

Memo

To: David Germain, Thomson Rogers
From: Ron Scheckenberger
Date: December 16, 2020
File: WW20101035
Re: **Peer Review**
Burlington Quarry Extension, Surface Water Assessment
Nelson Aggregate Co.

Further to direction received from Thomson Rogers on behalf of the Region of Halton, Wood Environment & Infrastructure Solutions (Wood) has been retained to conduct a peer review of documentation filed by Nelson Aggregate Co. to support its planned Burlington Quarry Expansion. The focus of this review by Ron Scheckenberger P. Eng., Senior Engineer and Principal with Wood, has been on the surface water assessment aspects of the application. The following reports were examined in detail as part of the surface water peer review:

- (a) Terms of Reference: Level 1 and 2 Hydrogeologic and Hydrologic Impact Assessment of the Proposed Burlington Quarry Extension, Nelson Aggregates Co., February, 2020
- (b) Burlington Quarry Extension, Surface Water Assessment, Nelson Aggregate Co., prepared by Tatham Engineering (April 2020).

In addition, the following reports were also cross-referenced and considered in the peer review, however these were not reviewed in detail, as others on the Region of Halton Peer Review Team will be providing comments accordingly:

- (a) Level 1 and Level 2 Hydrogeological and Hydrological Impact Assessment Report of the Proposed Burlington Quarry Extension, Nelson Aggregates Co. prepared by Earthfx Incorporated, (April 2020).
- (b) Adaptive Management Plan, Proposed Burlington Quarry Extension (AMP) prepared by Earthfx Incorporated, Savanta Inc., Tatham Engineering, (April 2020).
- (c) Level 1 and Level 2 Natural Environment Technical Report, proposed Burlington Quarry Extension. Nelson Aggregates Co., prepared by Savanta Inc., (April 2020).

Detailed comments on the "Burlington Quarry Extension, Surface Water Assessment", Nelson Aggregate Co., prepared by Tatham Engineering (April 2020) are provided in the attached file. A brief summary of some of the more key points is provided as follows:

Thomson Rogers
December 16, 2020

1. Evolution and background details on the purpose and development of the Terms of Reference would be helpful to understand the context of the scope of the surface water assessment.
2. Rating Curve development is unclear; given the importance to corroborating modelling results this should be discussed in further detail including an indication of potential error bands.
3. The Colling Rd. diversion seems central to future management of quarry water; additional background and status on this proposal is required including the potential for a back-up strategy in the event this is not ultimately feasible.
4. Cross-references to the Hydrogeological Assessment reporting should be minimized and relevant text supporting the findings/recommendations in the Surface Water reporting should be extracted and repeated in the Surface Water reporting for completeness.
5. Rationale as to why runoff parameters to wetlands were not adjusted for the wetland results calibration (validation) should be provided. Further, the methodology to establishing wetland "storage correction factors" should be expanded upon as this is a key aspect of validating the model's performance.
6. Why was the hydrologic modelling conducted with a simplistic SCS event-based technique rather than a more detailed continuous modelling approach?
7. The integration of the natural systems feature characteristics and their water needs is not well established. The form and function of these features should be elaborated on and better connected to the results interpretation.
8. The reporting states that there was an iterative process used to refine the Site Plan however no details are provided; documentation of this process should be included in the reporting.
9. Details of impacts during remediation when the lake is filling are not provided; these need to be documented and considered in the assessment of impacts to surrounding systems.

We trust the foregoing and attached adequately address the needs of the Region of Halton in this review. Should you have any additional questions please contact our office.

RS/rs/kf

Attached: Peer Review comments

cc – Aaron Farrell, Wood

PEER REVIEW

"SURFACE WATER ASSESMENT - BURLINGTON QUARRY EXTENSION, NELSON AGGREGATES",
TATHAM ENGINEERING, APRIL 2020

REPORT:

<i>Comment No.</i>	<i>Section</i>	<i>Page (s)</i>	<i>Comment/Question</i>
1	1	1	The study is understood to have been guided by the TOR developed for the Level 1 and 2 Hydrogeologic and Hydrologic Assessment; these are dated Feb 2020 and the submitted report is April 2020. While it is acknowledged that considerable work occurred for several years prior to the submission of the subject reporting, the authors should consider adding a section which outlines how the TOR evolved, what was their purpose and how the reporting has met the requirements of the TOR, including any deviations.
2	1.1	2	The text indicates that the "objective" of the study is to "establish the existing form and function of the surface water features on-site and in the surrounding area and determine if the proposed quarry extension will have an adverse impact ...". As noted in several of the comments that follow, the study tends to focus on water balance and hydroperiod as the only markers for impacts to wetlands and outlet receivers. Form and function are not explicitly integrated into the assessment as this requires input and support from the natural ecology study. As such, there is a need to further and more directly integrate the understanding of impacts from an ecological perspective to further inform and guide the overall water management strategy.
3	2/2.1	5/7	Were the monitoring locations advanced by Nelson reviewed and approved by the regulators/agencies either before or after installation? Also, what was the basis for establishing the locations of the gauges in the surrounding area?
4	2.1	7	The report indicates that the monitoring period was established as six (6) years; as Tatham is aware not all gauges have 6 years of data with some only having 2 years and others no data (i.e. those proposed for this past spring). Can Tatham comment as to how the lack of a full (6-year) and consistent monitoring period for all gauges affects the findings? Further, has each monitoring year been reviewed in terms of its relationship to climatic norms? This is important when reviewing the results at gauges with different monitoring periods.
5	2.1	7	Rating curves at each gauge site were noted to be developed by Tatham however no details have been provided. How many data points have been collected at each site and how many reflect storm conditions vs. non-storm conditions? Further has there been any effort to corroborate the water levels to flows using theoretical hydraulics of the local reaches?
6	2.1	7	The reports states that monitoring at all sites was to continue beyond the Sept 15, 2019 period selected as the end of reporting. Can Tatham verify that all gauges have continued and that the data from these gauges will be used to support decision-making in the future?
7	2	7	The report states that there are two (2) additional wetlands (within the west extension area) which were to be monitored this spring (2020); have these data been collected and if so do they have any impact on recommendations for water management?

Comment No.	Section	Page (s)	Comment/Question
8	2.1.4	19	What was the protocol for the manual in-situ measurements taken at the 38 locations surrounding the existing quarry? Was there an inter-event time? Were they always dry periods or also wet periods? Were results adjusted for actual antecedent conditions?
9	2.3	25	The report states that a single drivepoint piezometer was installed adjacent to each wetland to monitor shallow groundwater to assist in baseline monitoring. Can Tatham advise as to the rationale for only having a single gauge and what the potential for up and downgradient variation may be and how this may affect the baseline conditions? Based on more common industry practices, wetlands are typically instrumented with multiple gauges to improve the understanding of groundwater/surface water interactions in complex settings.
10	2.4	26	Water quality samples were collected from selected surface water monitoring sites for 2018 and 2019 and tested for a limited suite of parameters (TSS, pH and Conductivity); can Tatham advise how these sites were selected and the sampling period determined and why only 3 parameters were tested? Further there seems to be limited interpretation of these data in terms of physical characterization - how is this information being used?
11	3.1	27	Can the source and vintage of the topographic and aerial mapping be provided? Further there is reference to field survey - can this report provide documentation on the extent and purpose of the field survey?
12	3.1	27	Has Tatham compared drainage area mapping with that available through other sources? i.e. CH, MNRF, etc. This would be beneficial to assist in a comparative verification of the mapping.
13	3.1.1	28	Report states that Nelson is exploring options to divert drainage external to the quarry along Colling Rd. This alternative/option is cited in subsequent sections of the reporting as a core requirement of the mitigation strategy. Can Tatham provide additional details on what Nelson has done to "explore" this alternative? Has the City of Burlington been contacted in terms of potential influence on roadway drainage? Has CH been contacted in terms of transferred impacts? Have neighbours been contacted? have there been any earlier analyses and or design proposals?
14	3.1.2	28	The south extension is discussed in terms of drainage area which discharges to the West Arm (36 ha). There is also reference to a further drainage area draining overland into wetlands which are part of the East Arm however no drainage area is provided? Can Tatham advise?
15	3.2.4	34	The Water Balance Calibration section provides details on the approach and suggests that there was a topographic survey - can details of this survey be provided? Also the calculations have been reported daily and monthly; it is also suggested that these be considered/assessed at a seasonal time period. It should also be noted that there are numerous cross-references in this section and others to the Level 1 and 2 Hydrogeological Assessment; for completeness and readability it is suggested that relevant details be repeated in this document to improve the flow of content.
16	3.2.4	34	Given that only 4 years of data have been used for model performance review it is respectfully suggested that the analysis be re-titled to "Water Balance Validation" as 4 years of data would be considered insufficient for the purpose of model "calibration".

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17	3.2.4	34	This section indicates that the basis for the calibration (validation) was founded on the wetland discharge parameters rather than any of the runoff generating parameters. Tatham states that this is due to a review of the results which suggests this approach was "reasonable and did not warrant adjustment". Further it is unclear as to how the "correction factors" were established, along with the storage discharge curves and the "broad crested weir equation". Wetland discharge relationships are inherently complex and it is unclear as to how these have been represented accurately. Can Tatham offer more details?
18	3.2.5	35	The differences between observed and modelled hydroperiods ranges between 7 and 10 days - has the Nelson Team's ecological specialists weighed in on the adequacy of this predictive range?
19	3.2.6	38	Table 19 results for some years indicate more runoff than precipitation (e.g. 2009). Can Tatham advise as to the rationale?
20	3.3	39	The surface-groundwater model has assumed the quarry discharge as fixed at 67l/s. It is questioned whether this assumption is valid and what the range of discharge rates are based on actual monitoring?
21	3.3	39	Are the flows reported in Table 20 based on the calibrated (validated) modelling?
22	3.4	40	Can a modelling schematic be provided for the OTTHYMO modelling?
23	3.4	40	For the surface water assessment for the hazard and erosion impact assessment why has a simplistic event based model been used rather than a more complex and comprehensive modelling approach (continuous simulation)? It is suggested that continuous modelling will provide a better and more representative result for the surface water flow regime, including sub-annual events. Further, the SCS CN methodology has been used for this assessment which again tends to be limiting and more black box in its methodology. Other time varying approaches for soil properties applied in long term continuous modelling are considered more accurate and superior to SCS and also eliminate bias when using design storm based methodologies.
24	3.4.3	41	It is noted that Table 21 reports on the SCS 24 hour distribution but unclear as to why that distribution has been reported rather than the Chicago 4 hour which is also noted to have been executed - pls advise; also the timestep is not documented in this section - pls advise and outline supporting rationale for its selection
25	3.4.3	40	It is noted that the MTO IDF has been selected - have these values been compared to local data available from the City of Burlington and CH?
26	3.4.3	41	Why was the quarry discharge not included in the event based results from Quarry Sumps 100 and 200?
27	3.5.2	42	Why was the flood hazard assessment restricted to the West Arm? Should not all outlets be examined for potential impacts due to the alteration of quarry surface water changes?
28	3.5.3	43	It is suggested that a Stream Morphologist be retained to review the erosion thresholds associated with the current predicted flow regime
29	4.1	45	Tatham references an "iterative" process to Site Plan development - for completeness and a more fulsome understanding of the process followed by the Nelson Team, can the iterative changes/adjustments be documented for the record?
30	4.1.1	46	Per earlier comment on section 3.1.1. pg 28 - can Nelson provide details on the process to-date on establishing a diversion along Colling Rd?

Comment No.	Section	Page (s)	Comment/Question
31	4.1.2	46	For the South extension it states that the quarry water is being treated at rates "set to mimic existing conditions"; can Tatham elaborate on how this is going to be operationalized?
32	4.1.2	46	Can Tatham provide additional details as to how the 50l/s was established as a limit for pumping? This approach assumes a rate but has there also been a check on volumes? To this end can calculations and assumptions be provided for the 1800 m3 settling pond sizing?
33	4.1.2	46	The report states that 5 ha is a threshold condition for extraction which triggers implementation of a new sump; can Tatham provide details on this determination? Why 5 ha?
34	4.1.3	47	What is the source of the 350 m dimension from the face as a point of comparison?
35	4.1.3	47	As a means of mitigating impacts to off-site systems Tatham is proposing a "replica" pond. This appears to be a long linear feature extending approx. 3/4 of the distance between No. 2 SR to Colling Rd. From the available documentation it appears that there is no preliminary design for this feature, rather it is shown as a concept in plan form on the Site Plan, with basic sections only. Given the importance which Tatham places on this "replica" facility to service off-site systems and maintain overall water balance can Tatham provide additional design details to ensure that the facility as conceptualized is feasible, particularly in light of its length and the number of inlets and outlets.
36	4.1.3	48/49	It is postulated by Tatham that reducing flows to the roadside ditch and ultimately the Medad Valley and Willoughby Creek is positive for the function of the ditches however no comment is provided as to the potential environmental impact to the Medad Valley and Willoughby Creek - has this been assessed by Nelson's ecologist?
37	4.2	49	All of the mitigation relies on the diversion of external flow along Colling Rd.; has Tatham considered a back-up or alternate strategy should this not be feasible or approved?
38	4.2.1	50	Can Tatham confirm the statement that all surface drainage catchments draining to the wetlands under assessment will not change in area or use over the course of the extraction and post extraction?
39	4.2.1	50	Tatham indicates that for 7 of the 10 years analysed the hydroperiod would be delayed 5 days or less; can Tatham indicate why the other 3 years have not been reported ?
40	4.2.2	55	This section is understood to document the impacts to the runoff regime to the various outlets from the Quarry Study area; the last sentence in para. 2 in this section indicates that "if necessary, mitigation measures have been developed that could address potential impacts on the wetlands, ...". For clarity should this not refer to the "outlets" and further what would constitute the measure to indicate if mitigation is "necessary"? Can Tatham elaborate in this section?
41	4.2.2	56	Can Table 28 be re-structured to include a comparison between existing and proposed runoff volume at the respective outlets? Further can a table be added which provides a monthly or seasonal comparison at the outlets?
42	4.3	56	Can Tatham provide details on how the system would be performing while the Lake is filling and how long this is predicted to take?
43	4.4	59	Can Table 30 be re-structured to include a comparison between existing and proposed runoff volume at the respective outlets? Further can a table be added which provides a monthly or seasonal comparison at the outlets?

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44	5.2	62	Section 5.2 makes reference to a new rehabilitation plan which proposes to convert the Burlington Quarry into a landform rather than a lake. Drawing 3 of the Site Plan set outlines the proposed rehabilitation for the west extension however no plan(s) are provided for the existing Burlington Quarry. In order to fully understand the drainage patterns and operations affecting surface water, a plan should be provided at this stage which illustrates the full rehabilitation plan, including the existing quarry.
45	5.3	62	Tatham references an "iterative" process to Site Plan development - for completeness and a more fulsome understanding can the iterative changes/adjustments be documented for the record?
46	5.3.1	63	This section describes long term water management objectives for the Quarry but does not provide any indication as to the overall water budget nor the needs for each of the proposed features requiring water. Can Tatham outline the water demands and associated tolerances for each element cited and also provide an indication of sustainability?
47	5.3.2	63	Tatham indicates that a water level control is not proposed for the lake - can the reason and rationale be provided? It is suggested that with out some form of control adaptive management opportunities may be compromised
48	5.3.3	64	It is unclear if under the rehabilitated condition whether the water balance will change in the vicinity of the replica pond - can Tatham advise?
49	5.3.3	64	Tatham notes that a bottom draw outlet control will be maintained post extraction and monitoring of the wetland will be completed to maintain the hydroperiod; can Tatham advise on the triggers for adaptive management and the adjustments which may be required if those triggers are not met?
50	5.4.2	71	Can Table 36 be re-structured to include a comparison between existing and proposed runoff volume at the respective outlets? Further can a table be added which provides a monthly or seasonal comparison at the outlets?
51	5.6	73	Can Table 37 be re-structured to include a comparison between existing and proposed peak flows at the respective outlets?
52	6.1.1	74	Can Tatham provide a basis for the range in active storage requirements - i.e. 700,000 to 800,000 m ³ ?
53	6.3	79	For clarity can Tatham indicate which gauges were installed for this study and which will remain and which will be added post extraction? Suggest adding these details to Tables 38 and 39
54	6.3	79	Can Tatham outline the elements of the adaptive management plan which will potentially be available to meet the environmental management goals?
55	6.3	81	Can Tatham describe the methodology proposed for Nelson to establish a long-term discharge protocol?