Technical Memorandum

03 March 2023

To	Conservation Halton: Jacek Strakowski, Lisa Jennings, Jessica Bester	**Project No.**	010978-MEM-299
Copy to	JART, Kevin Mitchell (CRH), Brian Zeman (MHBC), Ellen Ferris (MHBC)		
From	Kyle Fritz, Richard Murphy, Anthony Goodban (Goodban Ecological Consulting Inc.)		
Project Name	Dufferin Aggregates Milton Quarry East Extension (MQEE)		
Subject	Supplemental Monitoring Wells and Triggers		

1. Introduction

GHD has prepared this memorandum in collaboration with Goodban Ecological Consulting Inc. (GEC) on behalf of Dufferin Aggregates in further response to JART comments requesting the addition of supplemental monitoring wells and associated response action water level triggers for Wetlands W41, Wetland W46, and Wetland W56 as part of the AMP requirements for the Proposed Milton Quarry East Extension (MQEE). The related JART comments were provided by Conservation Halton (CH) staff as Geology and Water Resources Assessment (GWRA) report Comments 30, 33, 34, 56, and AMP Addendum Comment 12. A response to these comments was provided in table format on January 25, 2023 and discussed at the JART meeting on February 3, 2023. During the course of those discussions, CH staff agreed that such additions to the AMP (via the AMP Addendum) were not necessary for Wetland W56; however, CH restated their request for Wetland W41 and Wetland W46. It was agreed to further consider this request for Wetland W41 and Wetland W46, including the feasibility of installing monitoring wells in the desired area (which is heavily wooded) and respond to CH and JART. This memorandum provides CRH's response to this request.

CRH agrees to the proposed installation of two additional Supplemental Monitoring wells and establishment of water level response triggers and actions to be implemented as part of the AMP Addendum subject to, and part of, an overall JART agreement on resolution of the comments on the proposed MQEE application.

The two proposed monitoring well locations are shown on the updated AMP Addendum figures: Figure 5 Rev 2, as attached. It is also proposed to install 2 additional staff gauges in wetland pool areas adjacent to the proposed monitoring well locations.

2. Proposed Addition to the Supplemental Monitoring Program

The following provides a description and explanation of the additions proposed to the Supplemental Monitoring program of the AMP Addendum in response to the request by CH/JART. Specific details for inclusion in the AMP Addendum to implement these additions are provided in the attached Proposed Modification to the AMP Addendum.

2.1 Supplemental Monitoring Wells and Staff Gauges

CRH is in agreement with the installation of two additional Supplemental Monitoring wells at the approximate locations shown on the attached figure as 'W41-MW-A' and 'W46D-MW-B'. These locations were field verified by GEC and GHD on February 22, 2023 and found to be suitably accessible for installation of proper monitoring wells that are suitable for long-term monitoring purposes. Care was taken to select Supplemental Monitoring well locations and drill rig access routes that would minimize the potential for disturbance within the forested environment. The well locations are as close to Wetlands W41 and W46 as was possible while following the restrictions and best practices described in AMP Addendum Part II, Section A.2.4.2 (Significant Woodlands, Significant Wetlands and Buffers – Restrictions and Design Considerations). Drill rig access routes were selected in order to avoid mature trees, rock outcrops and relatively undisturbed areas. A series of representative photographs of the proposed Supplemental Monitoring well and staff gauge locations, and the drill rig access routes, are provided in **Attachment A**.

These wells would be installed as soon as possible following the issue of all associated approvals for the MQEE subject to suitable seasonal conditions such as consideration of amphibian migration periods, breeding bird season and ground conditions (frozen ground conditions are preferable). The well installations would be in accordance with the WMS Implementation measures described in AMP Addendum Part II Section A.2.4 to ensure no, or negligible, ecological footprint from drilling equipment access as has been successfully achieved for past installations in woodland areas at the Milton Quarry.

It is also proposed to install 2 new staff gauges in suitable wetland pool areas adjacent to the new monitoring well locations to provide optimum points of comparison between groundwater and surface water elevations. The locations, designated as W41-SG and W46D-SG as shown on Figure 5 – Rev 2 (attached), will be compared to monitoring well locations W41-MW-A and W46-MW-B, respectively. While these staff gauges will provide the most direct point of comparison to the adjacent monitoring wells, surface water elevations at other nearby staff gauges will continue to be collected and analyzed as part of the Supplemental Monitoring program.

Based on the timeline for other water management system preparations required by the AMP Addendum, it is anticipated that these wells and staff gauges would be installed and monitored for at least one year prior to extraction below the water table in the MQEE area.

2.2 Monitoring Triggers and Response Actions

The AMP and AMP Addendum already include requirements for evaluation of all monitoring data, including the water level monitoring data that would be collected from these proposed new monitoring wells and staff gauges for Wetland W41 and Wetland W46, in conjunction with other Supplemental Monitoring information including groundwater levels, surface water levels, and ecological observations. The purpose of the additional two Supplemental Monitoring wells is to provide groundwater level monitoring data to confirm that the recharge well system is performing as intended, protecting Wetlands W41 and W46 by maintaining groundwater level support and discharge these features, while the proposed MQEE extraction is underway.

More specifically, as expressed by CH, these two monitoring wells will allow more direct and timely assessment of the groundwater level immediately upgradient of the wetlands to confirm whether the hydraulic gradient (i.e., groundwater discharge potential) to the wetlands is maintained. In the event that the groundwater level drops below the adjacent surface water level in the wetland, a response action plan would be triggered. This plan would include the following basic stages:

– Verify the water level measurements within 3 days following the identification of the condition and increase monitoring frequency if the condition is verified
– Verify that the groundwater recharge system is operating in accordance with the AMP/AMP Addendum requirements (i.e., maintaining target water levels at Trigger Wells in the area)
– Notify agencies of condition if verified and it persists for more than 14 days following the identification of the condition
– Assess potential influence of climatic conditions

– Evaluate the potential for negative impacts from the condition and suitable measures that may be implemented to address the condition. Typical response and contingency measures that may be considered are described in AMP Addendum Part II, Section A.2.6.

"Wetland W46" is a cluster of small wetland features contained within a bedrock-controlled environment. In the event that the groundwater level drops below the adjacent surface water level in Wetland W46D, conditions in the other wetland features that make up the Wetland W46 cluster will also be examined.

Refer to the attached Proposed Modification to the AMP Addendum for the specific modifications to be incorporated into the AMP Addendum. As previously identified to JART, the proposed AMP Addendum will be updated to incorporate any agreed-upon changes following the resolution of the JART comments.

3. Conclusion

As described in Section 1, CH has requested the addition of Supplemental Monitoring wells for Wetland W41 and Wetland W46 (2 wells in total) and establishment of appropriate water level response triggers. CRH agrees to satisfy this request by revising the AMP Addendum as detailed in the proposed Modification to the AMP Addendum, as attached. The proposed modifications increase the precautionary nature of the proposed MQEE mitigation measures and AMP Addendum, providing an additional level of assurance that Wetland W41 and Wetland W46 are maintained as intended.

Regards,

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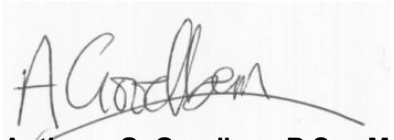


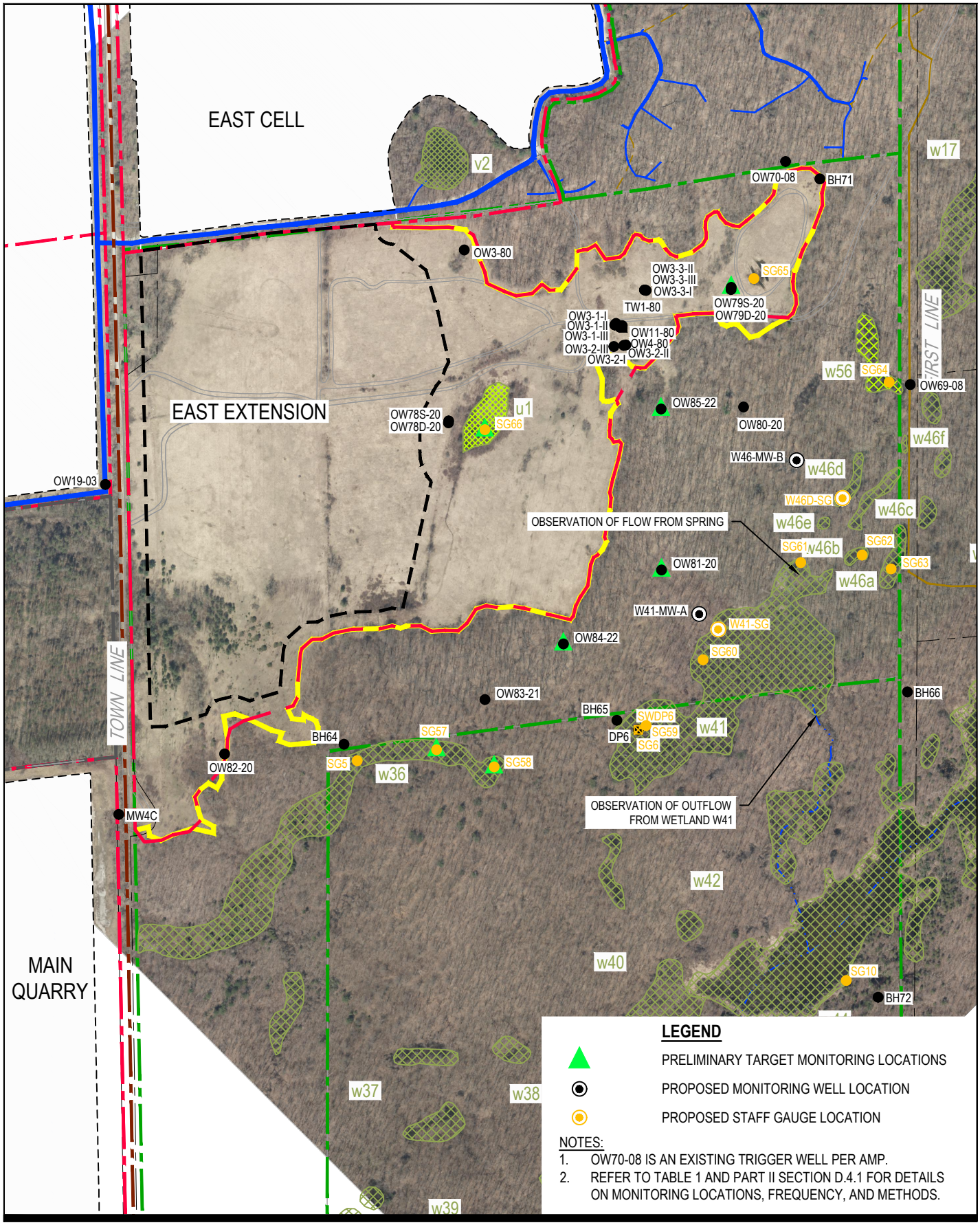
Anthony G. Goodban, B.Sc., M.E.S.(Pl.), MCIP, RPP
Goodban Ecological Consulting Inc. (GEC)

Attachments: Attachment A – AMP Addendum Figure 5Rev2
Attachment B – Representative Photographs of Proposed Monitoring Well and Staff Gauge Locations
Attachment C - Proposed Modification to the AMP Addendum

Attachments

Attachment A

AMP Addendum Figure 5 Rev2



0 60 120 180m

Coordinate System: UTM17m NAD27

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

SUPPLEMENTAL WATER LEVEL MONITORING LOCATIONS

Project No. **10978**
Date **February 2023**

FIGURE 5 REV 2

Filename: \\ghdnet\ghd\CA\Waterloo\Projects\662\010978\Digital_Design\ACAD\Figures\MEM299\010978-GHD-00-00-MEM-EN-D101_WA-299.dwg
Plot Date: 27 February 2023 8:26 AM

Image: 2019 Halton Region Orthoimagery from First Base Solutions.

Attachment B

Representative Photographs of Proposed Monitoring Well and Staff Gauge Locations

Attachment B:

Representative Photographs (April 2019 & February 2023)

Proposed Monitoring Well and Staff Gauge Locations at/near Wetlands W41 and W46d

Milton Quarry East Extension (MQEE) – Dufferin Aggregates

Goodban Ecological Consulting Inc. (GEC)

February 27, 2023

Photo 1: View from Monitoring Well OW81-20, looking down the route the drill rig will take in order to install a new Monitoring Well (MW-A) closer to Wetland W41. GEC 2023-02-22

Photo 2: The route that the drill rig will take to get close to Wetland W41 avoids mature trees, rock outcrops and other sensitive features and areas. GEC 2023-02-22

Photo 3: The route for the drill rig follows gentle slopes and uses less heavily treed areas where possible. Tree removals will mostly be limited to dead and/or declining trees. Where a treed area must be traversed by the drill rig, the route will be selected so that dead White Ash trees and other dead/declining trees are cut. Any trees that are felled will be cut up into logs 3' to 4' in length and placed in small log piles as habitat features. GEC 2023-02-22

Photo 4: View looking towards the proposed additional Wetland W41 monitoring well location. Any deadfalls that must be cleared from the path of the drill rig will be cut up and placed in small log piles, to create habitat features for salamanders and other small wildlife. GEC-2023-02-22

Photo 5: This view shows the proposed Wetland W41 Monitoring Well (MW-A) location, looking back towards Monitoring Well OW81-20. GEC 2023-02-22

Photo 6: View of Wetland W41 showing the area closest to the proposed Monitoring Well (MW-A) location. A staff gauge will be installed in this area. GEC 2023-02-22

Photo 7: View of OW80-20, looking downslope towards the proposed Wetland W46d Monitoring Well (MW-B) location. GEC 2023-02-22

Photo 8: View showing the proposed route for the drill rig to get closer to Wetland W46d. The forest in this vicinity was selectively-cut by the previous owner in the late-1990's. The remaining larger trees are fairly well spaced apart. The drill rig route avoids all of the larger trees. GEC 2023-02-22

Photo 9: The drill rig route to access the Wetland W46d Monitoring Well (MW-B) location will require the removal of some saplings, mostly White Ash and Sugar Maple, and some Alternate-leaved Dogwood. These saplings and shrubs will be flush-cut to promote regeneration. GEC-2023-02-22

Photo 10: View looking back towards OW80-20, along the route the drill rig will take to access the proposed Wetland W46d Monitoring Well (MW-B) location. GEC 2023-02-22

Photo 11: View showing the location of the proposed Wetland W46d Monitoring Well (MW-B) location, in the foreground. Advancing any further towards Wetland W46d would require considerable tree removals and disturb sensitive bedrock outcrops and other important habitat features. The area that surrounds Wetland W46d has very rugged terrain, with complex topography and extensive bedrock outcrops.
GEC 2023-02-22

Photo 12: View showing the proposed Wetland W46d staff gauge location, which is a vernal pool at the southern end of Wetland W46d. Relative to proposed Monitoring Well MW-B location, this is the closest wetland feature in the W46 cluster where a staff gauge can be installed, i.e., where there is vernal pooling (standing water).
GEC 2023-02-22

Photo 13: Spring 2019 view of the proposed Wetland W46d Staff Gauge location. GEC 2019-04-07

Photo 14: The proposed Wetland W46d Staff Gauge location is within a shallow vernal pool. GEC 2019-04-07

Attachment C

Proposed Modification to AMP Addendum

Attachment C

Proposed Modification to the AMP Addendum
Milton Quarry East Extension

Part I

- Text: No change in text. Additional Supplemental Monitoring Wells and Staff Gauges are included in Section 3.1 through reference to Figure 5 Rev 2.
- Figure 5 – Revised as attached Figure 5 Rev 2

Part II, Section D

- Section 4.1.1, First Bullet amended to: "***Existing and proposed monitoring well and surface water level monitoring locations …***"
- Section 4.1.3, Insert the following after the 2nd paragraph:

Supplemental Monitoring wells MW41-MW-A and MW46D-MW-B and staff gauges W41-SG and W46-SG, shown on Figure 5 Rev 2, are designated specifically for the protection of Wetland W41 and Wetland W46. In the event that the water level measured in either of these Supplemental Monitoring wells falls below the surface water level at the corresponding staff gauge (i.e. W41-SG or W46D-SG, respectively), the following actions will be triggered to assess the situation and determine whether adjustment or implementation of mitigation measures is warranted for the timely protection of these wetlands:

- **Verify the water level measurements within 3 days following the identification of the condition. If the condition is verified, the following response actions should be undertaken in a timely manner. If the condition is not verified (i.e., was not correct or has since reversed) the following actions would not be required however monitoring would continue and conditions documented in the Annual Monitoring Report**
- **If the Groundwater Level is Verified to be Below the Surface Water Level:**
- **Increase the monitoring frequency to a minimum of weekly while the condition persists or until a response plan is established**
- **Verify that the groundwater recharge system is operating in accordance with the AMP/AMP Addendum requirements (i.e., maintaining target water levels at Trigger Wells in the area) and adjust if/as warranted**
- **Notify agencies of condition if it persists for more than 14 days following the identification of the condition**
- **Assess potential influence of climatic conditions**
- **Compare to baseline conditions (prior to extraction below the groundwater table in MQEE)**
- **Compare groundwater level to surface water level at other staff gauges in Wetland W41 and/or Wetland W46**
- **Compare with conditions in other wetlands (both in vicinity and beyond)**

- **Consider other potential causes, both anthropogenic and natural conditions (e.g., hydraulic changes due to windthrow or beaver activity, natural succession, extreme weather events, etc.)**
- **Consider the nature and extent of any identified influence on wetland features or functions at present and in the future. Conduct this assessment in conjunction with ecological evaluations described in Section 4.5.4 herein (Part II Section D of the AMP Addendum)**
- **Based on the assessment, establish an appropriate course of action in consultation with the agencies. The course of action may include:**

  1) No further action required

  2) Further monitoring and evaluation to assess the nature, cause, and effect of the identified condition

  3) Implement response actions to mitigate the quarry related influence (e.g., adjust Trigger Well Target Level, adjust/augment the groundwater recharge system flow) in accordance with Part II, Section A.2.6 of the AMP Addendum

- **Document the conditions, assessment, and established course of action in the Annual Monitoring Report.**