c. Ross Lashbrook, Manager, Technical Support Section, Central Region MOECC
Celeste Dugas, Manager, York Durham District Office
Sandra Thomas, Issues Project Coordinator, York Durham District Office

APPENDIX B

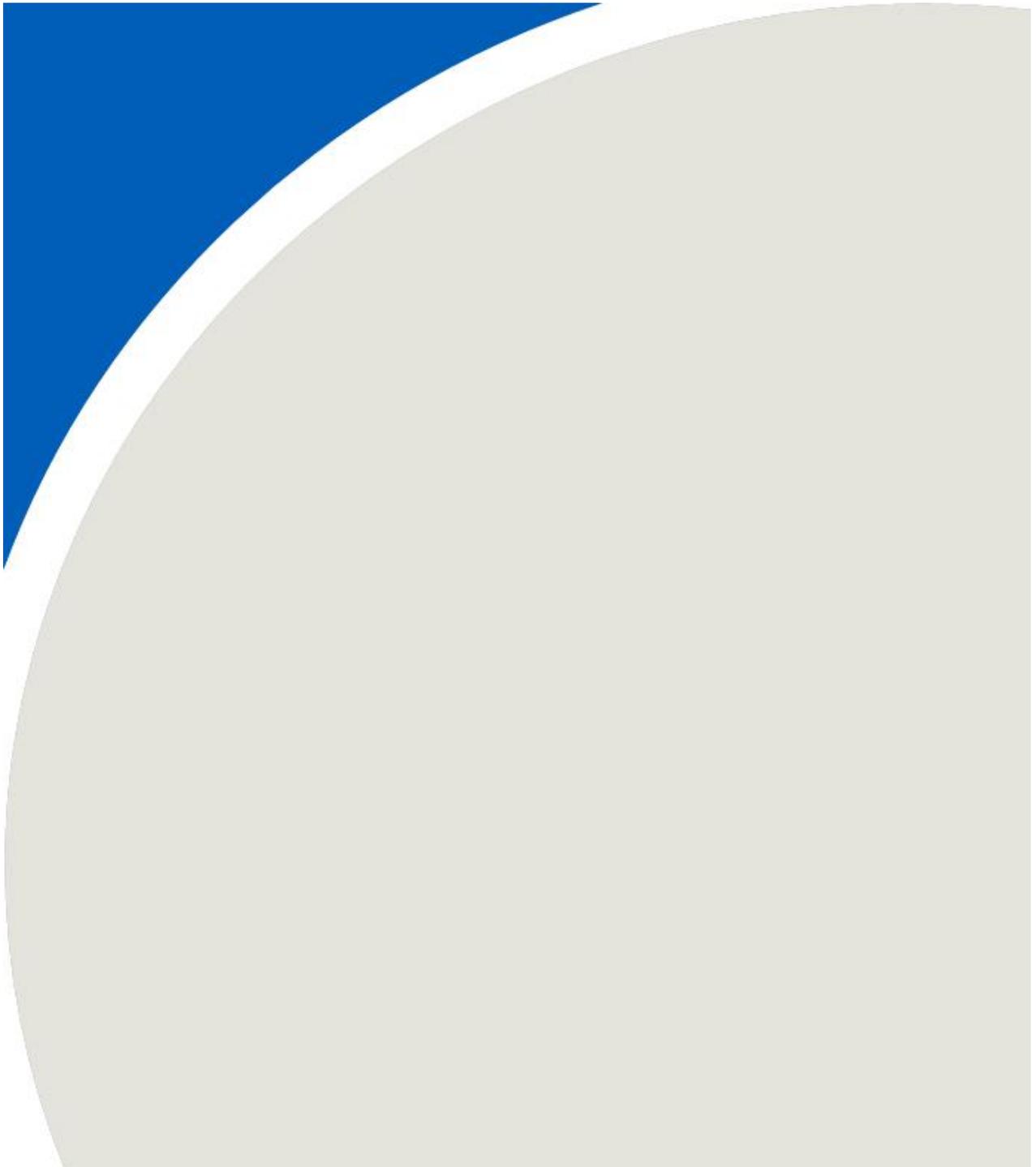


Table B-1 - Monitoring Well Construction Detail Summary

Durham York Energy Centre - 2018 Monitoring Program
 Regional Municipality of Durham
 Project No. 1604066

Monitoring Well ID	Monitor Type	Monitor Diameter	Measuring Point Elevation	Ground Surface Elevation	Monitor Stick-Up	Screen Interval		Filter Pack Interval		Bentonite Seal Interval		Surface Seal Interval	
		mm	mSD	mSD	m	mSD	mSD	mSD	mSD	mSD	mSD	mSD	mSD
MW1	Standpipe	51	102.32	101.29	1.03	95.19	- 93.67	95.50	- 93.67	101.29	- 95.50	-	
MW2A	Piezometer	51	103.03	102.01	1.02	94.39	- 92.87	94.69	- 92.82	102.01	- 94.69	-	
MW2B	Standpipe	51	103.08	102.01	1.07	97.46	- 95.94	97.77	- 95.94	102.01	- 97.77	-	
MW3A	Piezometer	51	96.22	95.17	1.05	87.63	- 86.10	87.93	- 86.10	93.95	- 87.93	95.17	93.95
MW3A-R	Piezometer	51	99.16	98.36	1.05	90.74	- 89.22	91.35	- 89.22	98.36	- 91.35	-	
MW3B	Standpipe	51	96.31	95.28	1.03	90.76	- 89.23	91.06	- 89.23	95.28	- 91.06	-	
MW3B-R	Standpipe	51	99.11	98.31	1.03	93.81	- 91.86	94.06	- 91.86	98.31	- 94.06	-	
MW4	Standpipe	51	98.27	97.17	1.10	95.25	- 93.72	95.55	- 93.72	97.17	- 95.55	-	
MW5A	Piezometer	51	102.79	101.96	1.05	94.81	- 93.36	95.16	- 93.36	101.96	- 95.16	-	
MW5B	Standpipe	51	102.75	101.97	1.03	97.47	- 95.97	97.77	- 95.87	101.97	- 97.77	-	

Notes:

- 1) mSD denotes metres relative to the assumed site datum.
- 2) Measuring Point denotes the top of the monitoring well riser pipe [i.e., top-of-pipe (TOP)].
- 3) Blank denotes data not available.

APPENDIX C

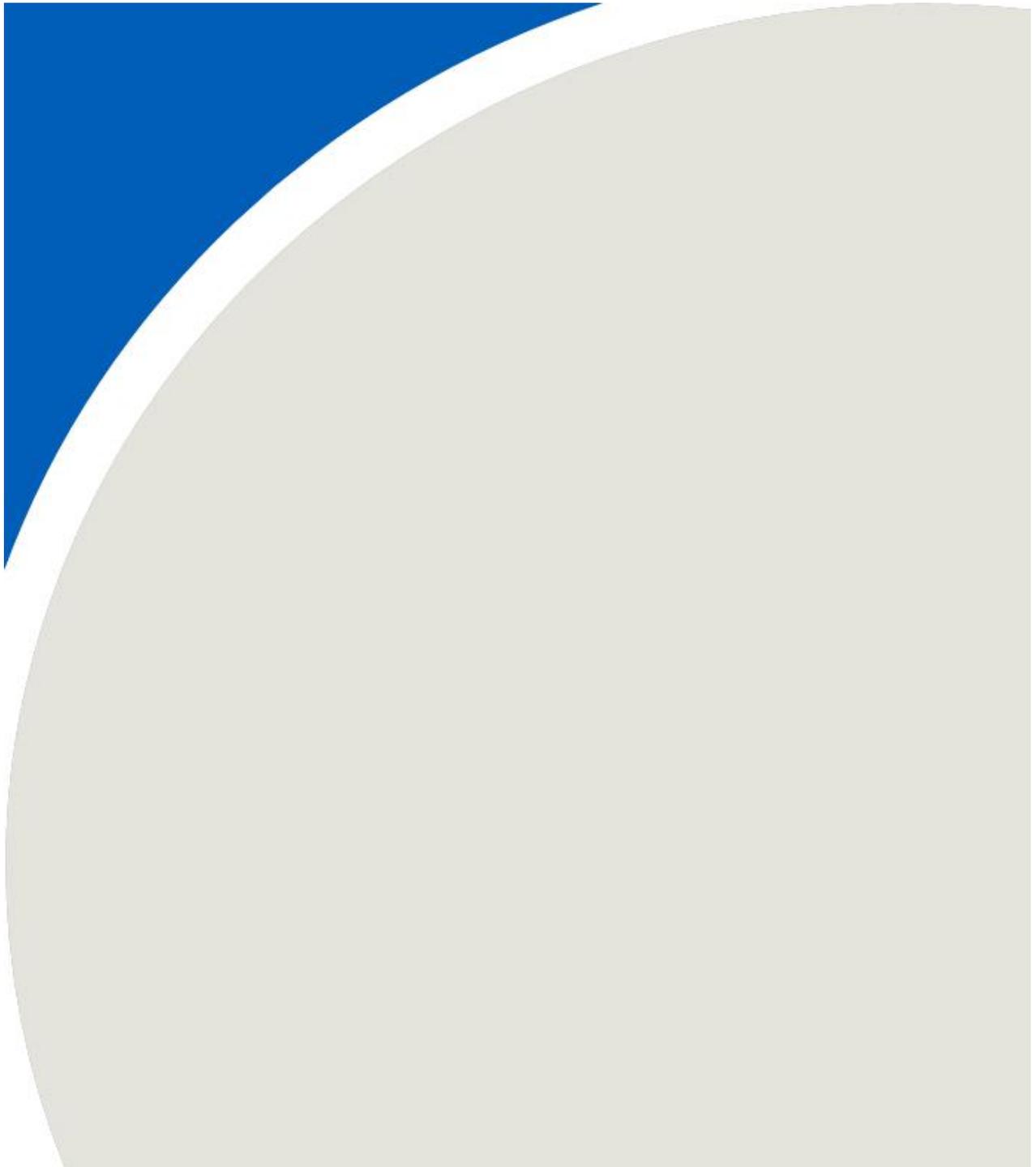


Table C-1 - Groundwater Elevations

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Monitor ID	Groundwater Elevations											
	MW1		MW2A		MW2B		MW3A		MW3A-R		MW3B	
Measuring Point Elevation (mSD)	102.32		103.03		103.08		96.22		99.16		96.31	
Units	mBTOP	mSD	mBTOP	mSD	mBTOP	mSD	mBTOP	mSD	mBTOP	mSD	mBTOP	mSD
28-Dec-11		100.62		100.18		99.98		89.20				94.50
14-Mar-12		100.58		100.53		100.75		94.34				94.51
21-Jun-12		99.76		100.06		100.22		94.26				94.11
5-Nov-12		100.47		100.24		101.00		94.56				94.91
22-Mar-13		100.50		100.22		100.79		94.50				94.59
12-Jul-13		100.01		100.07		100.42		94.94				94.14
9-Sep-13								94.33				94.22
26-Nov-13		97.72		100.01		100.41						
9-Apr-14		94.34		100.22		101.46				93.52		
18-Jun-14										95.07		
11-Aug-14		95.96		99.98		100.64				94.98		
29-Oct-14		96.09		99.99		100.56				95.12		
16-Apr-15		96.96		100.17		101.24				95.12		
10-Aug-15		95.84		100.05		101.74				95.06		
9-Nov-15		96.93		100.11		100.91				95.15		
29-Apr-16	4.86	97.46	2.85	100.18	2.42	100.66			4.40	94.76		
10-Aug-16	8.42	93.90	3.84	99.19	3.69	99.39			4.92	94.24		
23-Nov-16	Dry (< 8.60)		4.06	98.97	4.14	98.94			5.17	93.99		
11-Apr-17	4.56	97.76	2.58	100.45	1.48	101.60			4.30	94.86		
3-Aug-17	5.80	96.52	2.96	100.07	2.57	100.51			4.44	94.72		
17-Nov-17	6.55	95.77	3.17	99.86	2.19	100.89			4.59	94.57		
20-Apr-18	4.10	98.22	2.24	100.79	1.32	101.76			3.19	95.97		
16-Aug-18	7.12	95.20	3.13	99.90	2.83	100.25			4.72	94.44		
7-Nov-18	7.14	95.18	2.70	100.33	1.96	101.12			4.59	94.57		

Notes:

- 1) mSD denotes metres relative to the assumed site datum.
- 2) mBTOP denotes metres below the monitoring well riser top-of-pipe (TOP).
- 3) Bold denotes that water level elevation is assumed to be anomalous (anomalous data are not plotted in the relevant hydrographs).
- 4) Blank denotes data not available.
- 5) The measuring point elevations noted within this table for MW3A-R and MW3B-R do not match the respective top of pipe (TOP) elevations noted within Table B-1 (Monitor Construction Details) and therefore, the calculated groundwater elevations for these monitoring wells should be interpreted with caution.

Table C-1 - Groundwater Elevations

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Monitor ID	Groundwater Elevations							
	MW3B-R		MW4		MW5A		MW5B	
Measuring Point Elevation (mSD)	99.11		98.27		102.75		102.79	
Units	mBTOP	mSD	mBTOP	mSD	mBTOP	mSD	mBTOP	mSD
28-Dec-11				97.17				
14-Mar-12				97.18				
21-Jun-12				96.51				
5-Nov-12				95.39				
22-Mar-13				95.44				
12-Jul-13				95.32				
9-Sep-13								
26-Nov-13				95.30				
9-Apr-14		92.40		95.26		100.18		100.58
18-Jun-14		95.34				100.27		100.26
11-Aug-14		95.04		94.83		100.13		100.12
29-Oct-14		95.31		95.19		100.10		100.08
16-Apr-15		95.79		95.72		100.17		100.36
10-Aug-15		95.45		94.89		100.16		100.16
9-Nov-15		95.57		95.50		100.25		100.25
29-Apr-16	3.68	95.43	2.55	95.72	2.39	100.36	2.47	100.32
10-Aug-16	4.70	94.41	4.19	94.08	2.94	99.81	2.85	99.94
23-Nov-16	4.88	94.23	3.92	94.35	3.17	99.58	3.67	99.12
11-Apr-17	3.20	95.91	2.56	95.71	2.23	100.52	2.30	100.49
3-Aug-17	3.81	95.30	3.43	94.84	2.38	100.37	2.47	100.32
17-Nov-17	4.84	94.27	3.22	95.05	2.63	100.12	2.68	100.11
20-Apr-18	2.40	96.71	2.40	95.87	2.18	100.57	2.24	100.55
16-Aug-18	4.48	94.63	3.45	94.82	2.55	100.20	2.57	100.22
7-Nov-18	4.44	94.67	2.93	95.34	2.25	100.50	2.23	100.56

Notes:

- 1) mSD denotes metres relative to the assumed site datum.
- 2) mBTOP denotes metres below the monitoring well riser top-of-pipe (TOP).
- 3) Bold denotes that water level elevation is assumed to be anomalous (anomalous data are not plotted in the relevant hydrographs).
- 4) Blank denotes data not available.
- 5) The measuring point elevations noted within this table for MW3A-R and MW3B-R do not match the respective top of pipe (TOP) elevations noted within Table B-1 (Monitor Construction Details) and therefore, the calculated groundwater elevations for these monitoring wells should be interpreted with caution.

Table C-2 - Hydraulic Gradients

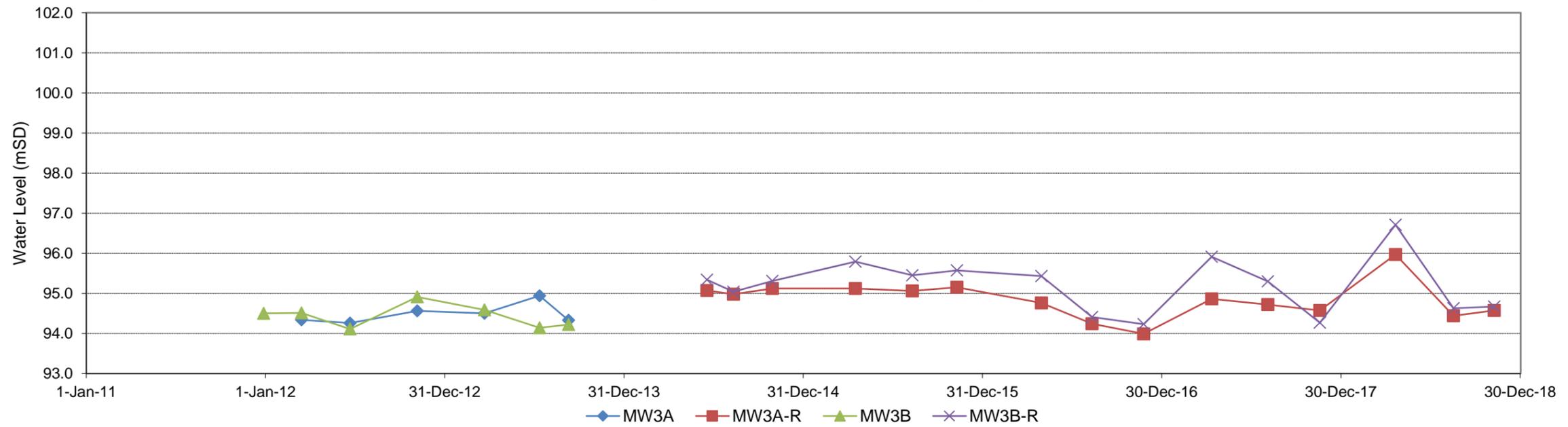
Durham York Energy Centre - 2018 Monitoring Program
 Regional Municipality of Durham
 Project No. 1604066

Monitoring Well	MW2B	MW2A	Hydraulic Gradient (m/m)	MW3B	MW3A	Hydraulic Gradient (m/m)	MW3B-R	MW3A-R	Hydraulic Gradient (m/m)	MW5B	MW5A	Hydraulic Gradient (m/m)
Measuring Point Elevation (mSD)	103.08	103.03		96.31	96.22		99.11	99.16		102.79	102.75	
Top of Screen (mSD)	97.46	94.39		90.76	87.63		93.81	90.74		97.47	94.81	
Bottom of Screen (mSD)	95.94	92.87		89.23	86.10		91.86	89.22		95.97	93.36	
Screen Midpoint (mSD)	96.70	93.63		90.00	86.87		92.84	89.98		96.72	94.09	
Date	Water Levels (mSD)		Water Levels (mSD)		Water Levels (mSD)		Water Levels (mSD)					
28-Dec-11	99.98	100.18	-0.07	94.50								
14-Mar-12	100.75	100.53	0.07	94.51	94.34	0.05						
21-Jun-12	100.22	100.06	0.05	94.11	94.26	-0.05						
5-Nov-12	101.00	100.24	0.25	94.91	94.56	0.11						
22-Mar-13	100.79	100.22	0.19	94.59	94.50	0.03						
12-Jul-13	100.42	100.07	0.11	94.14	94.94	-0.26						
9-Sep-13				94.22	94.33	-0.04						
26-Nov-13	100.41	100.01	0.13									
9-Apr-14	101.46	100.22	0.40							100.58	100.18	0.15
18-Jun-14							95.34	95.07	0.09	100.26	100.27	0.00
11-Aug-14	100.64	99.98	0.21				95.04	94.98	0.02	100.12	100.13	0.00
29-Oct-14	100.56	99.99	0.19				95.31	95.12	0.07	100.08	100.10	-0.01
16-Apr-15	101.24	100.17	0.35				95.79	95.12	0.23	100.36	100.17	0.07
10-Aug-15	101.74	100.05	0.55				95.45	95.06	0.14	100.16	100.16	0.00
9-Nov-15	100.91	100.11	0.26				95.57	95.15	0.15	100.25	100.25	0.00
29-Apr-16	100.66	100.18	0.16				95.43	94.76	0.23	100.32	100.36	-0.02
10-Aug-16	99.39	99.19	0.07				94.41	94.24	0.06	99.94	99.81	0.05
23-Nov-16	98.94	98.97	-0.01				94.23	93.99	0.08	99.12	99.58	-0.17
11-Apr-17	101.60	100.45	0.37				95.91	94.86	0.37	100.49	100.52	-0.01
3-Aug-17	100.51	100.07	0.14				95.30	94.72	0.20	100.32	100.37	-0.02
17-Nov-17	100.89	99.86	0.34				94.27	94.57	-0.11	100.11	100.12	0.00
20-Apr-18	101.76	100.79	0.32				96.71	95.97	0.26	100.55	100.57	-0.01
16-Aug-18	100.25	99.90	0.11				94.63	94.44	0.07	100.22	100.20	0.01
7-Nov-18	101.12	100.33	0.26				94.67	94.57	0.04	100.56	100.50	0.02

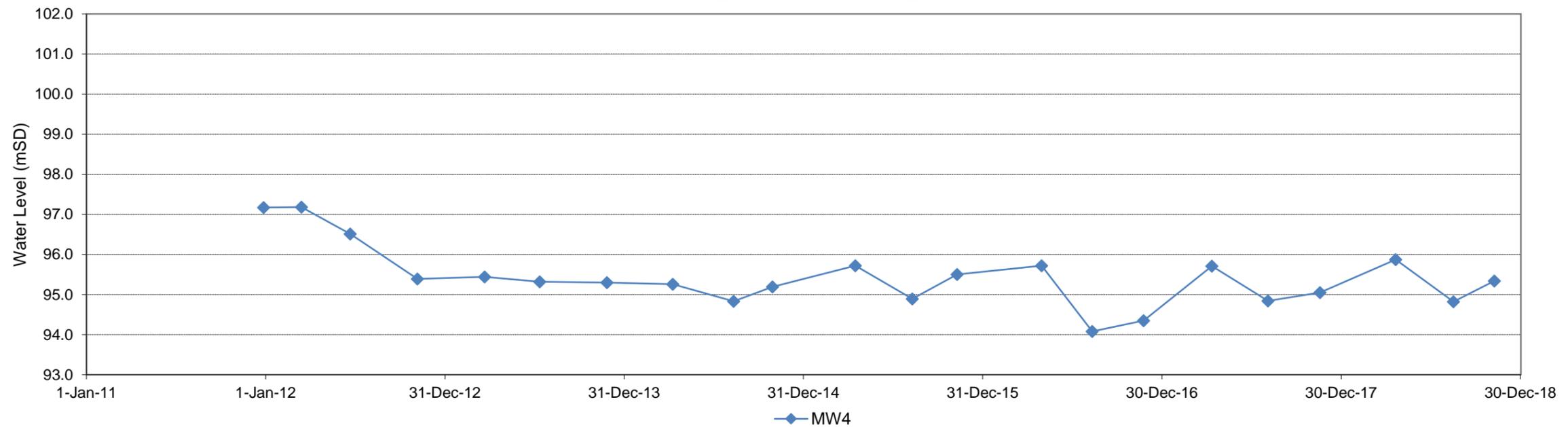
Notes:

- 1) mSD denotes metres relative to an assumed site datum.
- 2) Bold denotes that the water level is above the top of the well screen (i.e., the well screen is fully submerged).
- 3) The hydraulic gradient is calculated as the difference in water level elevation between the shallow and deep monitoring wells, divided by the difference in the screen midpoint elevation.
 Where a water level within the well screen, the difference between the water level and bottom of the well screen is used to calculate the screen midpoint.
- 4) A positive hydraulic gradient indicates downward groundwater movement, while a negative hydraulic gradient indicates upward groundwater movement.
- 5) MW3A and MW3B were decommissioned in September 2013 and replaced in March 2014 as MW3A-R and MW3B-R, respectively.
- 6) Blank denotes data not available.

Monitoring Wells: MW3A and MW3B (Downgradient)



Monitoring Well: MW4 (Downgradient)



NOTES:

1. Unfilled markers denote that the monitoring well was dry at the time of the monitoring event (i.e., groundwater level was below the total depth of the monitor).

GROUNDWATER HYDROGRAPHS

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

C-2

APPROX. SCALE

NTS

PROJECT NUMBER

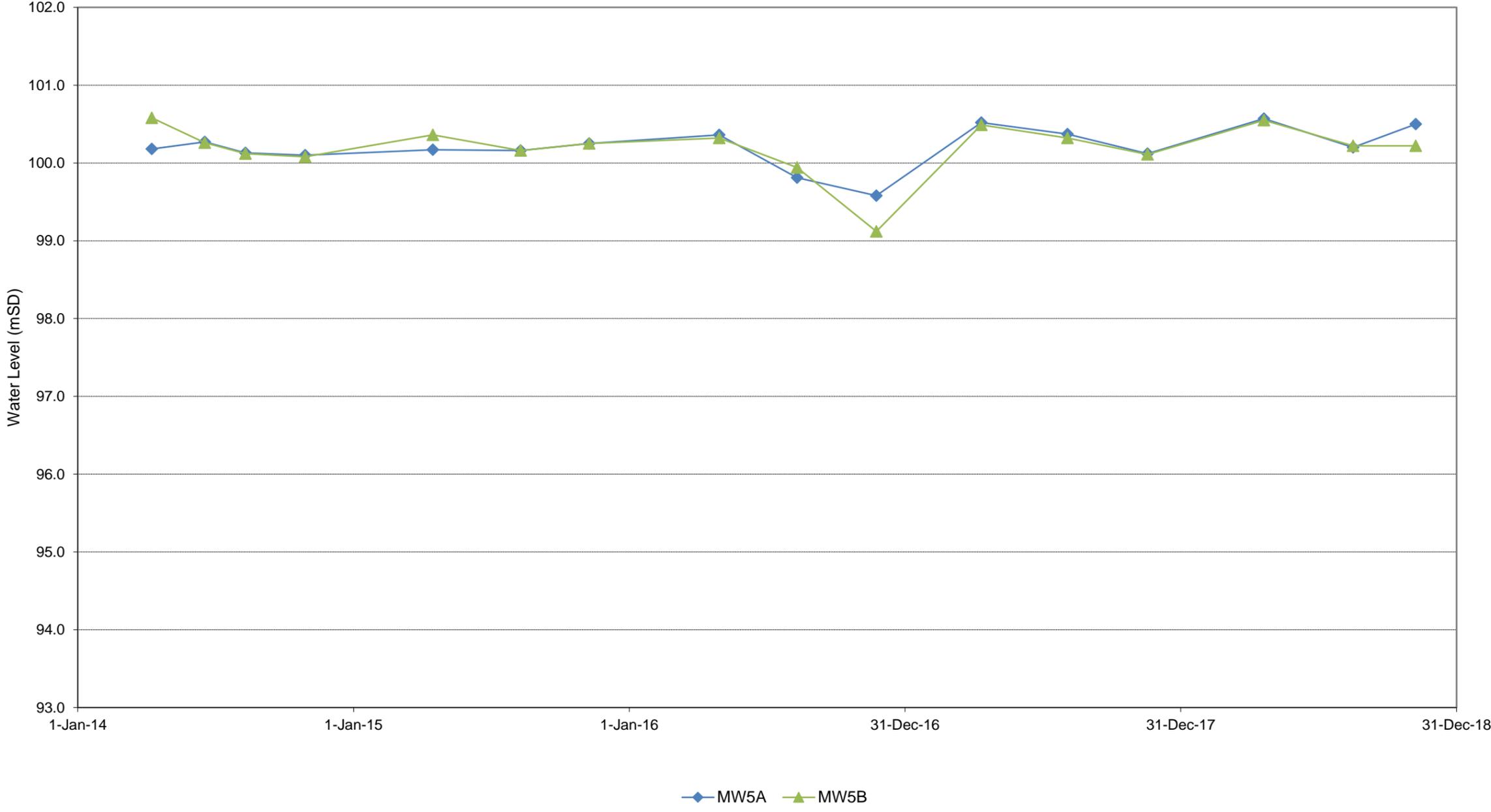
1604066

DATE REVISED

13/12/2018



Monitoring Wells: MW5A and MW5B (Internal Assessment Wells)



NOTES:

1. Unfilled markers denote that the monitoring well was dry at the time of the monitoring event (i.e., groundwater level was below the total depth of the monitor).

GROUNDWATER HYDROGRAPHS

2018 ANNUAL MONITORING REPORT

 REGIONAL MUNICIPALITY OF DURHAM
 Durham-York Energy Centre

FIGURE NUMBER	PROJECT NUMBER
C-3	1604066
APPROX. SCALE	DATE REVISED
NTS	13/12/2018



APPENDIX D

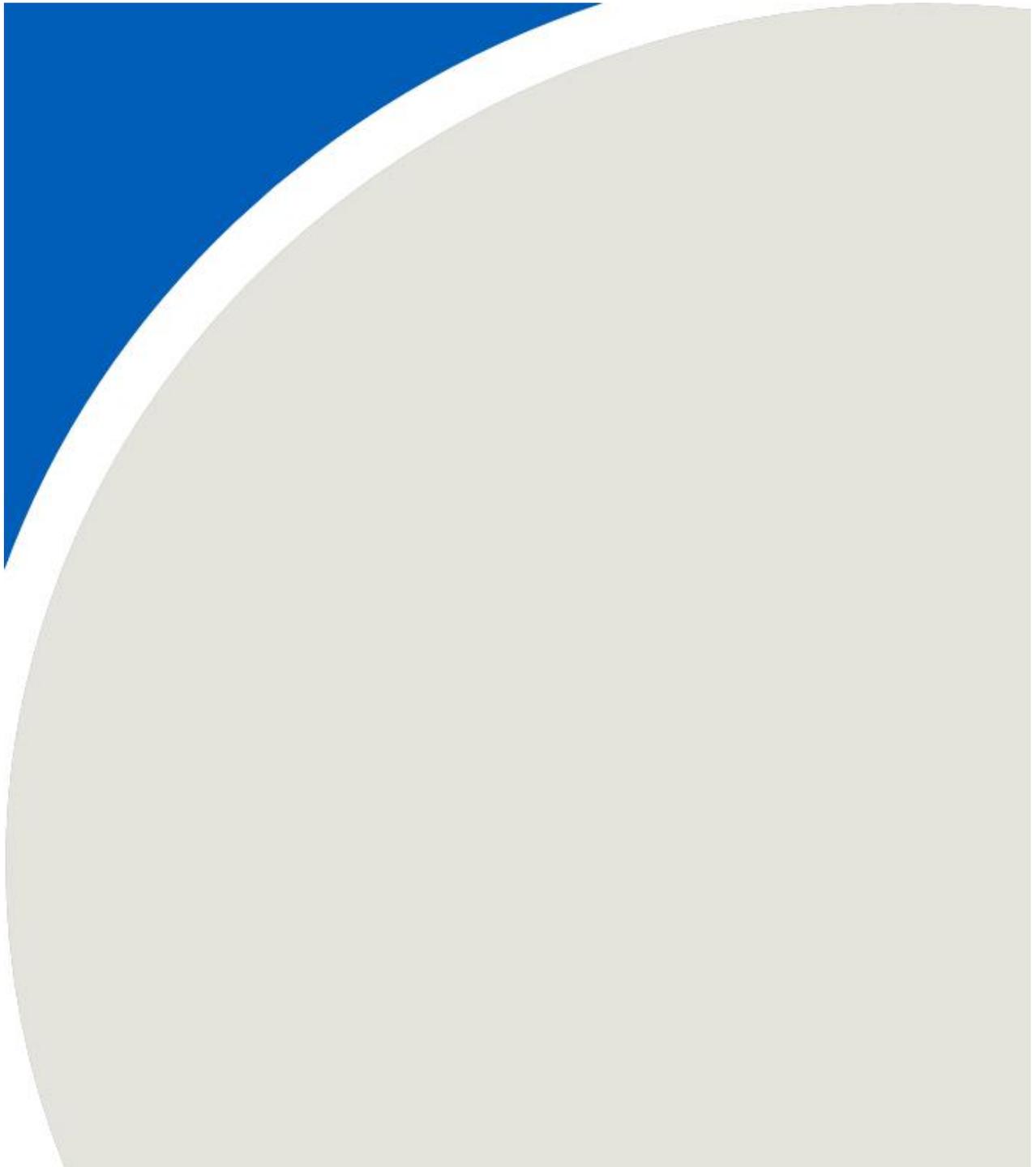


Table D-1 - Groundwater Field Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Monitor ID	Date	Temperature	pH	Conductivity	ORP
		°C	pH units	µS/cm	Unitless
MW1	23-Apr-18	9.5	7.89	770	186
	17-Aug-18	15.0	7.74	770	198
	7-Nov-18	11.1	7.99	810	40
MW2A	23-Apr-18	10.4	8.37	400	149
	17-Aug-18	13.3	8.14	420	179
	7-Nov-18	10.7	8.36	400	-5
MW2B	23-Apr-18	10.7	7.86	1040	181
	17-Aug-18	14.1	7.82	940	181
	7-Nov-18	10.9	7.95	970	26
MW3A-R	23-Apr-18	11.0	8.55	340	122
	17-Aug-18	14.9	8.26	380	169
	7-Nov-18	11.8	8.14	350	-43
MW3B-R	23-Apr-18	10.0	7.88	600	158
	17-Aug-18	13.5	7.95	610	175
	7-Nov-18	11.3	7.80	620	18
MW4	23-Apr-18	8.4	7.70	1050	176
	17-Aug-18	16.3	7.69	2230	182
	7-Nov-18	11.7	7.65	3350	-9
MW5A	23-Apr-18	10.1	8.25	410	109
	17-Aug-18	15.0	8.46	440	159
	7-Nov-18	11.8	8.20	440	10
MW5B	23-Apr-18	10.1	7.93	740	98
	17-Aug-18	15.5	8.20	710	170
	7-Nov-18	12.0	7.90	770	7

Notes:

- 1) µS/cm denotes micro-Siemens per centimetre.
- 2) ORP denotes oxidation-reduction potential.
- 3) Blank denotes data not available.

Table D-2 - Groundwater Laboratory Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Parameter	Unit	ODWS	MW1											
			28-Dec-11	14-Mar-12	21-Jun-12	5-Nov-12	22-Mar-13	12-Jul-13	26-Nov-13	9-Apr-14	11-Aug-14	29-Oct-14	16-Apr-15	10-Aug-15
Laboratory			AGAT											
Bicarbonate	mg/L		240	244	243	214	226	228	241	223	262	244	229	238
Carbonate	mg/L		<5	<5	<5	6	<5	<5	<5	<5	<5	<5	<5	<5
Chloride	mg/L	250 (AO)	14.9	15	13.5	15.3	14.8	14.6	13.4	13.5	15	15.3	19.9	20.5
Sulphate	mg/L	500 (AO)	152	153	131	147	127	129	132	227	151	150	158	143
Calcium	mg/L		83	68.8	67.7	73.9	73.8	65.3	65.5	90.7	70.4	69.1	68	68.3
Magnesium	mg/L		46.2	44.4	45.5	50.1	53.2	46	43.6	62.2	50.1	47.8	46.4	46
Sodium	mg/L	200 (AO) *	10.3	8.34	8.09	8.46	10.2	8.64	10	9.6	13.4	13	21.1	20.2
Potassium	mg/L		2.99	2.99	3.1	3.55	3.28	2.71	2.98	4.32	3.8	3.74	3.24	2.94
Boron	mg/L	5 (IMAC)	0.019	0.015	0.014	0.016	0.012	0.023	0.015	0.014	0.012	0.015	0.014	0.015
Cadmium	mg/L	0.005 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002
Cobalt	mg/L		0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Unit	ODWS	MW1	MW1									
			9-Nov-15	29-Apr-16	10-Aug-16	23-Nov-16	11-Apr-17	3-Aug-17	21-Nov-17	23-Apr-18	17-Aug-18	7-Nov-18	
Laboratory			AGAT	Eurofins	Eurofins	Eurofins							
Bicarbonate	mg/L		243	235			257	246	248	233	248	262	
Carbonate	mg/L		8	<5	INS	INS	<5	<5	<5	N/A-PH	N/A-PH	N/A-PH	
Chloride	mg/L	250 (AO)	19	24.4			26	21.1	22.7	22	18	22	
Sulphate	mg/L	500 (AO)	139	154			184	160	166	162	164	193	
Calcium	mg/L		69.2	70.7			77.1	67.8	72.2	71	75	73	
Magnesium	mg/L		48.4	49			54.3	49	51.5	51	51	53	
Sodium	mg/L	200 (AO) *	17	20.3			21.2	18.9	17.1	24	19	18	
Potassium	mg/L		3.2	2.99			3.53	3.16	3.24	3	3	3	
Boron	mg/L	5 (IMAC)	0.015	0.014			0.014	0.019	0.018	0.01	0.01	0.02	
Cadmium	mg/L	0.005 (MAC)	<0.001	<0.001			<0.002	<0.001	<0.002	<0.0001	<0.0001	<0.0001	
Cobalt	mg/L		<0.001	<0.001			<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	
Lead	mg/L	0.01 (MAC)	<0.002	<0.002			<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	

Notes:

- 1) ODWS denotes Ontario Drinking Water Standards, per the Technical Support Document for Ontario Drinking Water, Standards, Objectives, and Guidelines (MOE, 2006).
- 2) OG = Operational Guideline; AO = Aesthetic Objective; MAC = Maximum Acceptable Concentration; and IMAC = Interim Maximum Acceptable Concentration.
- 3) < denotes analyte concentration is below the laboratory reportable detection limit (RDL) or the method reporting limit (MRL).
- 4) Bold and Shaded denotes exceedance of the ODWS.
- 5) * denotes that the aesthetic objective for sodium in drinking water is 200 mg/L, per the ODWS. As noted in the ODWS, the local Medical Officer of Health should be notified when the sodium concentration (in drinking water) exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
- 6) mg/L denotes milligrams per litre.
- 7) INS denotes insufficient volume available for sample collection.
- 8) Blank denotes data not available.
- 9) N/A-PH denotes that the carbonate value is not available due to the fact the pH is below 8.3 for all samples, per the laboratory.

Table D-2 - Groundwater Laboratory Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Parameter	Unit	ODWS	MW2A											
			28-Dec-11	14-Mar-12	21-Jun-12	5-Nov-12	22-Mar-13	12-Jul-13	26-Nov-13	9-Apr-14	11-Aug-14	29-Oct-14	16-Apr-15	10-Aug-15
Laboratory			AGAT											
Bicarbonate	mg/L		221	215	195	168	188	190	206	185	180	188	198	194
Carbonate	mg/L		<5	<5	<5	7	<5	<5	<5	<5	<5	<5	<5	<5
Chloride	mg/L	250 (AO)	4.72	3.17	1.81	4	1.92	2.74	2.52	3.32	4.46	4.47	6.08	5.14
Sulphate	mg/L	500 (AO)	72.9	45.7	21.2	28.8	15.6	18.9	21.8	25.1	27.5	26.3	33.8	26.5
Calcium	mg/L		48.3	27.3	18.4	19.5	17.9	15.4	16.5	15.8	16.6	15.1	18.3	17.2
Magnesium	mg/L		32	31.3	32.2	35.5	37.5	32.3	30.6	33.6	30	30.6	31.8	32.4
Sodium	mg/L	200 (AO) *	23.5	16.8	14.6	17.3	17.6	15.2	18.7	24.7	25.9	25.2	29.5	28.1
Potassium	mg/L		2.31	2.2	1.62	1.8	1.75	1.34	1.51	1.52	1.42	1.3	1.5	1.62
Boron	mg/L	5 (IMAC)	0.088	0.081	0.09	0.097	0.096	0.106	0.104	0.106	0.108	0.117	0.111	0.113
Cadmium	mg/L	0.005 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002
Cobalt	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Unit	ODWS	MW2A	MW2A									
			9-Nov-15	29-Apr-16	10-Aug-16	23-Nov-16	11-Apr-17	3-Aug-17	21-Nov-17	23-Apr-18	17-Aug-18	7-Nov-18	
Laboratory			AGAT	Eurofins	Eurofins	Eurofins							
Bicarbonate	mg/L		202	217	193	192	197	195	198	196	198	200	
Carbonate	mg/L		<5	<5	<5	<5	<5	<5	<5	N/A-PH	N/A-PH	N/A-PH	
Chloride	mg/L	250 (AO)	4.02	4.48	4.49	3.46	2.71	2.51	2.36	4	4	6	
Sulphate	mg/L	500 (AO)	22.7	29.9	28	24	17.3	15.7	15.7	16	24	20	
Calcium	mg/L		14.6	13.4	14.8	14.6	12.5	12.1	12.2	17	17	14	
Magnesium	mg/L		33.3	30	31.6	30.6	32.6	32	31.8	34	33	32	
Sodium	mg/L	200 (AO) *	28.2	28.5	28.7	22.1	18.8	18	16.9	20	29	23	
Potassium	mg/L		1.26	1.2	1.27	1.24	1.05	1.08	0.98	1	1	1	
Boron	mg/L	5 (IMAC)	0.098	0.104	0.114	0.105	0.106	0.1	0.09	0.11	0.12	0.11	
Cadmium	mg/L	0.005 (MAC)	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.0001	<0.0001	<0.0001	
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	

Notes:

- 1) ODWS denotes Ontario Drinking Water Standards, per the Technical Support Document for Ontario Drinking Water, Standards, Objectives, and Guidelines (MOE, 2006).
- 2) OG = Operational Guideline; AO = Aesthetic Objective; MAC = Maximum Acceptable Concentration; and IMAC = Interim Maximum Acceptable Concentration.
- 3) < denotes analyte concentration is below the laboratory reportable detection limit (RDL) or the method reporting limit (MRL).
- 4) Bold and Shaded denotes exceedance of the ODWS.
- 5) * denotes that the aesthetic objective for sodium in drinking water is 200 mg/L, per the ODWS. As noted in the ODWS, the local Medical Officer of Health should be notified when the sodium concentration (in drinking water) exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
- 6) mg/L denotes milligrams per litre.
- 7) INS denotes insufficient volume available for sample collection.
- 8) Blank denotes data not available.
- 9) N/A-PH denotes that the carbonate value is not available due to the fact the pH is below 8.3 for all samples, per the laboratory.

Table D-2 - Groundwater Laboratory Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Parameter	Unit	ODWS	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B
			28-Dec-11	14-Mar-12	21-Jun-12	5-Nov-12	22-Mar-13	12-Jul-13	26-Nov-13	9-Apr-14	11-Aug-14	29-Oct-14	16-Apr-15	10-Aug-15
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT
Bicarbonate	mg/L		235	244	252	220	242	241	248	224	236	238	240	225
Carbonate	mg/L		<5	<5	<5	8	<5	<5	<5	<5	<5	<5	<5	<5
Chloride	mg/L	250 (AO)	13.5	11.7	11.8	12.6	14.2	15.2	14.3	22.6	45.4	59.9	71.3	66.3
Sulphate	mg/L	500 (AO)	98.8	120	93.6	99.4	84.9	82.2	77.3	84	78.1	80.2	96.2	80.4
Calcium	mg/L		58.7	49.7	45.6	48.1	46.2	40.8	39.4	43.6	44.7	45.8	48.6	48.3
Magnesium	mg/L		34.8	42.3	44.2	49.5	54.5	46.8	44.2	52.2	52.3	53.2	54.8	55
Sodium	mg/L	200 (AO) *	29.1	24	20.7	20.4	21.9	18.5	19.3	22.5	22.5	24.5	26.5	27.7
Potassium	mg/L		1.09	1.67	1.81	2.2	2.23	1.82	2.03	2.02	2.04	2	1.98	2.04
Boron	mg/L	5 (IMAC)	0.076	0.077	0.078	0.087	0.082	0.086	0.083	0.076	0.077	0.08	0.074	0.069
Cadmium	mg/L	0.005 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Unit	ODWS	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B	MW2B
			9-Nov-15	29-Apr-16	10-Aug-16	23-Nov-16	11-Apr-17	3-Aug-17	21-Nov-17	23-Apr-18	17-Aug-18	7-Nov-18
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	Eurofins	Eurofins	Eurofins
Bicarbonate	mg/L		258	250	233	243	247	258	251	235	243	251
Carbonate	mg/L		<5	<5	<5	<5	<5	<5	<5	N/A-PH	N/A-PH	N/A-PH
Chloride	mg/L	250 (AO)	67	76.4	78.5	70.5	77.4	106	132	152	129	131
Sulphate	mg/L	500 (AO)	74.6	84.7	82.5	81	84.2	80.4	74	66	79	71
Calcium	mg/L		47.9	50.1	49.6	46.3	48.3	51.4	52.1	63	59	51
Magnesium	mg/L		56.5	58.4	58.8	55.6	58.6	62	63.2	70	67	65
Sodium	mg/L	200 (AO) *	30.9	29.4	29.4	26.2	28.7	34.5	34.9	42	40	39
Potassium	mg/L		2.11	2.27	2.21	2.13	2.07	2.2	2.25	2	2	2
Boron	mg/L	5 (IMAC)	0.068	0.069	0.08	0.088	0.079	0.08	0.074	0.08	0.09	0.09
Cadmium	mg/L	0.005 (MAC)	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	0.0001	<0.0001	<0.0001
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Notes:

- 1) ODWS denotes Ontario Drinking Water Standards, per the Technical Support Document for Ontario Drinking Water, Standards, Objectives, and Guidelines (MOE, 2006).
- 2) OG = Operational Guideline; AO = Aesthetic Objective; MAC = Maximum Acceptable Concentration; and IMAC = Interim Maximum Acceptable Concentration.
- 3) < denotes analyte concentration is below the laboratory reportable detection limit (RDL) or the method reporting limit (MRL).
- 4) Bold and Shaded denotes exceedance of the ODWS.
- 5) * denotes that the aesthetic objective for sodium in drinking water is 200 mg/L, per the ODWS. As noted in the ODWS, the local Medical Officer of Health should be notified when the sodium concentration (in drinking water) exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
- 6) mg/L denotes milligrams per litre.
- 7) INS denotes insufficient volume available for sample collection.
- 8) Blank denotes data not available.
- 9) N/A-PH denotes that the carbonate value is not available due to the fact the pH is below 8.3 for all samples, per the laboratory.

Table D-2 - Groundwater Laboratory Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Parameter	Unit	ODWS	MW3A	MW3A	MW3A	MW3A	MW3A	MW3A	MW3A	MW3A-R	MW3A-R	MW3A-R	MW3A-R	MW3A-R
			28-Dec-11	14-Mar-12	21-Jun-12	5-Nov-12	22-Mar-13	12-Jul-13	9-Sep-13	18-Jun-14	11-Aug-14	29-Oct-14	16-Apr-15	10-Aug-15
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT
Bicarbonate	mg/L		181	153	147	130	124	121	151	134	120	123	147	126
Carbonate	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloride	mg/L	250 (AO)	22.7	24.6	24.4	26.3	25.1	23.8	26.2	7.53	6.52	6.24	7.7	6.52
Sulphate	mg/L	500 (AO)	125	78.7	50.7	44	29.3	23	20.3	27.4	20.7	21.4	26.8	25.7
Calcium	mg/L		76.9	43.8	34.3	27.9	26.4	22.5	24.4	22	19.4	16	18.3	21.2
Magnesium	mg/L		11.5	9.92	9.13	8.95	8.76	6.68	6.91	9.27	8.73	8.74	11.1	11.6
Sodium	mg/L	200 (AO) *	47.5	45.3	43	46	49.6	40.8	44.7	35.1	35.7	34.5	39.2	37.9
Potassium	mg/L		1.79	1.79	1.33	1.86	1.25	1.09	2.94	2.34	2.09	1.41	1.51	1.74
Boron	mg/L	5 (IMAC)	0.129	0.164	0.171	0.182	0.175	0.172	0.169	0.132	0.139	0.155	0.148	0.141
Cadmium	mg/L	0.005 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002
Cobalt	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.01 (MAC)	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Unit	ODWS	MW3A-R	MW3A-R	MW3A-R	MW3A-R	MW3A-R	MW3A-R	MW3A-R	MW3A-R	MW3A-R	MW3A-R
			9-Nov-15	29-Apr-16	10-Aug-16	23-Nov-16	13-Apr-17	9-Aug-17	21-Nov-17	23-Apr-18	17-Aug-18	7-Nov-18
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	Eurofins	Eurofins	Eurofins
Bicarbonate	mg/L		137	152	141	140	154	157	157	146	158	178
Carbonate	mg/L		<5	<5	<5	<5	<5	<5	<5	N/A-PH	N/A-PH	N/A-PH
Chloride	mg/L	250 (AO)	6.19	6.29	6.38	5.85	5.71	6.92	5.9	8	7	7
Sulphate	mg/L	500 (AO)	21.7	20.7	18.7	16.8	20.2	26.2	21.9	19	19	18
Calcium	mg/L		17.7	20.4	17.4	16.2	20.1	16.5	18.6	20	20	19
Magnesium	mg/L		10.4	10.7	10.5	9.8	10.5	10.2	10.8	11	11	11
Sodium	mg/L	200 (AO) *	40	38.5	38.1	36.8	37	40.8	38.4	42	42	40
Potassium	mg/L		1.41	1.67	1.34	1.27	1.51	1.27	1.13	1	1	1
Boron	mg/L	5 (IMAC)	0.123	0.132	0.155	0.153	0.145	0.145	0.134	0.16	0.16	0.15
Cadmium	mg/L	0.005 (MAC)	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Notes:

- 1) ODWS denotes Ontario Drinking Water Standards, per the Technical Support Document for Ontario Drinking Water, Standards, Objectives, and Guidelines (MOE, 2006).
- 2) OG = Operational Guideline; AO = Aesthetic Objective; MAC = Maximum Acceptable Concentration; and IMAC = Interim Maximum Acceptable Concentration.
- 3) < denotes analyte concentration is below the laboratory reportable detection limit (RDL) or the method reporting limit (MRL).
- 4) Bold and Shaded denotes exceedance of the ODWS.
- 5) * denotes that the aesthetic objective for sodium in drinking water is 200 mg/L, per the ODWS. As noted in the ODWS, the local Medical Officer of Health should be notified when the sodium concentration (in drinking water) exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
- 6) mg/L denotes milligrams per litre.
- 7) INS denotes insufficient volume available for sample collection.
- 8) Blank denotes data not available.
- 9) N/A-PH denotes that the carbonate value is not available due to the fact the pH is below 8.3 for all samples, per the laboratory.

Table D-2 - Groundwater Laboratory Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Parameter	Unit	ODWS	MW3B	MW3B	MW3B	MW3B	MW3B	MW3B	MW3B	MW3B-R	MW3B-R	MW3B-R	MW3B-R	MW3B-R
			28-Dec-11	14-Mar-12	21-Jun-12	5-Nov-12	22-Mar-13	12-Jul-13	9-Sep-13	18-Jun-14	11-Aug-14	29-Oct-14	16-Apr-15	10-Aug-15
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT
Bicarbonate	mg/L		247	212	211	186	213	202	235	198	209	203	215	200
Carbonate	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloride	mg/L	250 (AO)	10.8	10.2	10.7	12.5	15.6	13.9	18.8	15.4	12.3	10.7	11.6	10.3
Sulphate	mg/L	500 (AO)	102	58.6	52.4	45.8	33.9	39.9	43.4	103	88.7	85.7	95.5	82.9
Calcium	mg/L		78.4	49.7	47.9	49.3	55.5	46.8	61.4	58.3	46.8	47.7	51.5	52.4
Magnesium	mg/L		22.4	19.9	20.2	21.7	26.4	21.2	25.1	31.4	29.2	29.3	31.4	31.7
Sodium	mg/L	200 (AO) *	35.5	25.5	25.7	26.2	26.4	24.1	27.1	25.1	23.8	23.9	25.7	26.6
Potassium	mg/L		2	1.42	1.55	1.99	1.59	1.38	2.39	5.92	4.62	4.04	3.43	3.23
Boron	mg/L	5 (IMAC)	0.071	0.079	0.088	0.092	0.073	0.095	0.082	0.118	0.095	0.115	0.096	0.09
Cadmium	mg/L	0.005 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Unit	ODWS	MW3B-R	MW3B-R	MW3B-R	MW3B-R	MW3B-R	MW3B-R	MW3B-R	MW3B-R	MW3B-R	MW3B-R
			9-Nov-15	29-Apr-16	10-Aug-16	23-Nov-16	11-Apr-17	9-Aug-17	21-Nov-17	23-Apr-18	17-Aug-18	7-Nov-18
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	Eurofins	Eurofins	Eurofins
Bicarbonate	mg/L		235	222	221	220	223	231	252	223	262	253
Carbonate	mg/L		<5	<5	<5	<5	<5	<5	<5	N/A-PH	N/A-PH	N/A-PH
Chloride	mg/L	250 (AO)	9.23	8.7	9	8.79	8.75	13.1	10.9	12	13	14
Sulphate	mg/L	500 (AO)	78.8	79.6	75.7	71.3	77	95	81	66	75	72
Calcium	mg/L		51.2	49	49.7	46.5	47.3	48.9	48.4	51	53	47
Magnesium	mg/L		32	30.6	30.7	29.8	31	32	32.8	33	34	33
Sodium	mg/L	200 (AO) *	28.9	25.7	25.4	25	25.8	29.6	29	32	35	32
Potassium	mg/L		3.27	3.02	2.77	2.82	2.71	2.71	2.72	2	3	3
Boron	mg/L	5 (IMAC)	0.082	0.084	0.087	0.101	0.08	0.118	0.085	0.09	0.09	0.1
Cadmium	mg/L	0.005 (MAC)	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.0001	0.0005	0.0003
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Notes:

- 1) ODWS denotes Ontario Drinking Water Standards, per the Technical Support Document for Ontario Drinking Water, Standards, Objectives, and Guidelines (MOE, 2006).
- 2) OG = Operational Guideline; AO = Aesthetic Objective; MAC = Maximum Acceptable Concentration; and IMAC = Interim Maximum Acceptable Concentration.
- 3) < denotes analyte concentration is below the laboratory reportable detection limit (RDL) or the method reporting limit (MRL).
- 4) Bold and Shaded denotes exceedance of the ODWS.
- 5) * denotes that the aesthetic objective for sodium in drinking water is 200 mg/L, per the ODWS. As noted in the ODWS, the local Medical Officer of Health should be notified when the sodium concentration (in drinking water) exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
- 6) mg/L denotes milligrams per litre.
- 7) INS denotes insufficient volume available for sample collection.
- 8) Blank denotes data not available.
- 9) N/A-PH denotes that the carbonate value is not available due to the fact the pH is below 8.3 for all samples, per the laboratory.

Table D-2 - Groundwater Laboratory Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Parameter	Unit	ODWS	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4
			28-Dec-11	14-Mar-12	21-Jun-12	5-Nov-12	22-Mar-13	12-Jul-13	26-Nov-13	9-Apr-14	11-Aug-14	29-Oct-14	16-Apr-15	10-Aug-15
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT
Bicarbonate	mg/L		300	430	506	346	330	448	496	301	353	300	539	482
Carbonate	mg/L		<5	<5	<5	8	<5	<5	<5	<5	<5	<5	<5	<5
Chloride	mg/L	250 (AO)	12.3	14.5	7.11	12	8.21	7.47	6.79	8.64	8.46	12.2	6.98	7.55
Sulphate	mg/L	500 (AO)	50.8	47.5	47.8	60.8	38.5	62.6	62.6	23.8	31.8	32.1	78.1	58.9
Calcium	mg/L		42.7	36.4	43.1	45.9	42.2	44.7	39	29	31.9	31.3	38.5	46
Magnesium	mg/L		51.5	72.8	88.2	68.2	68.8	83.6	83.9	54.9	62	53.8	103	102
Sodium	mg/L	200 (AO) *	22	25.5	28	23.1	23.7	28.6	35.8	22.2	25.5	22	40	36.6
Potassium	mg/L		4.39	2.45	2.7	6.08	2.81	3.55	3.61	2.3	2.73	2.63	2.68	3.43
Boron	mg/L	5 (IMAC)	0.057	0.061	0.066	0.057	0.038	0.064	0.066	0.04	0.051	0.051	0.069	0.065
Cadmium	mg/L	0.005 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002
Cobalt	mg/L		0.002	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Unit	ODWS	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4
			9-Nov-15	29-Apr-16	10-Aug-16	23-Nov-16	11-Apr-17	3-Aug-17	17-Nov-17	23-Apr-18	17-Aug-18	7-Nov-18
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	Eurofins	Eurofins	Eurofins
Bicarbonate	mg/L		574	590	425	337	503	563	289	518	332	292
Carbonate	mg/L		<5	15	<5	<5	31	<5	<5	N/A-PH	N/A-PH	N/A-PH
Chloride	mg/L	250 (AO)	8.69	6.58	28.3	141	11.5	11.2	682	14	765	1160
Sulphate	mg/L	500 (AO)	72	66.1	62.7	35.7	76.6	74.7	32.6	67	44	32
Calcium	mg/L		43.9	41.4	37.3	42	39.9	38.6	82.9	45	79	103
Magnesium	mg/L		106	114	88.8	86.8	108	105	165	112	174	228
Sodium	mg/L	200 (AO) *	47.6	37.4	31.4	35.2	34.3	34.6	127	38	148	293
Potassium	mg/L		3.7	3.18	3.23	3.43	3.07	3.4	4.97	3	6	7
Boron	mg/L	5 (IMAC)	0.075	0.055	0.065	0.062	0.05	0.065	0.049	0.06	0.05	0.06
Cadmium	mg/L	0.005 (MAC)	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.0001	<0.0001	<0.0001
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	0.0011	0.0013
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Notes:

- 1) ODWS denotes Ontario Drinking Water Standards, per the Technical Support Document for Ontario Drinking Water, Standards, Objectives, and Guidelines (MOE, 2006).
- 2) OG = Operational Guideline; AO = Aesthetic Objective; MAC = Maximum Acceptable Concentration; and IMAC = Interim Maximum Acceptable Concentration.
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- 6) mg/L denotes milligrams per litre.
- 7) INS denotes insufficient volume available for sample collection.
- 8) Blank denotes data not available.
- 9) N/A-PH denotes that the carbonate value is not available due to the fact the pH is below 8.3 for all samples, per the laboratory.

Table D-2 - Groundwater Laboratory Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

Parameter	Unit	ODWS	MW5A											
			18-Jun-14	11-Aug-14	29-Oct-14	16-Apr-15	10-Aug-15	9-Nov-15	29-Apr-16	10-Aug-16	23-Nov-16	11-Apr-17	3-Aug-17	21-Nov-17
Laboratory			AGAT											
Bicarbonate	mg/L		207	199	183	200	198	215	215	200	203	217	218	234
Carbonate	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	6	<5	<5	<5
Chloride	mg/L	250 (AO)	5.29	3.87	3.16	2.83	2.7	2.15	1.89	2.03	2.19	1.65	1.64	1.48
Sulphate	mg/L	500 (AO)	16.9	11	5.56	9.37	7.56	6.9	9.11	7.73	9.92	16.8	9.17	9.97
Calcium	mg/L		25.2	19.4	17.4	19.5	20.7	17.1	24.5	17.9	17.4	20.9	16.6	16.3
Magnesium	mg/L		34.9	31.7	31	33.3	35.1	35	34.8	35.4	35	38.2	35.9	37.3
Sodium	mg/L	200 (AO) *	12.2	11.2	11.4	11.9	11.7	12.9	11.8	11.5	11.4	11.9	10.2	10.1
Potassium	mg/L		3.83	2.89	2.82	2.53	2.44	2.38	2.75	2.2	2.05	2.28	1.83	1.61
Boron	mg/L	5 (IMAC)	0.054	0.045	0.049	0.041	0.036	0.033	0.033	0.036	0.037	0.033	0.031	0.033
Cadmium	mg/L	0.005 (MAC)	<0.002	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002
Cobalt	mg/L		<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Unit	ODWS	MW5A	MW5A	MW5A
			23-Apr-18	17-Aug-18	7-Nov-18
Laboratory			Eurofins	Eurofins	Eurofins
Bicarbonate	mg/L		205	232	223
Carbonate	mg/L		N/A-PH	N/A-PH	N/A-PH
Chloride	mg/L	250 (AO)	2	2	3
Sulphate	mg/L	500 (AO)	9	15	13
Calcium	mg/L		17	21	18
Magnesium	mg/L		40	39	38
Sodium	mg/L	200 (AO) *	10	12	11
Potassium	mg/L		1	2	2
Boron	mg/L	5 (IMAC)	0.03	0.03	0.03
Cadmium	mg/L	0.005 (MAC)	<0.0001	<0.0001	<0.0001
Cobalt	mg/L		<0.0002	<0.0002	<0.0002
Lead	mg/L	0.01 (MAC)	<0.001	<0.001	<0.001
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001

Notes:

- 1) ODWS denotes Ontario Drinking Water Standards, per the Technical Support Document for Ontario Drinking Water, Standards, Objectives, and Guidelines (MOE, 2006).
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- 6) mg/L denotes milligrams per litre.
- 7) INS denotes insufficient volume available for sample collection.
- 8) Blank denotes data not available.
- 9) N/A-PH denotes that the carbonate value is not available due to the fact the pH is below 8.3 for all samples, per the laboratory.

Table D-2 - Groundwater Laboratory Analytical Results

Durham York Energy Centre - 2018 Monitoring Program

Regional Municipality of Durham

Project No. 1604066

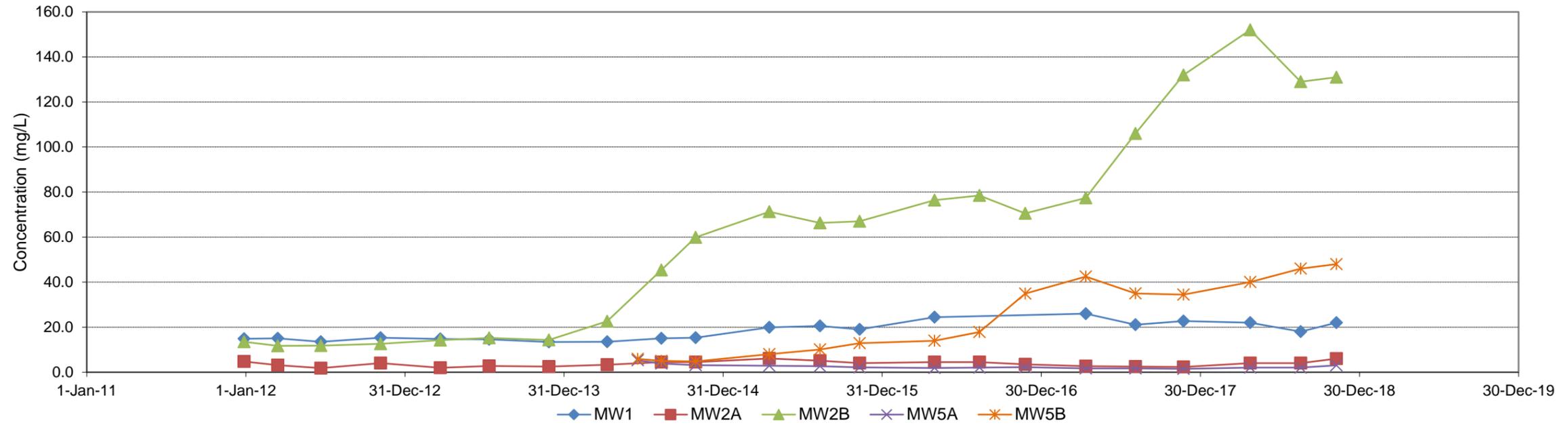
Parameter	Unit	ODWS	MW5B	MW5B	MW5B	MW5B	MW5B	MW5B	MW5B	MW5B	MW5B	MW5B	MW5B	MW5B
			18-Jun-14	11-Aug-14	29-Oct-14	16-Apr-15	10-Aug-15	9-Nov-15	29-Apr-16	10-Aug-16	23-Nov-16	11-Apr-17	3-Aug-17	21-Nov-17
Laboratory			AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT	AGAT
Bicarbonate	mg/L		240	247	234	247	229	274	266	263	262	258	255	258
Carbonate	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	6	<5	<5	<5
Chloride	mg/L	250 (AO)	5.93	5.01	4.78	7.97	10.1	12.9	14	17.8	34.9	42.5	35	34.4
Sulphate	mg/L	500 (AO)	96.4	91.4	95.9	107	103	98.7	111	104	94.9	100	91	82.1
Calcium	mg/L		41.2	34.4	36.2	39.1	46.9	38.7	43.8	39.9	40.1	41.2	35.8	33.4
Magnesium	mg/L		56.7	52.3	52.6	55.1	60.1	59.1	60.6	60.3	61.1	66.7	60.5	59.9
Sodium	mg/L	200 (AO) *	10.2	10.1	10.2	12.2	13	16.6	14.9	15.6	19.1	17.2	14.9	15.5
Potassium	mg/L		4.37	3.76	3.51	2.95	3.31	3.25	3.21	2.96	3.1	2.73	2.54	2.4
Boron	mg/L	5 (IMAC)	0.045	0.048	0.053	0.04	0.042	0.037	0.035	0.044	0.046	0.038	0.04	0.042
Cadmium	mg/L	0.005 (MAC)	<0.002	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.01 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Unit	ODWS	MW5B	MW5B	MW5B
			23-Apr-18	17-Aug-18	7-Nov-18
Laboratory			Eurofins	Eurofins	Eurofins
Bicarbonate	mg/L		246	245	267
Carbonate	mg/L		N/A-PH	N/A-PH	N/A-PH
Chloride	mg/L	250 (AO)	40	46	48
Sulphate	mg/L	500 (AO)	74	88	79
Calcium	mg/L		36	41	33
Magnesium	mg/L		64	66	63
Sodium	mg/L	200 (AO) *	17	17	20
Potassium	mg/L		2	3	3
Boron	mg/L	5 (IMAC)	0.04	0.04	0.04
Cadmium	mg/L	0.005 (MAC)	<0.0001	<0.0001	<0.0001
Cobalt	mg/L		<0.0002	<0.0002	<0.0002
Lead	mg/L	0.01 (MAC)	<0.001	<0.001	<0.001
Mercury	mg/L	0.001 (MAC)	<0.0001	<0.0001	<0.0001

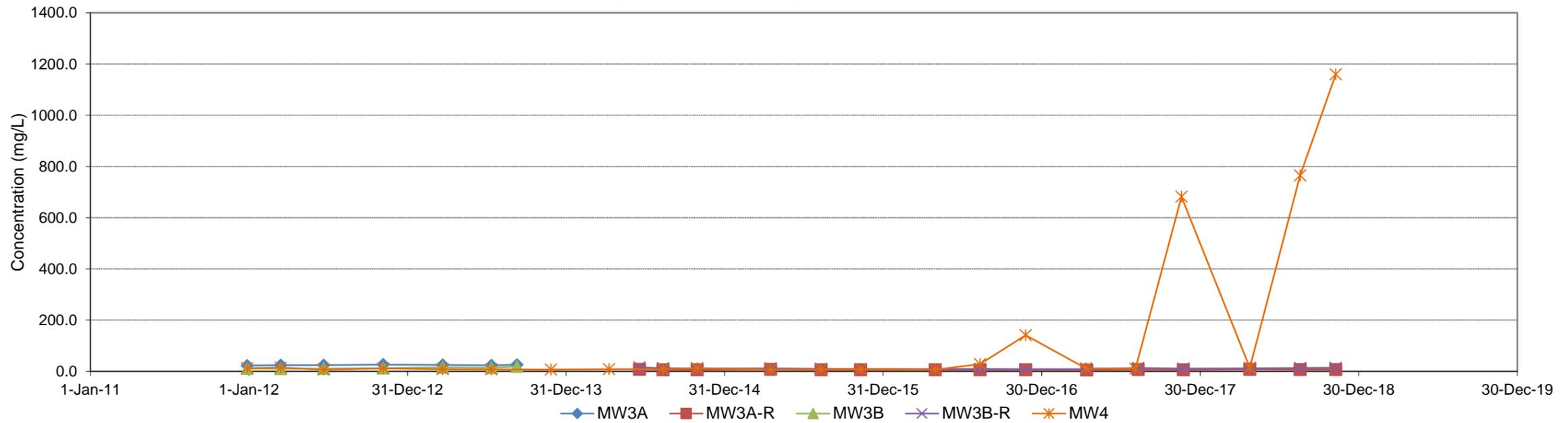
Notes:

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- 6) mg/L denotes milligrams per litre.
- 7) INS denotes insufficient volume available for sample collection.
- 8) Blank denotes data not available.
- 9) N/A-PH denotes that the carbonate value is not available due to the fact the pH is below 8.3 for all samples, per the laboratory.

Monitoring Locations: MW1 (Crossgradient), MW2 (Upgradient), and MW5 (Internal Assessment)



Downgradient Monitoring Locations: MW3 and MW4



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
CHLORIDE**

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

D-1

APPROX. SCALE

NTS

PROJECT NUMBER

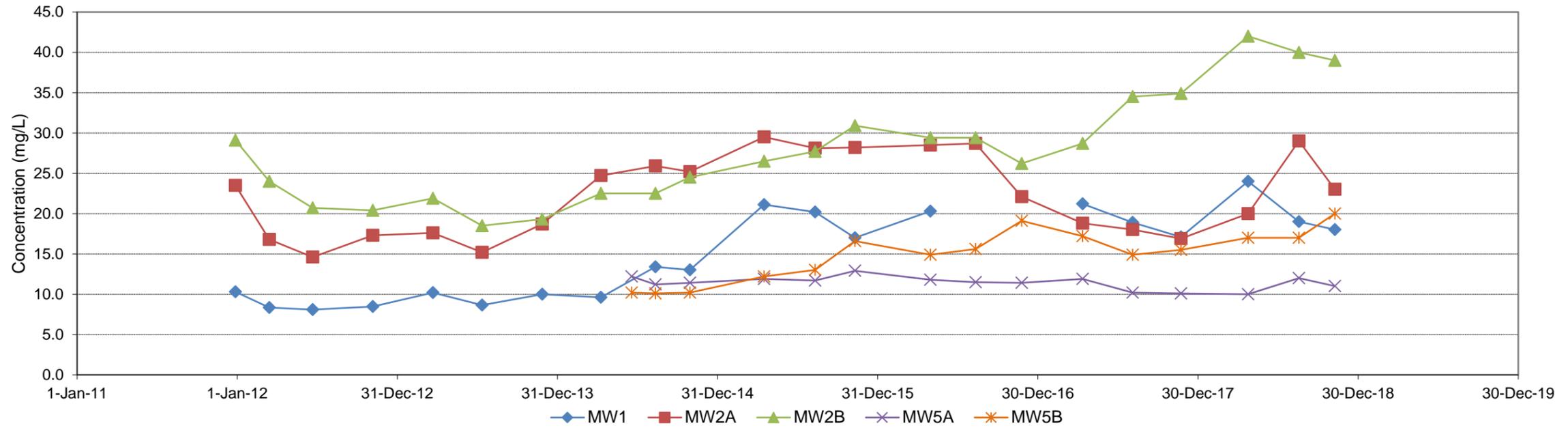
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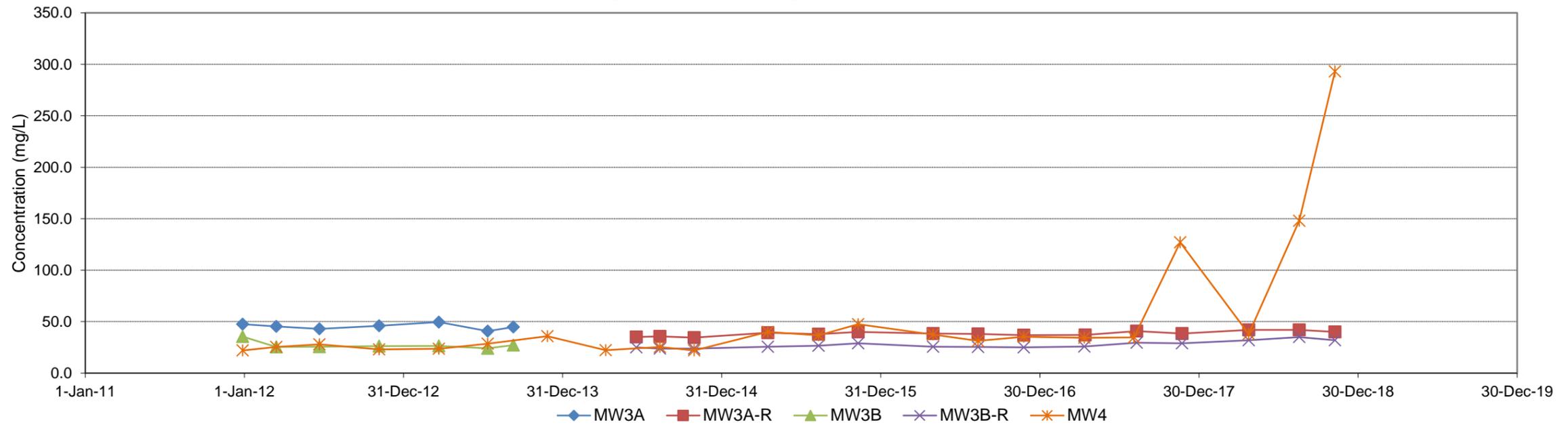
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Monitoring Locations: MW1 (Crossgradient), MW2 (Upgradient), and MW5 (Internal Assessment)



Downgradient Monitoring Locations: MW3 and MW4



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
SODIUM**

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

D-2

APPROX. SCALE

NTS

PROJECT NUMBER

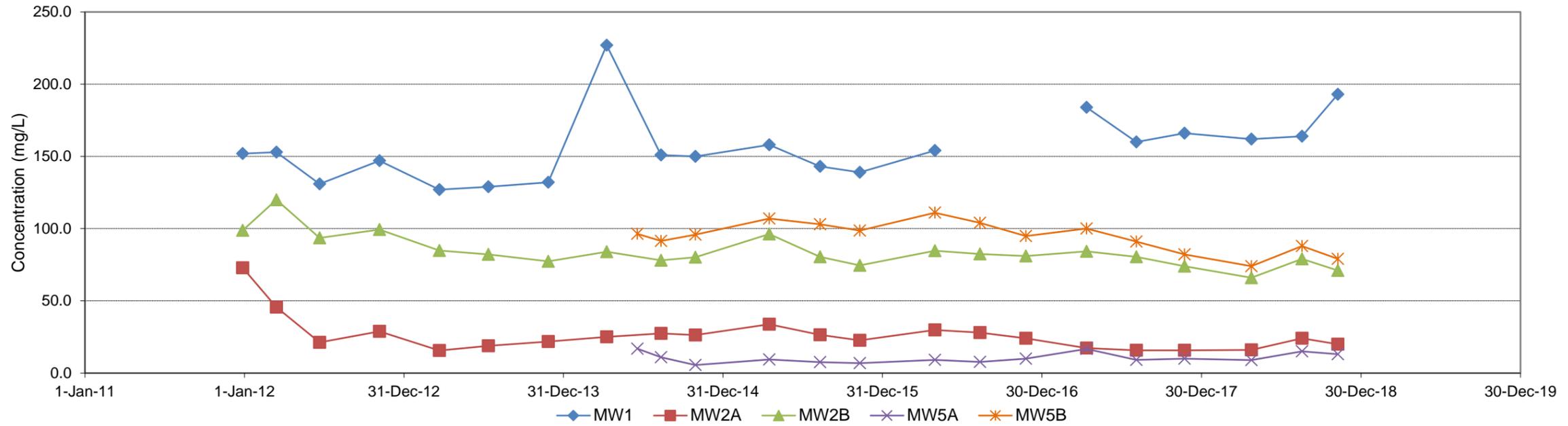
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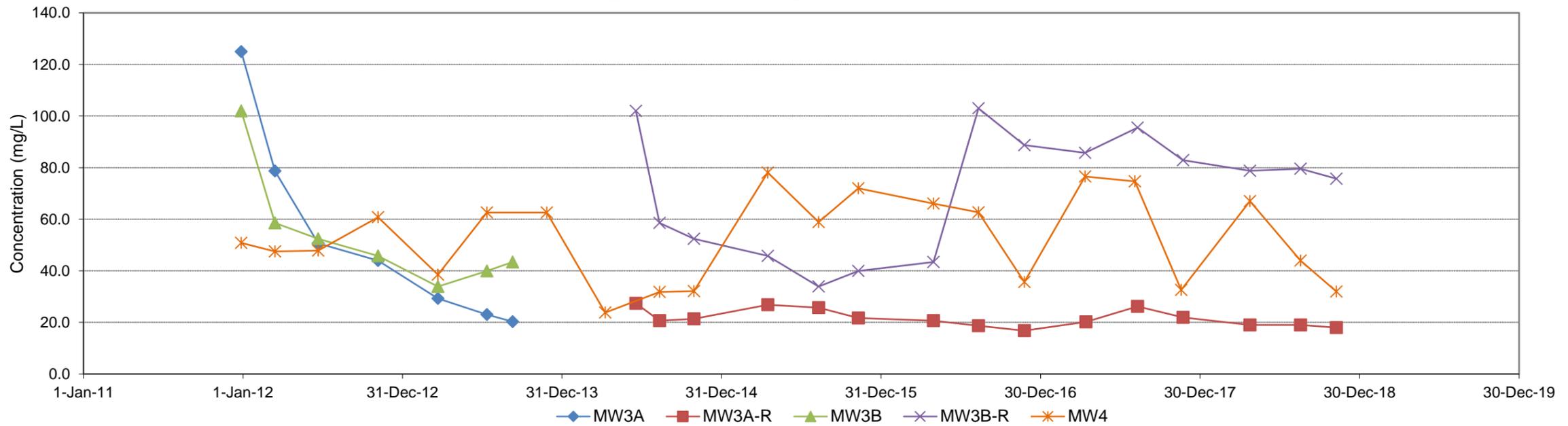
15/01/2019



Monitoring Locations: MW1 (Crossgradient), MW2 (Upgradient), and MW5 (Internal Assessment)



Downgradient Monitoring Locations: MW3 and MW4



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
SULPHATE**

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

D-3

APPROX. SCALE

NTS

PROJECT NUMBER

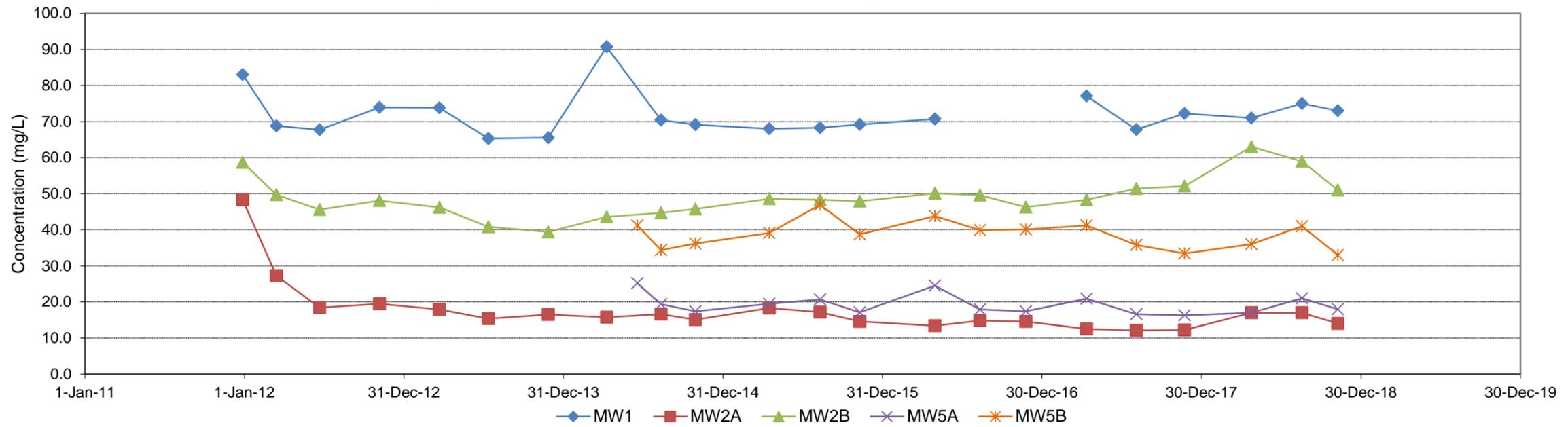
1604066

DATE REVISED

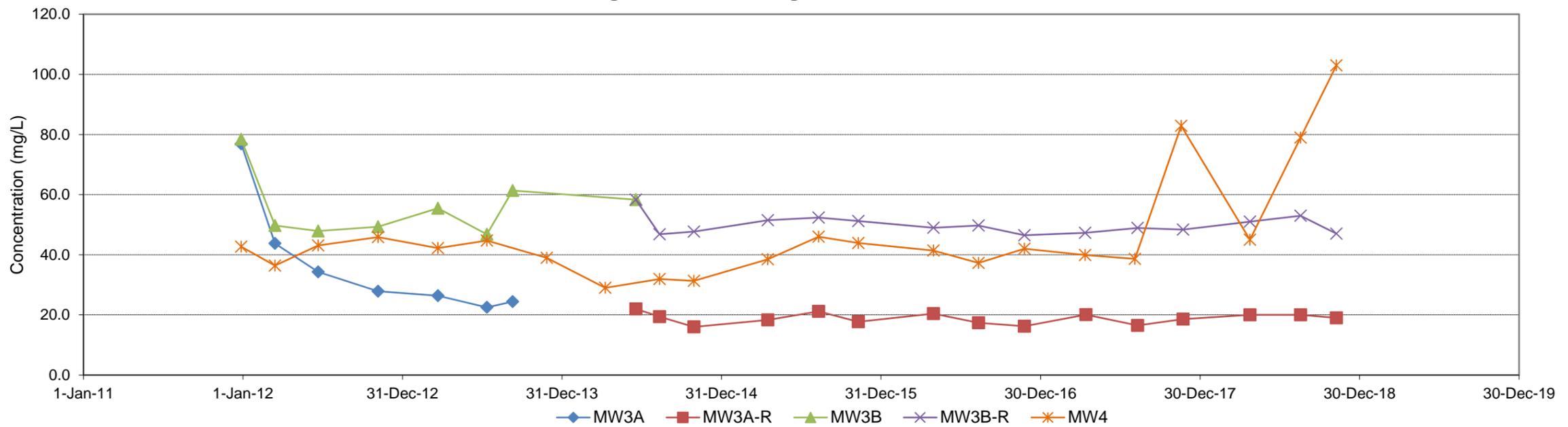
15/01/2019



Monitoring Locations: MW1 (Crossgradient), MW2 (Upgradient), and MW5 (Internal Assessment)



Downgradient Monitoring Locations: MW3 and MW4



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
CALCIUM**

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

D-4

APPROX. SCALE

NTS

PROJECT NUMBER

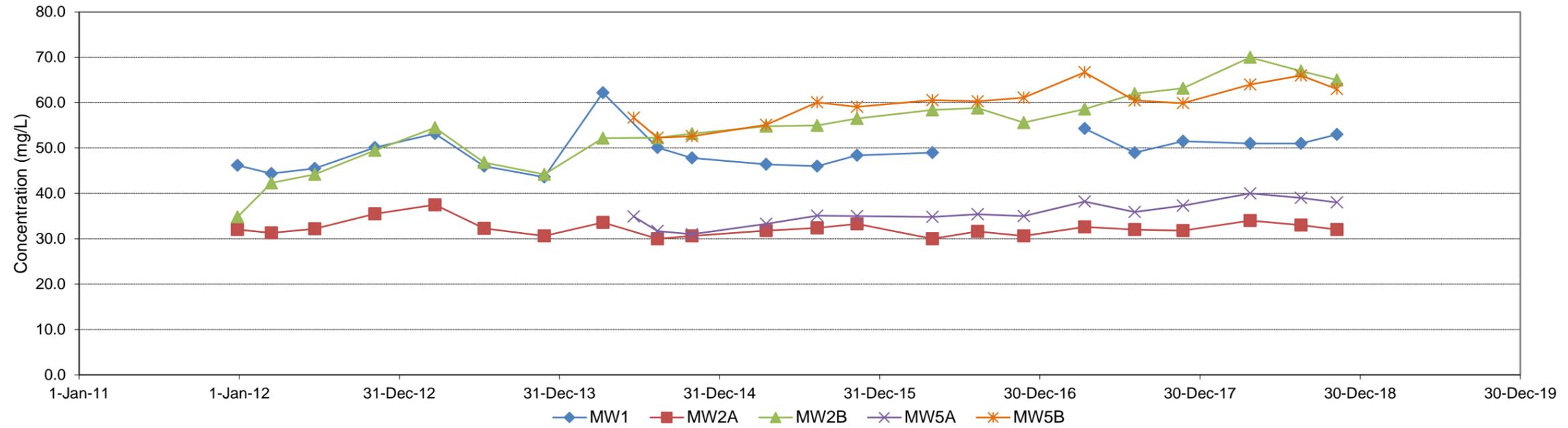
1604066

DATE REVISED

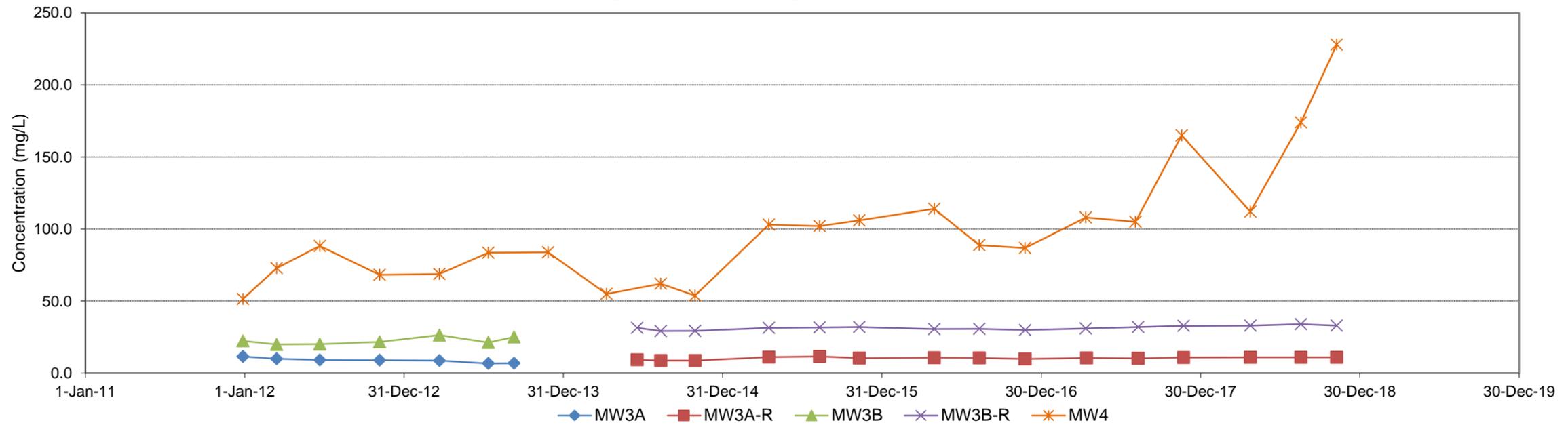
15/01/2019



Monitoring Locations: MW1 (Crossgradient), MW2 (Upgradient), and MW5 (Internal Assessment)



Downgradient Monitoring Locations: MW3 and MW4



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
MAGNESIUM**

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

D-5

APPROX. SCALE

NTS

PROJECT NUMBER

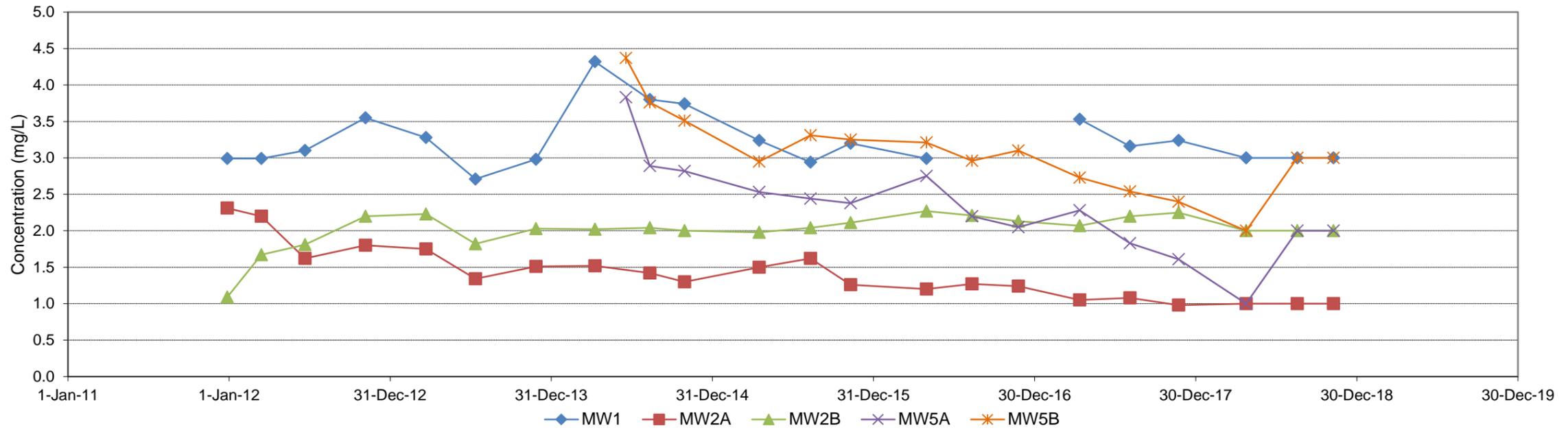
1604066

DATE REVISED

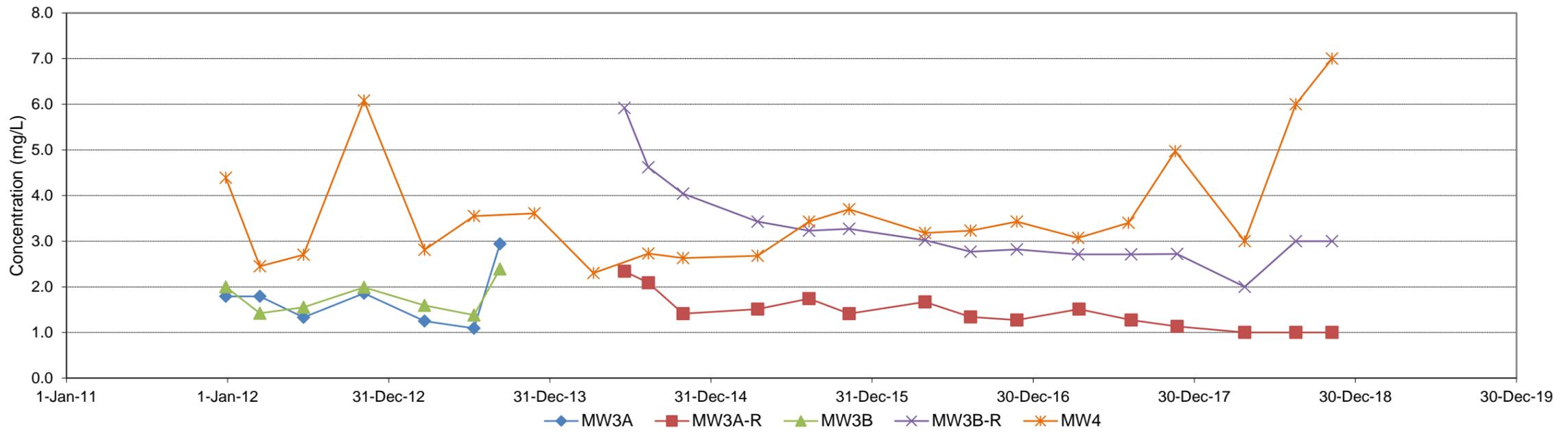
15/01/2019



Monitoring Locations: MW1 (Crossgradient), MW2 (Upgradient), and MW5 (Internal Assessment)



Downgradient Monitoring Locations: MW3 and MW4



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
POTASSIUM**

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

D-6

APPROX. SCALE

NTS

PROJECT NUMBER

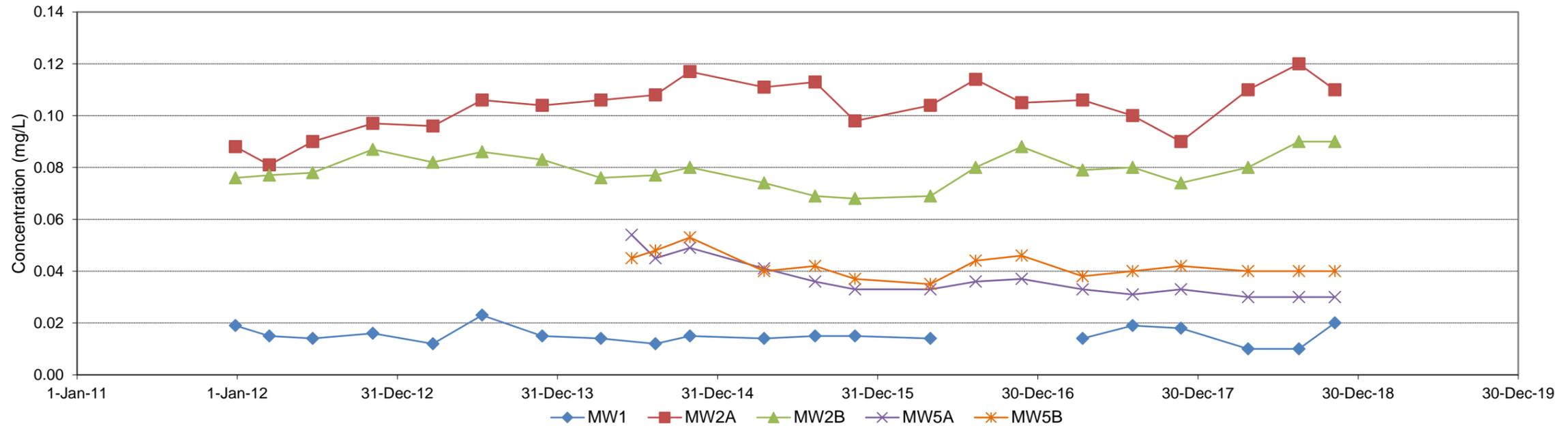
1604066

DATE REVISED

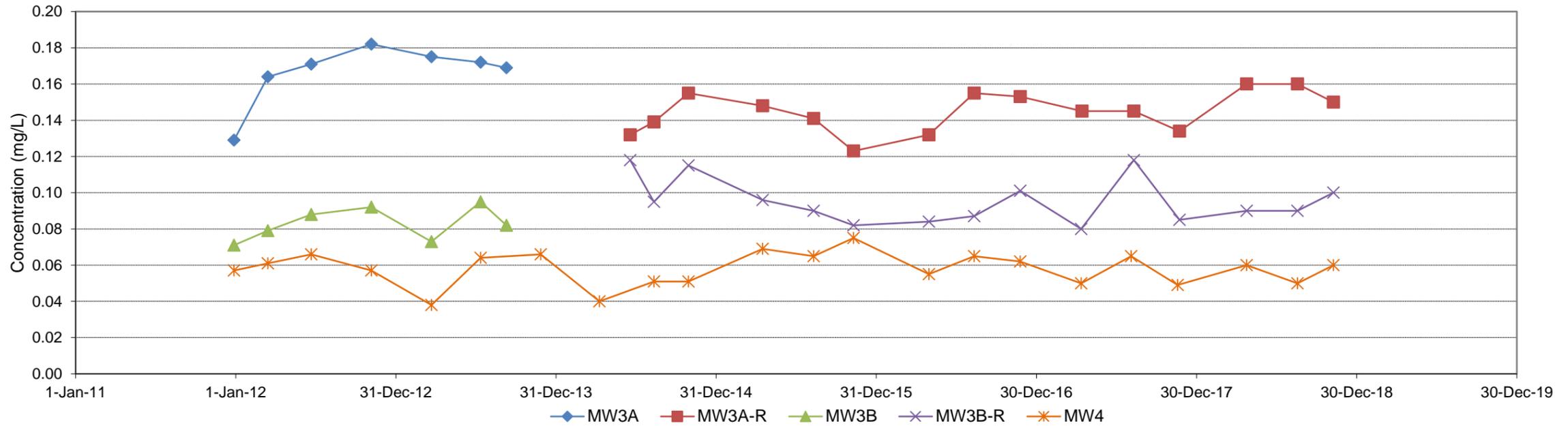
15/01/2019



Monitoring Locations: MW1 (Crossgradient), MW2 (Upgradient), and MW5 (Internal Assessment)



Downgradient Monitoring Locations: MW3 and MW4



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
BORON**

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

D-7

APPROX. SCALE

NTS

PROJECT NUMBER

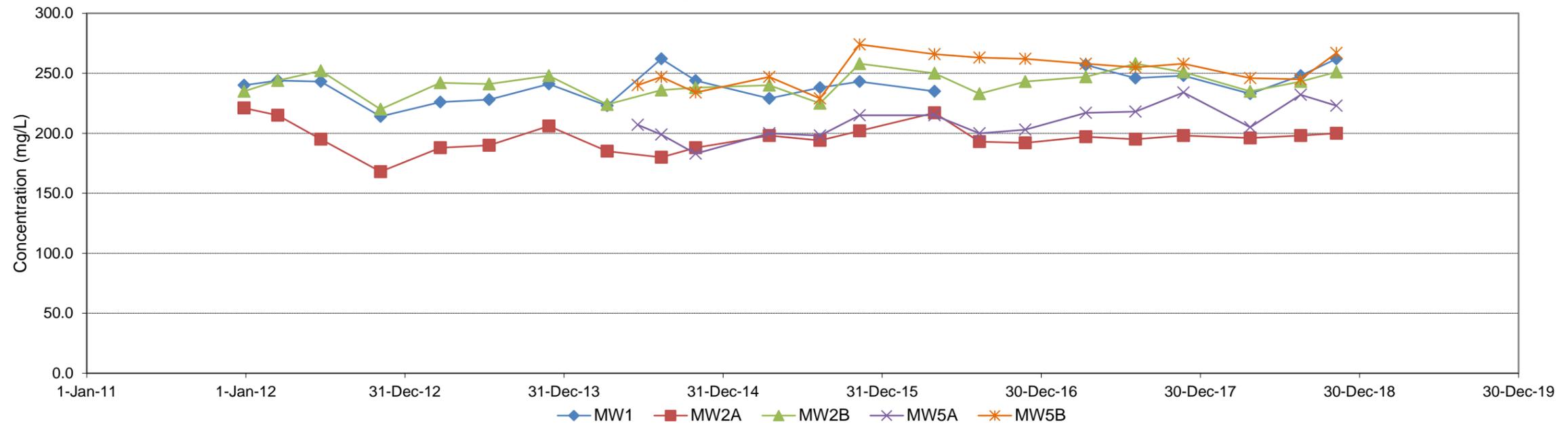
1604066

DATE REVISED

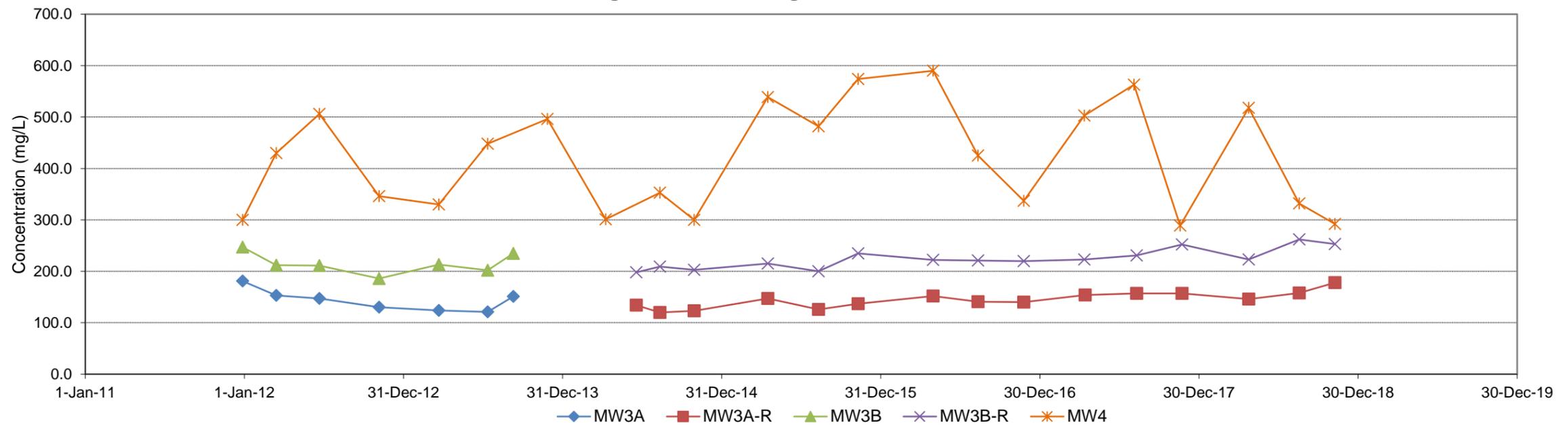
15/01/2019



Monitoring Locations: MW1 (Crossgradient), MW2 (Upgradient), and MW5 (Internal Assessment)



Downgradient Monitoring Locations: MW3 and MW4



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
BICARBONATE**

2018 ANNUAL MONITORING REPORT

*REGIONAL MUNICIPALITY OF DURHAM
Durham-York Energy Centre*

FIGURE NUMBER

D-8

APPROX. SCALE

NTS

PROJECT NUMBER

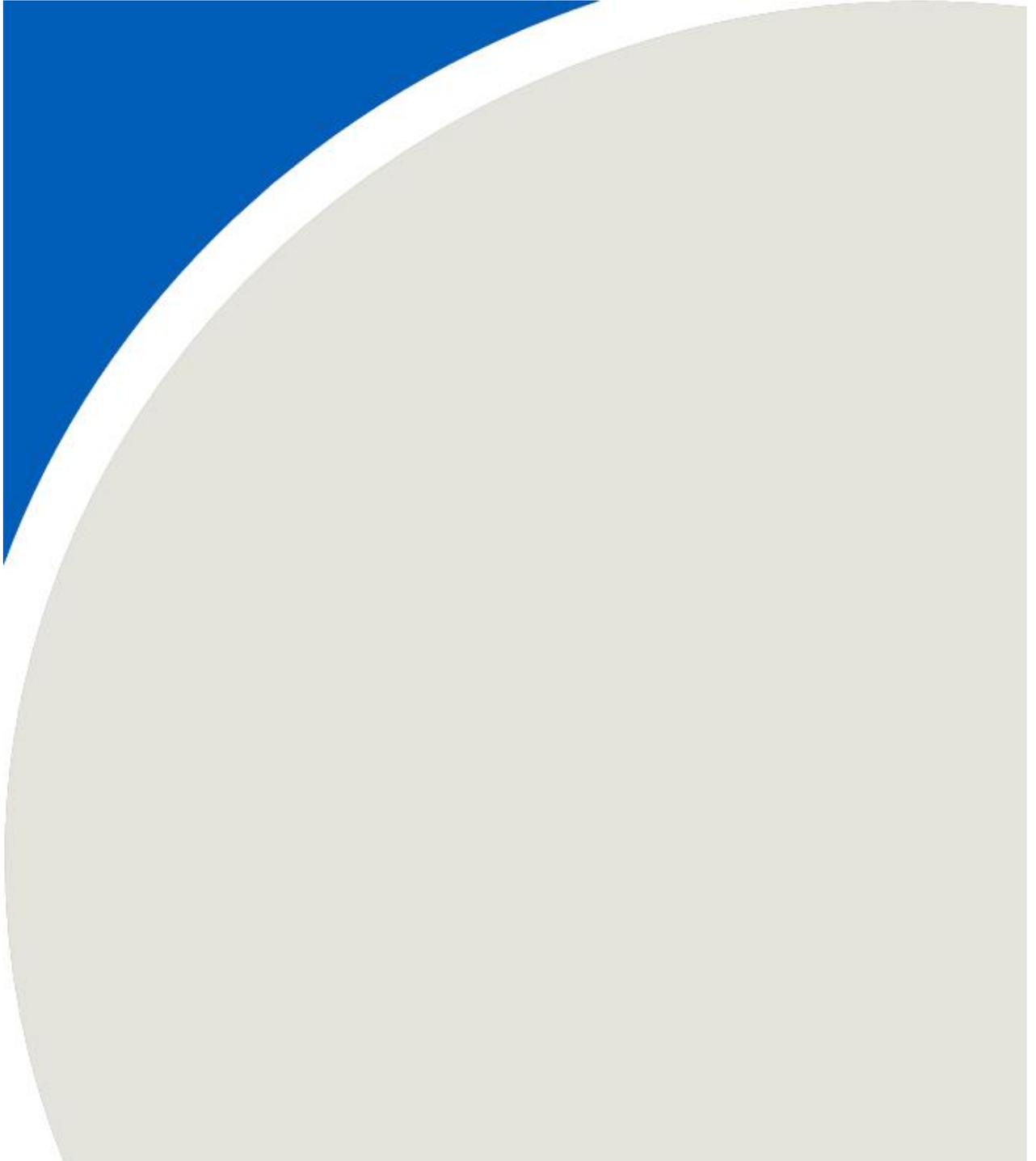
1604066

DATE REVISED

15/01/2019



APPENDIX E



Client: RWDI Air Inc (c/o Region of Durham)
4510 Rhodes Drive, Unit 520
Windsor, ON
N8W 5K5
Attention: Mr. Phil Janisse
PO#:
Invoice to: The Regional Municipality of Durham

Report Number: 1806157
Date Submitted: 2018-04-25
Date Reported: 2019-02-20
Project: 1604066, 8002
COC #: 189283

Page 1 of 6

Dear Phil Janisse:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Revision 1: This is a revision and supersedes the version of this report issued on 2018-05-02. Ph and Alkalinity were removed as per client.

APPROVAL: _____

Rebecca Koshy, Project Manager

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: <http://www.cala.ca/scopes/2602.pdf>.

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Certificate of Analysis

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 4510 Rhodes Drive, Unit 520
 Windsor, ON
 N8W 5K5
 Attention: Mr. Phil Janisse
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 Invoice to: The Regional Municipality of Durham

Report Number: 1806157
 Date Submitted: 2018-04-25
 Date Reported: 2019-02-20
 Project: 1604066, 8002
 COC #: 189283

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1355528 GW 2018-04-23 MW1	1355529 GW 2018-04-23 MW2B	1355530 GW 2018-04-23 MW3A-R	1355531 GW 2018-04-23 MW3B-R
Anions	Cl	1	mg/L	AO 250		22	152	8	12
	SO4	1	mg/L	AO 500		162	66	19	66
General Chemistry	CO3 as CaCO3	1	mg/L			N/A-PH	N/A-PH	N/A-PH	N/A-PH
	HCO3 as CaCO3	1	mg/L			233	235	146	223
Mercury	Hg	0.0001	mg/L	MAC 0.001		<0.0001	<0.0001	<0.0001	<0.0001
Metals	B	0.01	mg/L	IMAC 5.0		0.01	0.08	0.16	0.09
	Ca	1	mg/L			71	63	20	51
	Cd	0.0001	mg/L	MAC 0.005		<0.0001	0.0001	<0.0001	<0.0001
	Co	0.0002	mg/L			<0.0002	<0.0002	<0.0002	<0.0002
	K	1	mg/L			3	2	1	2
	Mg	1	mg/L			51	70	11	33
	Na	2	mg/L	AO 200		24	42	42	32
	Pb	0.001	mg/L	MAC 0.010		<0.001	<0.001	<0.001	<0.001
Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1355532 GW 2018-04-23 MW2A	1355533 GW 2018-04-23 MW4	1355534 GW 2018-04-23 MW5B	1355535 GW 2018-04-23 MW8002
Anions	Cl	1	mg/L	AO 250		4	14	40	40
	SO4	1	mg/L	AO 500		16	67	74	75
General Chemistry	CO3 as CaCO3	1	mg/L			N/A-PH	N/A-PH	N/A-PH	N/A-PH
	HCO3 as CaCO3	1	mg/L			196	518	246	230
Mercury	Hg	0.0001	mg/L	MAC 0.001		<0.0001	<0.0001	<0.0001	<0.0001
Metals	B	0.01	mg/L	IMAC 5.0		0.11	0.06	0.04	0.03

Guideline = ODWSOG

* = Guideline Exceedence

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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Certificate of Analysis

Client: RWDI Air Inc (c/o Region of Durham)
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 N8W 5K5
 Attention: Mr. Phil Janisse
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 Invoice to: The Regional Municipality of Durham

Report Number: 1806157
 Date Submitted: 2018-04-25
 Date Reported: 2019-02-20
 Project: 1604066, 8002
 COC #: 189283

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1355532 GW 2018-04-23 MW2A	1355533 GW 2018-04-23 MW4	1355534 GW 2018-04-23 MW5B	1355535 GW 2018-04-23 MW8002
Metals	Ca	1	mg/L			17	45	36	35
	Cd	0.0001	mg/L	MAC 0.005		<0.0001	<0.0001	<0.0001	<0.0001
	Co	0.0002	mg/L			<0.0002	<0.0002	<0.0002	<0.0002
	K	1	mg/L			1	3	2	2
	Mg	1	mg/L			34	112	64	64
	Na	2	mg/L	AO 200		20	38	17	16
	Pb	0.001	mg/L	MAC 0.010		<0.001	<0.001	<0.001	<0.001

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Anions	Cl	1	mg/L	AO 250	1355536 GW 2018-04-23 MW5A
	SO4	1	mg/L	AO 500	
General Chemistry	CO3 as CaCO3	1	mg/L		N/A-PH
	HCO3 as CaCO3	1	mg/L		205
Mercury	Hg	0.0001	mg/L	MAC 0.001	<0.0001
Metals	B	0.01	mg/L	IMAC 5.0	0.03
	Ca	1	mg/L		17
	Cd	0.0001	mg/L	MAC 0.005	<0.0001
	Co	0.0002	mg/L		<0.0002
	K	1	mg/L		1
	Mg	1	mg/L		40
	Na	2	mg/L	AO 200	10

Guideline = ODWSOG

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Lab I.D.
 Sample Matrix
 Sample Type
 Sampling Date
 Sample I.D.

1355536
 GW
 2018-04-23
 MW5A

Group	Analyte	MRL	Units	Guideline
Metals	Pb	0.001	mg/L	MAC 0.010

<0.001

Guideline = ODWSOG

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 Invoice to: The Regional Municipality of Durham

Report Number: 1806157
 Date Submitted: 2018-04-25
 Date Reported: 2019-02-20
 Project: 1604066, 8002
 COC #: 189283

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 344377 Analysis/Extraction Date 2018-04-27 Analyst SKH			
Method M SM3112B-3500B			
Mercury	<0.0001 mg/L	105	76-123
Run No 344383 Analysis/Extraction Date 2018-04-27 Analyst SKH			
Method EPA 200.8			
Boron (total)	<0.01 mg/L	112	84.9-115
Cadmium	<0.0001 mg/L	99	93.5-106.4
Cobalt	<0.0002 mg/L	101	92.7-107.2
Lead	<0.001 mg/L	99	90-110
Run No 344627 Analysis/Extraction Date 2018-05-02 Analyst H_F			
Method SM 4110			
Chloride	<1 mg/L	100	90-110
SO4	<1 mg/L	105	90-110
Run No 344636 Analysis/Extraction Date 2018-05-01 Analyst H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	98	90-110
Potassium	<1 mg/L	100	87-113
Magnesium	<1 mg/L	96	76-124
Sodium	<2 mg/L	100	82-118

Guideline = ODWSOG

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Report Number: 1806157
 Date Submitted: 2018-04-25
 Date Reported: 2019-02-20
 Project: 1604066, 8002
 COC #: 189283

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 344664	Analysis/Extraction Date 2018-05-02	Analyst AET	
Method SM 2320B			
CO3 as CaCO3			
HCO3 as CaCO3			

Guideline = ODWSOG

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Client: RWDI Air Inc (c/o Region of Durham)
4510 Rhodes Drive, Unit 520
Windsor, ON
N8W 5K5
Attention: Mr. Phil Janisse
PO#:
Invoice to: The Regional Municipality of Durham

Report Number: 1814778
Date Submitted: 2018-08-18
Date Reported: 2019-02-20
Project: 1604066-8002
COC #: 197543

Page 1 of 7

Dear Phil Janisse:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Revision 1: This is a revision and supersedes the version of this report issued on 2018-08-27. Ph and Alkalinity were removed as per client.

APPROVAL: _____

Rebecca Koshy, Project Manager

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Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1381705 GW 2018-08-17 MW1	1381706 GW 2018-08-17 MW2A	1381707 GW 2018-08-17 MW2B	1381708 GW 2018-08-17 MW3A-R
Anions	Cl	1	mg/L	AO 250		18	4	129	7
	SO4	1	mg/L	AO 500		164	24	79	19
General Chemistry	CO3 as CaCO3	1	mg/L			N/A-PH	N/A-PH	N/A-PH	N/A-PH
	HCO3 as CaCO3	1	mg/L			248	198	243	158
Mercury	Hg	0.0001	mg/L	MAC 0.001		<0.0001	<0.0001	<0.0001	<0.0001
Metals	B	0.01	mg/L	IMAC 5.0		0.01	0.12	0.09	0.16
	Ca	1	mg/L			75	17	59	20
	Cd	0.0001	mg/L	MAC 0.005		<0.0001	<0.0001	<0.0001	<0.0001
	Co	0.0002	mg/L			<0.0002	<0.0002	<0.0002	<0.0002
	K	1	mg/L			3	1	2	1
	Mg	1	mg/L			51	33	67	11
	Na	2	mg/L	AO 200		19	29	40	42
	Pb	0.001	mg/L	MAC 0.010		<0.001	<0.001	<0.001	<0.001
Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1381709 GW 2018-08-17 MW3B-R	1381710 GW 2018-08-17 MW4	1381711 GW 2018-08-17 MW5B	1381712 GW 2018-08-17 MW5A
Anions	Cl	1	mg/L	AO 250		13	765*	46	2
	SO4	1	mg/L	AO 500		75	44	88	15
General Chemistry	CO3 as CaCO3	1	mg/L			N/A-PH	N/A-PH	N/A-PH	N/A-PH
	HCO3 as CaCO3	1	mg/L			262	332	245	232
Mercury	Hg	0.0001	mg/L	MAC 0.001		<0.0001	<0.0001	<0.0001	<0.0001
Metals	B	0.01	mg/L	IMAC 5.0		0.09	0.05	0.04	0.03

Guideline = ODWSOG

* = Guideline Exceedence

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 COC #: 197543

Group	Analyte	MRL	Units	Guideline	1381709 GW 2018-08-17 MW3B-R	1381710 GW 2018-08-17 MW4	1381711 GW 2018-08-17 MW5B	1381712 GW 2018-08-17 MW5A
Metals	Ca	1	mg/L		53	79	41	21
	Cd	0.0001	mg/L	MAC 0.005	0.0005	<0.0001	<0.0001	<0.0001
	Co	0.0002	mg/L		<0.0002	0.0011	<0.0002	<0.0002
	K	1	mg/L		3	6	3	2
	Mg	1	mg/L		34	174	66	39
	Na	2	mg/L	AO 200	35	148	17	12
	Pb	0.001	mg/L	MAC 0.010	<0.001	<0.001	<0.001	<0.001

Group	Analyte	MRL	Units	Guideline	1381713 GW 2018-08-17 GW8002
Anions	Cl	1	mg/L	AO 250	46
	SO4	1	mg/L	AO 500	87
General Chemistry	CO3 as CaCO3	1	mg/L		N/A-PH
	HCO3 as CaCO3	1	mg/L		245
Mercury	Hg	0.0001	mg/L	MAC 0.001	<0.0001
Metals	B	0.01	mg/L	IMAC 5.0	0.04
	Ca	1	mg/L		41
	Cd	0.0001	mg/L	MAC 0.005	<0.0001
	Co	0.0002	mg/L		<0.0002
	K	1	mg/L		3
	Mg	1	mg/L		66
	Na	2	mg/L	AO 200	18

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 COC #: 197543

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Metals	Pb	0.001	mg/L	MAC 0.010	1381713 GW 2018-08-17 GW8002
					<0.001

Guideline = ODWSOG

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 Date Submitted: 2018-08-18
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 Project: 1604066-8002
 COC #: 197543

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 351102 Analysis/Extraction Date 2018-08-20 Analyst SKH			
Method EPA 200.8			
Boron (total)	<0.01 mg/L	96	84.9-115
Cadmium	<0.0001 mg/L	104	93.5-106.4
Cobalt	<0.0002 mg/L	101	92.7-107.2
Lead	<0.001 mg/L	100	90-110
Run No 351196 Analysis/Extraction Date 2018-08-21 Analyst SKH			
Method M SM3112B-3500B			
Mercury	<0.0001 mg/L	99	76-123
Run No 351361 Analysis/Extraction Date 2018-08-24 Analyst H_F			
Method SM 4110			
Chloride	<1 mg/L	100	90-110
SO4	<1 mg/L	105	90-110
Run No 351504 Analysis/Extraction Date 2018-08-25 Analyst H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	100	90-110
Potassium	<1 mg/L	103	87-113
Magnesium	<1 mg/L	98	76-124
Sodium	<2 mg/L	110	82-118

Guideline = ODWSOG

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 Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: RWDI Air Inc (c/o Region of Durham)
 4510 Rhodes Drive, Unit 520
 Windsor, ON
 N8W 5K5
 Attention: Mr. Phil Janisse
 PO#:
 Invoice to: The Regional Municipality of Durham

Report Number: 1814778
 Date Submitted: 2018-08-18
 Date Reported: 2019-02-20
 Project: 1604066-8002
 COC #: 197543

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 351518 Analysis/Extraction Date 2018-08-27 Analyst AET Method SM 2320B			
CO3 as CaCO3			
HCO3 as CaCO3			
Run No 351532 Analysis/Extraction Date 2018-08-27 Analyst H_F Method SM 4110			
Chloride	<1 mg/L	100	90-110

Guideline = ODWSOG

*** = Guideline Exceedence**

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 Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

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Sample Comment Summary

Sample ID: 1381705 MW1 Metals and Hg were field filtered for all samples.
Sample ID: 1381713 GW8002 N/A - PH - indicates the carbonate value is not available due to the fact the pH is below 8.3 for all samples.

Guideline = ODWSOG

*** = Guideline Exceedence**

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Client: RWDI Air Inc (c/o Region of Durham)
4510 Rhodes Drive, Unit 520
Windsor, ON
N8W 5K5
Attention: Mr. Phil Janisse
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Invoice to: The Regional Municipality of Durham

Report Number: 1820515
Date Submitted: 2018-11-09
Date Reported: 2019-02-20
Project: 1604066-4002
COC #: 198920

Page 1 of 6

Dear Phil Janisse:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Revision 1: This is a revision and supersedes the version of this report issued on 2018-11-19. Ph, Turbidity and Alkalinity were removed as per client.

APPROVAL:

Rebecca Koshy, Project Manager

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: <http://www.cala.ca/scopes/2602.pdf>.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

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Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1398424 GW 2018-11-07 MW1	1398425 GW 2018-11-07 MW2A	1398426 GW 2018-11-07 MW2B	1398427 GW 2018-11-07 MW3A-R
Anions	Cl	1	mg/L	AO 250		22	6	131	7
	SO4	1	mg/L	AO 500		193	20	71	18
General Chemistry	CO3 as CaCO3	1	mg/L			N/A-PH	N/A-PH	N/A-PH	N/A-PH
	HCO3 as CaCO3	1	mg/L			262	200	251	178
Metals	B	0.01	mg/L	IMAC 5.0		0.02	0.11	0.09	0.15
	Ca	1	mg/L			73	14	51	19
	Cd	0.0001	mg/L	MAC 0.005		<0.0001	<0.0001	<0.0001	<0.0001
	Co	0.0002	mg/L			<0.0002	<0.0002	<0.0002	<0.0002
	Hg	0.0001	mg/L	MAC 0.001		<0.0001	<0.0001	<0.0001	<0.0001
	K	1	mg/L			3	1	2	1
	Mg	1	mg/L			53	32	65	11
	Na	2	mg/L	AO 200		18	23	39	40
	Pb	0.001	mg/L	MAC 0.010		<0.001	<0.001	<0.001	<0.001
Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1398428 GW 2018-11-07 MW3B-R	1398429 GW 2018-11-07 MW4	1398430 GW 2018-11-07 MW5A	1398431 GW 2018-11-07 MW5B
Anions	Cl	1	mg/L	AO 250		14	1160*	3	48
	SO4	1	mg/L	AO 500		72	32	13	79
General Chemistry	CO3 as CaCO3	1	mg/L			N/A-PH	N/A-PH	N/A-PH	N/A-PH
	HCO3 as CaCO3	1	mg/L			253	292	223	267
Metals	B	0.01	mg/L	IMAC 5.0		0.10	0.06	0.03	0.04
	Ca	1	mg/L			47	103	18	33

Guideline = ODWSOG

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 Methods references and/or additional QA/QC information available on request.

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 COC #: 198920

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1398428 GW 2018-11-07 MW3B-R	1398429 GW 2018-11-07 MW4	1398430 GW 2018-11-07 MW5A	1398431 GW 2018-11-07 MW5B
Metals	Cd	0.0001	mg/L	MAC 0.005		0.0003	<0.0001	<0.0001	<0.0001
	Co	0.0002	mg/L			<0.0002	0.0013	<0.0002	<0.0002
	Hg	0.0001	mg/L	MAC 0.001		<0.0001	<0.0001	<0.0001	<0.0001
	K	1	mg/L			3	7	2	3
	Mg	1	mg/L			33	228	38	63
	Na	2	mg/L	AO 200		32	293*	11	20
	Pb	0.001	mg/L	MAC 0.010		<0.001	<0.001	<0.001	<0.001

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Anions	Cl	1	mg/L	AO 250	1398432 GW 2018-11-07 GW8002
	SO4	1	mg/L	AO 500	
General Chemistry	CO3 as CaCO3	1	mg/L		50
	HCO3 as CaCO3	1	mg/L		82
Metals	B	0.01	mg/L	IMAC 5.0	N/A-PH
	Ca	1	mg/L		250
	Cd	0.0001	mg/L	MAC 0.005	0.04
	Co	0.0002	mg/L		33
	Hg	0.0001	mg/L	MAC 0.001	<0.0001
	K	1	mg/L		<0.0001
	Mg	1	mg/L		3
	Na	2	mg/L	AO 200	62
					20

Guideline = ODWSOG

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Lab I.D. 1398432
 Sample Matrix GW
 Sample Type
 Sampling Date 2018-11-07
 Sample I.D. GW8002

Group	Analyte	MRL	Units	Guideline	
Metals	Pb	0.001	mg/L	MAC 0.010	<0.001

Guideline = ODWSOG

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 COC #: 198920

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 356398 Analysis/Extraction Date 2018-11-11 Analyst H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	102	90-110
Potassium	<1 mg/L	101	87-113
Magnesium	<1 mg/L	100	76-124
Sodium	<2 mg/L	103	82-118
Run No 356497 Analysis/Extraction Date 2018-11-13 Analyst H_F			
Method M SM3120B-3500C			
Sodium	<2 mg/L	97	82-118
Run No 356640 Analysis/Extraction Date 2018-11-14 Analyst H_D			
Method EPA 200.8			
Boron (total)	<0.01 mg/L	106	84.9-115
Cadmium	<0.0001 mg/L	99	93.5-106.4
Cobalt	<0.0002 mg/L	104	92.7-107.2
Mercury	<0.0001 mg/L	89	80-120
Lead	<0.001 mg/L	103	90-110
Run No 356650 Analysis/Extraction Date 2018-11-15 Analyst AET			
Method SM 2320B			
CO3 as CaCO3			

Guideline = ODWSOG

*** = Guideline Exceedence**

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 COC #: 198920

QC Summary

Analyte	Blank	QC % Rec	QC Limits
HCO3 as CaCO3			
Run No 356672 Analysis/Extraction Date 2018-11-16 Analyst H_F Method SM 4110			
Chloride	<1 mg/L	100	90-110
SO4	<1 mg/L	95	90-110
Run No 356853 Analysis/Extraction Date 2018-11-17 Analyst H_F Method SM 4110			
Chloride	<1 mg/L	100	90-110

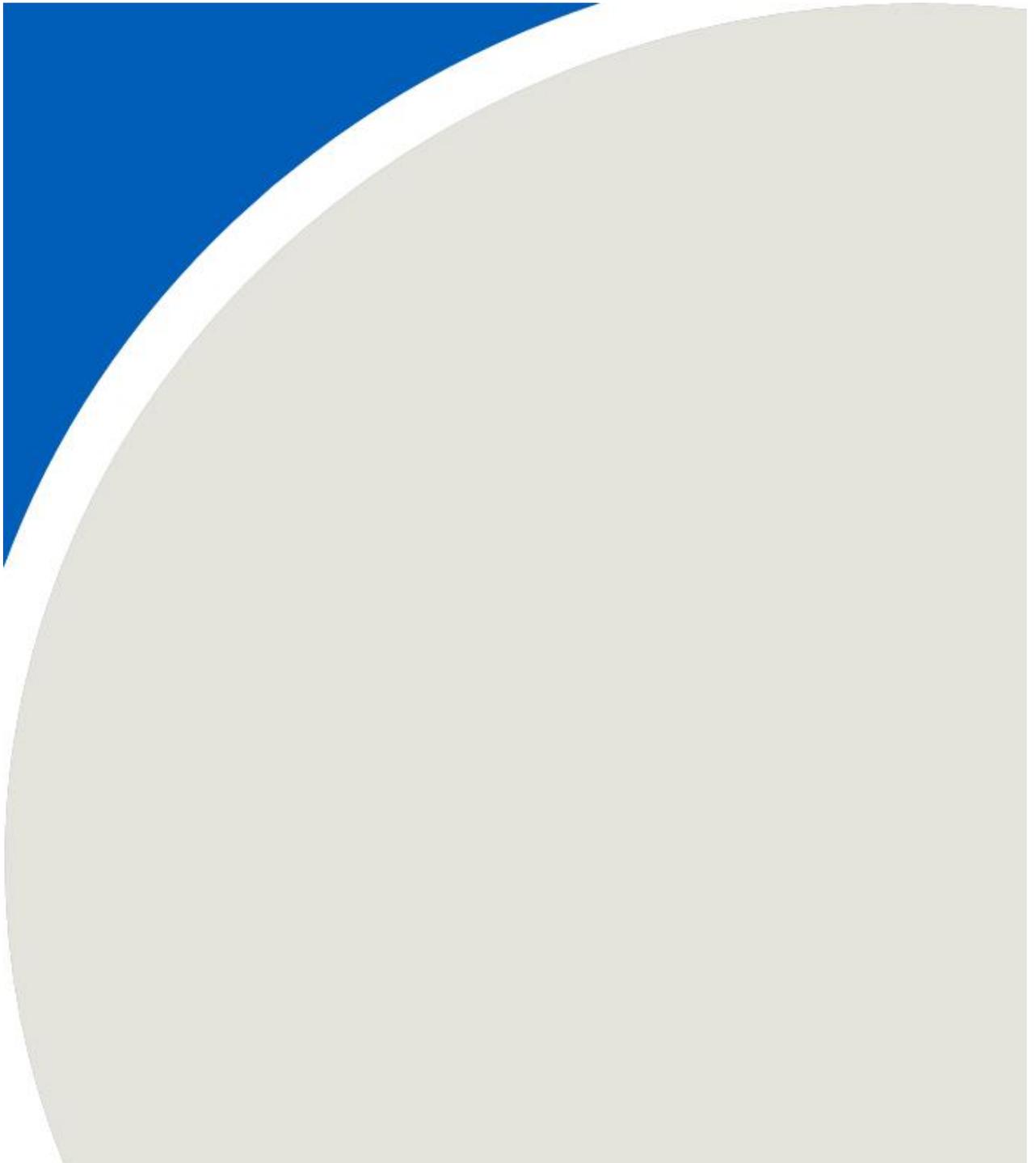
Guideline = ODWSOG

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MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

APPENDIX F



Appendix D-Monitoring and Screening Checklist General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.

Instructions: A complete checklist consists of:

- (a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
- (b) completed contact information for the Competent Environmental Practitioner (CEP)
- (c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:

For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:

- (a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
- (b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..

Definition of Surface water CEP:

A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information

Monitoring Report and Site Information	
Waste Disposal Site Name	Durham York Energy Centre
Location (e.g. street address, lot, concession)	1835 Energy Dr., Courtice, Ontario
GPS Location (taken within the property boundary at front gate/ front entry)	NAD 83: Zone 17, 680660E, 4860490N
Municipality	Municipality of Clarington
Client and/or Site Owner	Regional Municipalities of Durham and York
Monitoring Period (Year)	2018
This Monitoring Report is being submitted under the following:	
Certificate of Approval No.:	7306-8FDKNX
Director's Order No.:	
Provincial Officer's Order No.:	
Other:	

Report Submission Frequency	<input checked="" type="radio"/> Annual <input type="radio"/> Other	Specify (Type Here):
The site is:	<input checked="" type="radio"/> Active <input type="radio"/> Inactive <input type="radio"/> Closed	
If closed, specify C of A, control or authorizing document closure date:		
Has the nature of the operations at the site changed during this monitoring period?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
If yes, provide details:	Type Here	
Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i. e. exceeded the LEL for methane)	<input type="radio"/> Yes <input checked="" type="radio"/> No	

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

<p>1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	
<p>2) All groundwater, leachate and WDS gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by Certificate(s) of Approval or other relevant authorizing/control document(s):</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Applicable</p>	<p>If no, list exceptions below or attach information.</p>

Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

<p>3) a) Some or all groundwater, leachate and WDS gas sampling and monitoring requirements have been established or defined outside of a ministry C of A, authorizing, or control document.</p>	<p><input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable</p>	
<p>b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:</p>	<p><input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable</p>	<p>If no, list exceptions below or attach additional information.</p>
<p>Groundwater Sampling Location</p>	<p>Description/Explanation for change (change in name or location, additions, deletions)</p>	<p>Date</p>
<p>4) All field work for groundwater investigations was done in accordance with standard operating procedures as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

<p>5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	
<p>6) The site meets compliance and assessment criteria.</p>	<p><input type="radio"/> Yes <input checked="" type="radio"/> No</p>	<p>Refer to Section 4.4 of the 2018 Annual Groundwater and Surface Water Monitoring Report for additional details. There were ODWS exceedances in 2018 (chloride and sodium) at MW4, which are attributed to the application of de-icing salt.</p>
<p>7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.</p>	<p><input type="radio"/> Yes <input checked="" type="radio"/> No</p>	<p>Refer to Section 4.3 of the 2018 Annual Groundwater and Surface Water Monitoring Report for additional details. There were distinct increases in the concentration of salt related parameters (chloride, sodium, calcium, magnesium, and potassium) at MW4 in 2018, which are attributed to the application of de-icing salt.</p>
<p>1) Is one or more of the following risk reduction practices in place at the site:</p> <p>(a) There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/treatment; or</p> <p>(b) There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or</p> <p>(c) The site meets the following two conditions (typically achieved after 15 years or longer of site operation):</p> <p><i>i.</i> The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and</p> <p><i>ii.</i> Seasonal and annual water levels and water quality fluctuations are well understood.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p>Note which practice(s):</p> <p><input type="checkbox"/> (a) <input checked="" type="checkbox"/> (b) <input type="checkbox"/> (c)</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable</p>	

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories*, or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Select Date

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

No changes to the monitoring program are recommended

The following change(s) to the monitoring program is/are recommended:

In a letter to the MECP dated January 9, 2019, the Regional Municipalities of Durham and York requested a change to the Groundwater and Surface Water Monitoring Plan for DYEC. The DYEC facility design includes engineering controls and operating procedures for the protection of groundwater. As presented in Annual Reports for DYEC since 2012, monitoring results to date have demonstrated the effectiveness of the groundwater protection measures and have shown no adverse impacts to groundwater from DYEC waste treatment operations. As such, the Regional Municipalities of Durham and York requested that the Groundwater and Surface Water Monitoring Plan be amended to reduce the required groundwater monitoring frequency from three (3) times per year to once per year, commencing in 2019. Subject to MECP approval, groundwater sampling would occur once per year in the fall. Until confirmation and approval of the request is granted by the MECP, the groundwater sampling frequency will remain unchanged.

No Changes to site design and operation are recommended

The following change(s) to the site design and operation is/are recommended:

Name:	Philippe Janisse, B.Sc., P.Geo.		
Seal:			
Signature:		Date:	April 18, 2019
CEP Contact Information:	Philippe Janisse, B.Sc., P.Geo.		
Company:	RWDI AIR Inc.		
Address:	4510 Rhodes Drive, Unit 530, Windsor, ON N8W 5K5		
Telephone No.:	(519) 823-1311	Fax No. :	(519) 823-1316
E-mail Address:	Philippe.Janisse@rwdi.com		
Co-signers for additional expertise provided:			
Signature:		Date:	
Signature:		Date:	

Surface Water WDS Verification:

Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):

Name (s)	Tooley Creek and tributaries.
Distance(s)	The nearest natural surface water body to the Site is a tributary of Tooley Creek, located approximately 150 m northwest of the Site. At its nearest point, Tooley Creek is located approximately 700 m southwest of the Site.

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	<input type="radio"/> Yes <input checked="" type="radio"/> No	With MECP approval, the routine surface water monitoring program (i.e., placement and monitoring of sondes in Tooley Creek) for DYEC has been suspended due to construction activities for the Highway 401/Courtice Road interchange. As such, the routine surface water monitoring program for the DYEC was not required to be completed in 2018.
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the Certificate(s) of Approval or relevant authorizing/control document(s) (if applicable):	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not applicable (No C of A, authorizing / control document applies)	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

<p>3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry C of A or authorizing/control document.</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p> <p><input type="radio"/> Not Applicable</p>	
<p>b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> Not Applicable</p>	<p>If no, specify below or provide details in an attachment.</p>
<p>Surface Water Sampling Location</p>	<p>Description/Explanation for change (change in name or location, additions, deletions)</p>	<p>Date</p>
<p>4) All field work for surface water investigations was done in accordance with standard operating procedures, including internal/external QA/QC requirements, as established/ outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>Not applicable.</p>

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):	<input checked="" type="radio"/> Yes <input type="radio"/> No
--	--

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table below or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. C of A limit, PWQO, background	e.g. X% above PWQO

6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	<input checked="" type="radio"/> Yes <input type="radio"/> No	Not applicable.
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<p>7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>Not applicable.</p>
<p>8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g., PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input type="radio"/> Not Known</p> <p><input type="radio"/> Not Applicable</p>	<p>Groundwater quality naturally exceeds select PWQOs. Please refer to the 2018 Annual Groundwater and Surface Water Monitoring Report.</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p> <p><input type="radio"/> Not Applicable</p>	

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories*, or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Select Date

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

<p><input checked="" type="radio"/> No Changes to the monitoring program are recommended</p> <p><input type="radio"/> The following change(s) to the monitoring program is/are recommended:</p>	
<p><input checked="" type="radio"/> No changes to the site design and operation are recommended</p> <p><input type="radio"/> The following change(s) to the site design and operation is/are recommended:</p>	

CEP Signature		
Relevant Discipline	Geology	
Date:	April 18, 2019	
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