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Proposed Reid Road Reservoir Quarry
JART COMMENT SUMMARY TABLE RESPONSE #2

Please accept the following as feedback from the Reid Road Reservoir Quarry Joint Agency Review Team (JART). Fully addressing each comment below will help expedite the potential for resolutions of the consolidated JART comments and individual agency objections. **Additional comments may be provided once a response has been prepared by JDCL to the comments raised below and additional information provided**.

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1.	The bottom of each of the three existing ponds was surveyed for bottom elevations through manual measurements from pond surface. Water samples from both groundwater and surface water were taken and analyzed for a variety of parameters. Field measurements of water levels were taken both manually and with installed dataloggers which also recorded field water temperature at regular intervals. Water level measurements were taken over a period between July 2016 and April 2018. The monitoring period is considered to be a minimum for representing seasonal variations. The monitoring period is inadequate for determining minimum water levels for purposes of establishing trigger levels.	Section 2.0	Groundwater and surface water monitoring has continued. There are dataloggers now installed in eighteen locations. We have attached data collected up until October 7, 2019 (Appendix A) and data collection is ongoing. Trigger levels will be assigned prior to any extractive activities occurring, therefore an additional several months of data will be available.	Ongoing monitoring is considered essential in establishing baseline conditions prior to commencement of operations. At a number of locations Minimum Water Level Thresholds (MWLT), Warning Water Levels (WWL's), and Target Water Levels (TWL's), are based upon limited (i.e., three or fewer) data points for monthly threshold, warning, and target levels. The resulting levels may not be fully representative of long term baseline conditions. It is therefore questionable whether the available data and related MWLTs, and TWLs are appropriate for protection of the on-site features. A protocol for updating MWLTs, WLTs, and WWLs needs to be established by the JDCL's Team and incorporated into a revised and consolidated implementation document referred here as the Implementation Guide (IG)). Per the January 16-17, 2020 meetings between JART and JDCL's team re. (i) JDCL's responses to JART's hydrogeological-assessment comments, and (ii) JDCL's draft Environmental and Water Management Operational Guide (Nov/19) (OG) and Supplement (Dec/19) (SOG). A revised and updated version of the OG entitled Draft Environmental and Water Management Implementation Guide dated February 2020 (IG) was submitted February 2020. Information from both the OG and SOG were combined into the IG	Addressed in the revised Implementation Guide (August 2020). See Section 6.0 of the IG regarding trigger vs threshold vs MWLT. Monitoring is continuing and dataloggers are now obtaining data on a minimum of a daily basis in all wetlands. This coupled with historical precipitation data provides a sound approach to setting MWLTs, warnings and trigger values. The Implementation Guide ("IG") provides basis for determining the initial MWLTs, warnings and trigger values. Any recommendations for modifications to these initial values will be made in the annual report, reviewed by the agencies and approved by the MNRF. See Section 8.1 of the Implementation Guide ("IG").

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				document. The document referenced as Operational Guide and Implementation Plan (OG&IP) at the January 16th and 17th ,2020 JART meeting with JDCL, should be referred to as the Implementation Guide (IG) for consistency with the February 2020 document by JDCL. Comments may refer to these various documents interchangeably, with the overall JART intent being to see these consolidated into that final monitoring document and *ARA* Site Plan and notes as required. Note: the difference between “trigger” relative to “threshold” (per MWLTs) and “targets” (per TWLs) need to be clarified (e.g. in the definitions’ section of the IG document). Please provide additional information in the IG.	
2.	Twenty-three surface water staff gauge locations SG1 to SG23 located both on and off the site were monitored. Manual water level measurements were taken at SG1 to SG 20. Datalogger readings of water levels were obtained every 30 minutes over the monitoring period at SG9, SG10, and SG13. Figure 2.3 also indicates that SG17 had a datalogger installed although not mentioned in the report text. Streamflow measurements were obtained at stations SG9, SG10, SG13, SG17, SG18, SG19, SG20, SG21, SG22, and SG23. Monitoring data was collected over the period of July 2016 to April 2018. There are a limited number of surface water monitors in the vicinity of the wetlands which limits our understanding of water level changes within these wetlands. It is not clear whether the number and location of surface water monitoring stations is adequate or appropriate for wetland monitoring.	Section 2.0	Groundwater and surface water monitoring has continued. There are dataloggers now installed in twenty two locations. We have attached data collected up until October 7, 2019 and data collection is ongoing. Trigger levels will be assigned prior to any extractive activities occurring, therefore an additional several months of data will be available.	It is agreed that additional monitoring data will provide greater reliability in the proposed MWLTs, WWL, and TWLs as being representative of baseline site conditions. Proposed additional groundwater monitors CB12S/D, CB13S/D, CB14, and CB15 are identified in the IG by JDCL. Water quality monitoring for turbidity was included within the IG for the proposed monitors CB15 and for surface water stations SG9 and SG10A to establish baseline conditions. Per the January 16-17, 2020 meetings: • In addition to the proposed locations for MWLTs, TWLs, and WWLs, all established and proposed monitoring locations are to be monitored for water levels to facilitate regular re-assessment of groundwater flow conditions. • The complete monitoring plan is to be included in an addendum to the. hydrogeological assessment, the IG document, and the Site Plan.	Addressed in the revised Implementation Guide (August 2020). Most issues are addressed in the IG, here are some specific responses to points in same order as Jart Response Column. • Some off-site and on-site monitoring stations are redundant and will not be monitored. See Section 4.0 of the IG for complete list of active monitoring stations. • An updated monitoring plan is included in the IG (see Sections 4.0, 5.0 and 6.0) and will be in an addendum to the hydrogeological assessment (Section 9.0) and will also be included on the updated site plan. • We have included CB16S/D in water quality monitoring in the Section 4.2.16 of the IG. The intention is to monitor groundwater quality between BP2 and Kilbride Creek and between BP2 and residents west of Kilbride Creek. • The monitoring of all active extraction ponds (temperature and level) is described in Section 4.2.1.5 of the IG. Turbidity monitoring of the extraction

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				Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG and indicate revisions on the updated Site Plan, as applicable. The Environmental and Water Management Implementation Guide, February 2020 (IG) included additional groundwater monitors KC1, CB16S/D, and CB17. Water Quality Monitoring for general chemistry, metals, ammonia, nutrients and BTEX was added for CB17. Turbidity monitoring was added for CB15, CB16D, SG9 and SG10. The following issues remain unresolved: • Water quality analysis recommended for CB16S/D is incomplete and lacking sufficient detail for the identification of impact from the proposed quarry operations. • There is inadequate monitoring for turbidity and temperature within the existing ponds (West, Central, and East pond). • There is inadequate monitoring for turbidity and temperature for the mitigation facilities, BP1, BP2, DT1, and DT2. • There is inadequate water quality monitoring at the northwest corner of Phase 1 extraction area, the nearest point to Kilbride Creek for this phase of extraction. • Monitoring parameters for new monitor KC1 has not been identified. • Surface water monitoring is considered inadequate without considering the inclusion of selected seepages and springs between West Pond and Kilbride Creek, as well as those between Phase 1 excavation and Kilbride Creek , and seepages within the Tributary valley of Kilbride Creek. • Surface water and groundwater monitoring is considered to be inadequate, lacking comprehensive parameter list including critical parameters that could impact fish	ponds will be conducted during initial extraction periods of Phase 1 and Phase 2 as detailed in Section 4.2.1.8. • A groundwater monitor (CB18S) has been installed and CB18D, a bedrock will will be installed and included in the monitoring program for water levels and water quality monitoring will be included during the extraction of Phase 1. This includes turbidty and chemistry. • KC1 will be monitored for water level both inside and outside to document hydraulic gradient. KC2 also installed in Kilbride Creek will be monitored both inside and outside to document hydraulic gradient. • Details of newly installed monitors are found in Section 2 of the Hydrogeology Addendum Report. • See Section 4.2.18 of the IG regarding monitoring of seepage areas. • A Comprehensive list of water quality parameters included in IG sections 4.2.1.6 and 4.2.1.7 and will include pH, temperature for surface water to calculate unionized ammonia concentrations. • See Section 6.2 of the IG for water quality thresholds and trigger levels. • Water level monitoring for mitigation systems and ponds is included in IG. • Water quality monitoring will commence upon licensing. A minimum of four groundwater samples (seasonally distributed) will be obtained prior to below-water-table extraction. See IG Sections 4.2.1.6 and 4.2.1.7. • All agreed to monitoring changes have will be included in the updated Site Plan and are appropriately documented within the IG. • Sections 4.2.1.6 and 4.2.1.7 of the IG describe surface water and groundwater sampling starting from ponds, groundwater near to ponds and groundwater distant from ponds in the direction of groundwater flow

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				habitat as well as drinking water supplies. • Warning levels, trigger levels, and threshold levels for critical water quality parameters and a mitigation plan for water quality parameters have not been established. This is considered an omission. • Water level monitoring within the existing ponds (West, Central, and East Pond), as well as the mitigation features DT1, DT2, BP1, and BP2 is inadequate. • Sufficient monitoring data for all new groundwater and surface water monitoring stations is required prior to commencement of operations to provide a sound basis for the establishment of baseline conditions representing seasonal and background conditions. • All agreed to monitoring changes should be included in the Site Plan and appropriately documented within the IG. • Monitoring of groundwater and surface water between the East Pond and down gradient private wells is considered inadequate. • The proposed well survey and subsequent monitoring is considered inadequate to effectively monitor potential water level and water quality impacts on down gradient wells. • Mitigation measures for addressing water quality and quantity impacts on down gradient wells is considered inadequate. • Well Interference Complaint Protocol is incomplete.	toward industrial development south of the site. • Downgradient wells will be surveyed including a water quality sample prior to any sub aqueous extraction occurring at the site. We have recommended the inclusion of several private residences on the west side of Kilbride Creek in response to JART suggestions. See Section 5.1. • JDCL will remedy any water quantity or quality issue arising due to the proposed quarry activities. This is detailed in th water supply interference procedures in Section 5.3 of the IG.
3.	Section 2.11 mentions calibration figures. The stream flow calibration data would be better understood if the flow data is presented on a log scale. The low flow conditions are of a particular interest as it relates to sustaining local wetlands, streams and their habitat. As presented on Figures 8.13 and 8.14 the model seems to overestimate the low flow conditions at SG9 and SG10. Considering this, is the model calibration sufficient to use the model to assess the extraction and post-extraction impacts on the creek and wetlands in low flow and level conditions?	Section 2.11	Other than Phase 1, there are already water bodies in the proposed extraction area. Therefore there can only be subtle changes in the water level in these areas as a result of making the existing ponds deeper. Through the effort of maintaining the existing extent of the ponds, the relationship of the ponds to horizontal groundwater flow in the adjacent aquifer will not change. Also, there are no significant vertical hydraulic gradients that	The groundwater model is limited in reflecting apparent local conditions due to inherent limitations in stream flow measurements and external upstream influences on stream flow adjacent to the subject property. The significance of this with respect to model predictions of impact from the proposed site operations on Kilbride Creek should be clarified.	Addressed in the revised Implementation Guide (August 2020). The groundwater model was used to determine reasonable extraction rates and that mitigation can be implemented successful. There are several years of data now and increased monitoring in Kilbride Creek. The revised groundwater monitoring and surface water monitoring program in the IG (Section 4) will identify

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			will affect water levels in the deepened ponds. In the Phase 1 area it is expected that water levels will rise on the downgradient edge (on the Kilbride Creek side). With a) only small changes on-site and b) those changes increasing hydraulic gradients between the site and Kilbride Creek, there will not be a reduction in flow in Kilbride Creek post extraction. During the extractive periods, the hydraulic gradient between the extraction area and Kilbride Creek will be monitored and maintained, again no significant change in groundwater discharge to Kilbride Creek will occur. The modelling effort provides an adequate platform from which changes in flow in Kilbride Creek can be evaluated. The surface water model parameters were initially derived from the larger scale PRMS calibration to the long-term streamflow gauge Bronte Creek near Zimmerman. The baseflow, peak flow and recession calibration to that gauge, as shown in Figure 6.3, is somewhat better than that predicted at SG9 stream gauge. The reservoir at the Robert Edmondson Conservation Authority, approximately 2 km upstream of the site, likely affects the streamflow patterns at SG9 in a complex manner. While we represented the reservoir as a small lake in the model, no information on lake bathymetry and weir design was available. The calibration to SG13, which is not influenced by the Edmondson reservoir, is somewhat better than SG9. The fact that the long-term regional calibration and SG13 is good may indicate that the reservoir is responsible for the discrepancy at SG9.	Depending upon the subsurface conditions between the West Pond and Kilbride Creek, proposed excavations and associated blasting activities have the potential for altering and creating groundwater pathways between the West Pond and Kilbride Creek. Should this occur, there is potential for lowering of the water level within the West Pond by up to 1.5m or more. There is insufficient subsurface information within the area between the West Pond and Kilbride Creek to demonstrate that this will not occur. Understanding the subsurface stratigraphy within this area including, the bedrock surface elevation as well as the bedrock characteristics, are essential in assessing the potential for a significant loss of water from the West Pond both during and following excavation of the underlying bedrock within the West Pond. In consideration that the edge of the proposed excavation within the West Pond is less than 50m from Kilbride Creek at its closest there is a high potential for impact on the lateral groundwater flow between the West Pond and Kilbride Creek especially after removal of a dike east of BP2 to accommodate the Phase 4 extraction. It is noted that WP7 and West Lake Piezometer are located between the West Pond and Kilbride Creek. These monitors are 0.95m and 0.64m deep respectively, although there is no description of the materials encountered during the completion and installation of these monitors. Due to the observed variability of the bedrock surface on the property it is quite possible that lateral groundwater flow between the West Pond and Kilbride Creek is controlled to some degree by the underlying bedrock. Cross-section A-A' Sheet 5 of 5 of the Reid Road Reservoir Quarry Site Plans by MHBC, dated June 17, 2019 incorrectly shows the surface topography and elevation of Kilbride Creek relative to the West Pond. A more accurate representation of the surface topography within this area is illustrated on Figure 4.3, Conceptual Cross-section A-A' of the	any issue related to quality or quantity changes in groundwater passing between the site and Kilbride Creek. CB16S/D are designed to provide additional information on bedrock characteristics between BP2 and Kilbride Creek. There will be chemical water quality and physical water quality measurements in CB16S/D as detailed in Section 4.2.1.6. and 4.2.1.8 of the IG. CB16D will be monitored on a frequent basis during blasting and active extraction to confirm that turbidity is not moving through fractures to Kilbride Creek. The effect of blasting on fractures in bedrock extends approximately 20 borehole diameters away from the blast. For a 3" hole, this means the fracture propogation will extend 60" or 1.52 metres from the edge of the quarry. Persistent fractures will not be created between Kilbride Creek and the site resulting in a 1.5 metre decrease in surface water elevation in the West Pond. As a contingency to address this, lower permeable material can be placed along the west shore of the west pond or the southwest shore of the Phase 1 pond. Buffer Pond 2 will remain following the extraction of the West Pond. This creates greater separation distance between Kilbride Creek and the active extraction area. The noise berm material and additional silty material can be draped on the western edge of the West Pond to reduce loss of water via fractures should this occur. There will be many years of monitoring to confirm that water levels have stabililzed. See section 9.2 of the IG. CB16S/D are included for water level monitoring including CB16S as a cellular system tied monitor (see Section 4.2 of the IG).

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				Level 1 and 2 Hydrogeological Assessment Reid Road Reservoir Quarry, July 23, 2018 by Harden Environmental Services Ltd. The discrepancies between surface elevations and the subsurface interpretations should be addressed, as they may have a bearing on the design and construction of the mitigation features in this area. Per discussions at the January 16-17, 2020 meetings the revised Site Plan and the IG should incorporate figures with correct elevations. The IG Feb 2020 has included CB16S/D to provide better definition of the subsurface conditions between the West Pond and Kilbride Creek and to provide an additional monitoring point. Proposed monitoring of CB16D is considered to be incomplete Monitoring of CB16S has not been specified which is considered incomplete and an omission. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	
4.	Earthfx provides a detailed description of the local and regional bedrock geology. There is no discussion of the Eramosa Formation shown on the regional cross-section (Earthfx 2018, Figure 5.3), and the cross-sections through the property (Earthfx 2018, Figures 7.4, and 7.5). There is also no mention of these bedrock units within the Harden report. In the Harden Report, Table 3.1, Thickness of Rock Formations Found at Site, has no reference to the Eramosa Formation. The Eramosa Formation is shown to exist to the west of the subject property on Figure 5.1 (Earthfx, 2018). The Earthfx report shows the Eramosa/Upper Amabel Formation as layer 7 in the hydrostratigraphic model of the property. (Earthfx, Table 7.1, page 44). Layer 7 includes the Eramosa/Upper Amabel as subunits of model layer 7 which have distinctly different hydraulic conductivities by two orders of magnitude even though layer 7 is represented as one layer in the model. Figure 7.4 suggests that the Eramosa/Amabel bedrock unit is portrayed as one unit within the computer model. Figure 7.5 indicates that the Eramosa/ Amabel bedrock unit is assigned a hydraulic conductivity of 10E-05 m/s. It should be clarified whether the Eramosa Formation exists within the subject property and whether it has been included within the computer model as a distinctly separate bedrock unit as suggested in Table 7.1.	Section 3.4.2 Earthfx , Section 5.2.1 Figures 5.1, 5.3, 7.4, and 7.5 Earthfx, Table 7.1, page 44	The Eramosa Formation is not present at the site. There are numerous cored rock boreholes at the site and none of them encountered the Vinemount or Reformatory Formations. The cross-sections are regional in nature and inadvertently show the continuity of the Eramosa Formation in this area. The hydraulic conductivity assigned to the Eramosa Formation is not representative of an aquitard as none is present at the site. Section 3.4.2 of the Harden report identifies the underlying rock formations and these do not include the Eramosa Formation. None of the on-site or local outcrops expose the Eramosa Formation, only the underlying Goat Island/Gasport Formations.	It is agreed that the Eramosa Formation does not exist within the area of the Reid Road Reservoir Quarry property. It is therefore inconsistent to have this formation represented within the regional computer model. It should be removed from the model in the vicinity of the property. The correct geologic cross-section upon which the model hydrostratigraphy was based, should be included in an addendum [re. hydrogeological assessment] and referenced/ included in the IG. Please provide additional information (as noted above) in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment and the IG, as applicable.	Addressed in Section 3.4.2 of the 2020 Hydrogeology Addendum Report which provides additional information on the absence of the Eramosa Formation at the RRRQ property.

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5.	There are three main on-site ponds, East Pond (P11), Central Pond (P6), and West Pond (P1). These ponds were created from the previous sand and gravel operations through excavations below the water table. Pond bathymetry was determined manually measuring the depth of the East Pond P11, Central Pond P6, and West Pond P1 on July 22, 2016 (Harden 2018, Section 2.8, page 6). Smaller ponds, P2, P3, P4, and P15 are also considered to have been created from previous sand and gravel extraction operations. Pond P15 and associated wetland appears to have been created in a former test pit that was excavated below the water table. A number of natural wetlands with associated seasonal ponds occur within and adjacent the property and include P5, P7A, P7B, P8, P9, P10, P12, and P13. Railway construction is believed to have either created or modified wetland P14. A number of these wetlands appear to be hydraulically connected to the three main ponds either as providing a source of water or as receivers of water from the main ponds. Geodetic level survey was completed for wetlands P5, P7A, P7B, P8, P9, P10, and P14 (Harden Figures 2.5 to 2.8). It is noted that limited ground elevation data are available for P7A and P7B. The ground elevation was determined at monitor WP3 and at one nearby location in Pond P7B and at only one location, WP6, in Pond P7A. These elevations were used to establish minimum bed elevation and Pond Elevation Assessment Targets, (Table 10.1, page 69, Earthfx 2018). The lack of ground surface elevation data for Ponds P7A and P7B is inadequate for determining the minimum ground elevation for these ponds. It is questionable whether the number and location of water level monitors are adequate for assessing impact from the proposed aggregate operations on the wetlands.	Section 3.6 Figures 2.5 to 2.8 Table 10.1, page 69, Earthfx 2018	A ground elevation survey was conducted in Wetland 7A/B in May of 2018 in order to assist with the modelling exercise. The survey elevation points have been provided as Figure 2 "Pond 7 Survey".	Figure 2.7 (Harden 2018) and more recent topographical data shown in Figure 2 of the JDCL October 23, 2019 Response Table shows limited ground elevation data concentrated in the northern portion of Pond 7A. Figure 2.8 (Harden 2018) shows two ground elevations, both in close proximity to WP3. This represents a very limited characterization of the geometry of the ground surface at ponds 7A and 7B and is insufficient for determining the minimum bed elevation and Pond Elevation Assessment Targets. Measures should be included in the IG to confirm the correlation between per cent of wetland in flooded condition to the groundwater elevations within the respective wetland monitors. Per the January 16-17, 2020 meetings: Where limited wetland bathymetry data is available, wetland reconnaissance, with photographic records, is to be undertaken on a regular basis to monitor wetland conditions at greater distances from the designated water level threshold-target stations. The procedures for wetland reconnaissance should be incorporated into the IG and added to annual reporting requirements. Please provide additional information (as noted above) in the IG.	Addressed in Hydrogeology Addendum Report and the revised Implementation Guide (August 2020). Additional field elevation surveys will be provided in the hydrogeology addendum report Section 7.2. A site visit on July 30th, 2020 found that a significant portion of Wetland 7A was covered with water and in many places more than 30 centimeters deep. There appear to be anthropogenic channels in the wetland to facililtate the movement of water from the Central Pond to the southern extremities of the wetland. We have commenced correlating the percent inundation of the wetlands to water elevations. Detailed analysis is included in the addendum report with fine tuning likely required prior to licensing.See Addendum Report Section 7.2. We concur with suggestions for photographic records and reporting in the annual report. See Table 1 in Section 1.4.1 in the IG.
6.	Measured water levels within Pond 7A are generally about 0.10m higher at WP6 and SG3 than in the adjacent Central Pond P6. The water level in Pond 7B as measured in WP3 is also about 10cm higher than in Central Pond P6. Water levels at wetland monitors WP3 and WP6 are generally higher than the ground elevation at these monitors suggesting upward hydraulic gradients beneath these wetlands. Lowering of the groundwater level by rock excavations in the adjacent Central Pond P6 and by pumping from the West Pond P1, Central Pond P6, and Eastern Pond P11 may interfere or disrupt the upward gradients from beneath these wetlands and result in a downward gradient. Depending upon the amount of leakage from wetlands P7A and P7B, it is not clear that the proposed pumping into the wetlands will achieve the objective of maintaining water levels within wetlands P7A and P7B under conditions of downward hydraulic gradients. It is not clear that these conditions have been accounted for in the integrated model. Questions therefore remain regarding the effectiveness of the	Section 3.6	Upward hydraulic gradients do not exist beneath the P7/P7A as nearby groundwater monitors (CB11, CB10) or wetland piezometer WP12 have lower piezometric elevations than observed at WP6 and WP3. Two additional piezometers designated WP3A and WP6A were installed adjacent to WP3 and WP6 respectively. These piezometers were sealed with bentonite in sand sediments below the wetland organic material. Water levels obtained from WP3A are the same as found in WP3 and water levels in WP6A are consistently several centimeters lower than in WP6 indicating a downward	It is agreed that, the described additional groundwater level information from the newly installed monitors support the conclusion that there are likely downward hydraulic gradients beneath wetland ponds 7A and 7B. The proposed explanation for higher groundwater levels in the original monitors WP3 and WP6 would suggest that Ponds 7A and 7B would likely support additional water pumped into the wetlands for an extended period of time due to a time delayed drainage resulting from lower water levels in adjacent Pond 6. If the assumption of delayed drainage is correct, this would suggest that, proposed mitigation for	Addressed in the revised Implementation Guide (August 2020). The model was used to confirm that extraction of aggregate and occurance of lower water levels in the main ponds could be mitigated given a reasonable hydraulic conductivity of the overburden and bedrock beneath the wetlands. The detailed monitoring of the wetlands will be used to ensure that water levels in the wetland remain within acceptable limits. If there is negligible delayed drainage as suggested, the contingency will be either increased pumping or reducing permeabilty along the shoreline of the

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	proposed mitigation measures of pumping into buffer ponds and dispersion trenches to maintain water levels within adjacent wetlands and headwater areas of Kilbride Creek.		gradient. The 10 cm water level observed to be above the Central Pond level suggests a seasonally delayed response to regional groundwater level regression beneath P7A/B. In 2017 the wetland water level was some 10 cm higher than the Central Pond and in 2018 the water levels have been only different by one or two centimeters. These findings do not alter the potential efficacy of Buffer Pond 1 maintaining water levels in P7A/B. Furthermore, we do acknowledge the fact that P7A water levels at SG3 are up to 10cm higher than the central pond elevation (SG2). Regardless, assuming that the lower lake elevation is representative of the underlying aquifer, natural flow would be downward out of the wetland, not upward into the wetland like suggested by the reviewer. The integrated model simulates the gradient, whether upward or downward, between the wetland and the aquifer. The model does predict downward gradients to occur underneath wetlands P7A and P7B during extraction. The model fully simulates the process of seepage out of the bottom of the wetlands, which in-turn tends to flow back towards the extraction pond where water levels have been lowered. Our analysis showed that back-pumping into the dispersion trenches / buffer ponds was able to maintain water levels in the wetlands despite losses occurring. Loss (or gain) across the bottom of the wetlands, is controlled by the gradient between the wetland stage and the head in the underlying aquifer, the K of the underlying aquifer, the thickness of the wetland "bed", and the K of that bed. The "bed" refers to a virtual layer of material separating the open water within the wetland from the aquifer. We have assumed the wetland bed to be $1x10^{-7}$ m/s, while the underlying aquifer K is $1.0E^{-4}$ m/s. The assumption is based on the likelihood that the bottom of the wetland contains lower permeability	Ponds 7A and 7B from lower water levels within adjacent Pond 6 as a result of aggregate extraction, should be effective. What remains uncertain is the degree to which backflow of pumped water will occur into the Central Pond from P7A and P7B and the extent of pumping required to maintain water levels within the wetlands. It is understood that some backflow has been accounted for within the computer model although it is not clear that a sensitivity analysis has been completed to account for varying conditions. Contingency measures should be identified to address the potential for excessive backflow of pumped water into adjacent ponds in reaction to pumping of water into the adjacent wetlands. These measures should be included in the IG and in the Site Plan. Continued monitoring throughout the extraction period is essential to verify the underlying assumptions of the environmental analysis. It is not clear how alterations to the Permit to Take Water will be undertaken once the site operations commence and a Permit to Take Water has been issued by the MECP. Clarification is required. Per the January 16-17, 2020 meetings, the IG is to illustrate integrated water management system (WMS) and all target/threshold and applicable mitigation effectiveness monitoring stations. • As water taking and handling would be contingent on the MECP's permits (PTTW and ECA), the interrelationships among constructed features, natural channels, and planned infrastructure are to be displayed on one figure and incorporated into the Site Plan and the IG. • All features are to be identified according to their anticipated function (e.g. surface dispersion trench [e.g.	pond to minimize return drainage. See Section 3.4 of IG. The PTTW will be structured to have reasonable pumping rates including the contingency of additional pumping should it be necessary. If pumping rates are approaching the PTTW limit, an amendment will be requested. It is anticipated that there will be a Source of taking at each of the seven transfer pumping stations. Figure 6 included in the IG explains the required pumping system and the natural channel has been added. Details of the dispersion systems are included in Appendix C of the IG. We have redesignated dispersion trenches as dispersion systems as only one is a trench. The mitigation systems are no longer described as environmental protection features. See Section 3.4 of the IG includes the rapid response measures and Section 6.5 includes the Response Action Framework.

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			muck-type material. A four-hour test conducted in P5 confirms that groundwater mounding beneath Pond P5 is achieved by the addition of surface water. Figure 3 shows the locations of monitoring stations in the wetland. These stations are constructed of 19 mm slotted PVC pipe inserted into the organic substrate of the wetland. Surface water was pumped from the Central Pond at a rate of 76 L/min for 4.5 hours into the wetland. The water was discharged via a pipe designed to disperse the energy of the flow into a series of small streams. No erosion occurred during the test. The water was observed to infiltrate at the discharge location, there was no overland flow to the observation stations. Nine stations were monitored during the test for water levels including data loggers in P1, P2, P3, P4, WP8 and CB7D. Figure 4 shows the response as an increase (mounding) of water levels in the wetland. The magnitude of mounding is greatest near to the discharge point and decreases with distance away from the discharge point. The hydrographs show a distinct rise in water during the testing period and confirms that the introduction of surface water can raise water levels in the wetland. Despite the limited duration of the test and the small overall volume of water introduced, water was observed to rise up to 30 m away from the introduction site, indicating that the proposed mitigation will be effective in maintaining water levels in the wetland.	DT1], an infiltration trench [e.g. DT2], infiltration ponds [with and without natural outflows {e.g. BP1 vs BP2}], natural water outflow channel [e.g. from BP1 to P7A/7B], water lines [overland/subsurface], water storage and attenuation features, etc. • DP2 location and designation is to be clearly defined and identified on maps. • Based on the proposed construction details, DT2 should likely be designated an "infiltration trench". Distinction should be made between Infiltration Trench and Dispersion Trench. • BPs and DTs should not be referred to as "environmental protection features" as these are not the features to be protected. • IG is to include an approach to mitigation-related contingencies to deal with rapid-response needs (i.e., direct wetland supplementation, as necessary). It is agreed that the reported pump test results suggest that the proposed mitigation can be effective in introducing water to the wetlands. It is not clear to what extent the proposed mitigation can be maintained and the amount of water that will be required to ensure that the water levels are maintained over a long period of time as opposed to a short pumping test. As noted in the last bullet point above: • The IG is to describe "rapid-response" contingencies, to be utilized as necessary during ecologically-critical periods (e.g. overland piping to transfer water from storage [to be identified] to affected feature if mitigation via DTs and/or BPs is ineffective). Please provide additional information and clarifications (as noted above) in the IG.	

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7.	Table 4.5 Hydrologic parameters lists runoff as 10% of surplus, while Table 4.6 Pre-Extraction Water Balance shows that runoff is over 23% of surplus. How was the Pre-Extraction Water Balance Table 4.6 developed? How does it compare to the GSFLOW model results?	Section 4.13	A runoff value of 10% is used for terrestrial areas and 100% of the surplus water in micro drainage areas D1, D6 and D8 is assumed to runoff via active streams in the drainage area. This results in greater overall percentage of runoff. No comparison was made between the groundwater model and the water balance.	Runoff value addressed; however, There should be some agreement between the water balance and the computer model as a means of calibrating the model for accuracy and verifying characterization of the site. Per the January 17, 2020 meeting: • The IG is to include a plan and approach to regular (i.e. annual) water budget reviews, which should be based on the on-site water management and use; and • Additionally, provisions for model-based water budget analysis at key milestones to be considered. Please provide additional information (as noted above) in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, as part of the IG, and/or as a detail on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020) and Hydrogeology Addendum Report Section 4.13. There will be an annual review of the water balance based on measured/calculated storage in ponds, measured water transfers, distribution between ponds, extraction tonnage and original parameters value review (See IG section 7). The annual reporting requirments are outline in section 8 of the IG.
8.	The report should indicate if extraction will change the watershed boundaries between Sixteen Mile and Bronte Creek. Discharge should be maintained to the appropriate watershed.	Section 5.0	The extraction will not change the water shed boundary between Sixteen Mile Creek and Bronte Creek. The Conservation Authority and the MNRF currently have incorrect boundaries for these watersheds. The base map for the Halton Conservation watersheds has the KOA Tributary reporting to Bronte Creek whereas it reports to Sixteen Mile Creek. Our observations are that this area of Sixteen Mile Creek has been permanently altered by the site access road, Twiss Road, stream re-alignment on the KOA property and Hwy 401 construction. Until the recent construction effort in 2019 we observed two years of flooding north of Reid Side Road which prompted the Ministry of Transportation to improve ditching alongside the southbound ramp to westbound Hwy 401 and the Town of Milton is replacing the CSP culvert on Reid Sideroad with a box culvert.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
9.	Stream flows recorded along Kilbride Creek on June 17th, September 17th, and October 17th, 2017 show consistently lower flows in SG21 compared to stream flow measurements upstream at SG9. Although there are no groundwater monitors within this area of Kilbride Creek to	GWS, 2018, Section 4.3, page 21, 6th paragraph	Our field observations confirm that there is groundwater flowing westerly from the West Pond towards Kilbride Creek. This is confirmed by visual observations of	Field observations during the site visit November 1, 2019 support the conclusion that there is groundwater discharge occurring within portions of Kilbride Creek	Addressed in revised Implementation Guide (August 2020) and Hydrogeology Addendum Report.

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	confirm downward hydraulic gradients, the stream flow data suggests that either Kilbride Creek is losing water to the groundwater system along this stretch of the Creek during this time period or the stream flow measurements are not accurate. It is not clear that this condition was accounted for in the integrated surface water/groundwater model.	Section 3.6	seepage and measured thermal plume migration between West Lake Piezometer and monitor WP7. Groundwater discharge is also noted in the headwater area of the Kilbride Tributary. Four seepage monitors were installed in Kilbride Creek upstream of SG21 and each confirms upward groundwater gradients in the creek bed. This groundwater flow is reflected in the groundwater model. Mitigation measures, threshold and trigger values and contingencies have been designed to maintain this groundwater flow to Kilbride Creek.	and the Tributary to Kilbride Creek. This however does not explain the measured stream flow results that suggest that Kilbride Creek is losing water to the groundwater system between SG9 and SG21. Details of seepage monitors including installation details, location and monitoring data were not available for this review. These data should be provided to confirm the upward groundwater gradients within Kilbride Creek upstream of SG21. Per the January 16-17, 2020 meetings: • The IG is to include an approach to monitoring accessible seeps west of the West Pond and known upwellings within the Kilbride Creek west and southwest of the West Pond and west and southwest of Phase 1 extraction area. Please provide additional information in the IG.	Details of seepage field program will be provided in the Hydrogeology Addendum report Section 2. We have now installed KC1 and KC2 designed to determine hydraulic gradient in Kilbride Creek. These will be monitored during extraction to confirm that upwelling persists. In addition, CB16S will be added to confirm that hydraulic gradient between BP2 and Kilbride Creek is maintained. WP7 is located at an individual seep along the bank of Kilbride Creek and is already part of the monitoring program. Section 4.2.1.8 of the IG which addresses turbidity monitoring in the seepage areas.
10.	Portions of the Guelph Junction Provincially Significant Wetland (PSW) Complex occurs on the James Dick property. This is described in detail in the GWS 2018 report. The preservation of amphibian habitat, as well as habitat for other marsh dependent species, provides the rationale for maintaining water levels within the on-site and adjacent wetlands. Maintenance of springs and groundwater discharge to Kilbride Creek and associated aquatic habitat provides the rationale for maintaining groundwater levels in headwater discharge areas adjacent to Kilbride Creek. It is unclear whether the proposed monitoring program is adequate for assessing impact of the proposed aggregate operations on the wetlands.	Section 3.6	Prior to exploring any extraction scenarios at this site it was determined that this site does not require any long term maintenance to prevent impacts to the adjacent wetlands. Having determined that no maintenance is required post closure, the operation of the site needs to balance out extraction of the rock and pumping of water to wetlands in order to maintain the lifecycle of the most sensitive species. The proposed monitoring during the operations is designed to ensure that each of the wetlands has sufficient water at critical times of the year. It may be that pumping must be increased and extraction reduced or suspended to maintain the necessary wetland moisture conditions. There are surface water and groundwater monitoring stations in each wetland except P15 which is located centrally between P9, P8 and P14.	It has not been fully demonstrated that the site will not require long term maintenance. It is assumed that the existing pond levels will return to their original pre-development levels and that the groundwater flow system will not be significantly altered. There remains some uncertainty regarding potential alteration of lateral groundwater flow between the West Pond (P1) and Kilbride Creek, especially after the removal of BP2 for the Phase 4 extraction stage. The lack of subsurface information within this area has raised questions regarding the predictions of post-development water levels within the excavated existing ponds, especially the West Pond. See Item # 3 above. Similar concerns exist for the Phase 1 extraction area and Kilbride Creek and the Tributary to Kilbride Creek. See Item #2 above. Per the January 16-17, 2020 meetings, the IG is to include an approach to post-	Addressed in the revised Implementation Guide (August 2020). Post extraction monitoring is described in Section 9.2 of the IG. There will be many years of observation to confirm that water levels are returning to pre extraction levels prior to final closure. Should the water level in the ponds not return to pre-extraction levels, an investigation will ensue with solutions provided to the agencies. We suggest that the placement of fine grained material along the downgradient edge of the quarry ponds will reduce flow and raise water levels. See section 9.2 of the IG.

<table>
<tr><th></th><th>Initial JART Comments (July 2019)</th><th>Page / Section</th><th>Applicant Response
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<tr><td colspan="3">Report: Hydrogeological Assessment – July 2018</td><td colspan="3">Author: Harden Environmental Services Limited</td></tr>
<tr><td></td><td></td><td></td><td></td><td>development contingencies, as may be necessary before the deepened extraction ponds return to their natural water level conditions.

Additionally, the IG and Site Plan need to identify stations for post-extraction monitoring as well as any post-extraction decommissioning needs.

Please provide additional information in the IG, and indicate revisions on the updated Site Plan, as applicable.</td><td></td></tr>
<tr><td>11.</td><td>Similar to Table 5.1, a hydrogeological assessment should assess impacts to the local streams and creek flows. Page 31 lists “hydrologic and hydrogeological limitations” established by the natural heritage consultants, the limitation for Kilbride Tributary is to maintain water levels within the historical range. This is rather vague, more details are needed and clear targets should be provided in terms of either stage or flows.</td><td>Section 6</td><td>1) The monitoring plan includes a minimum water level target for the Kilbride Tributary measured at WP4 located upstream of main groundwater seepage.
2) Water levels in BP2 are designed to maintain groundwater flow to Kilbride Creek and the Kilbride Tributary.
3) Minimum threshold values are set for CB9S and CB4S needed for maintaining the hydraulic gradient to Kilbride Creek.

This adequately addresses the monitoring for and mitigation of potential changes in groundwater flow to Kilbride Creek. There are too many off-site variables to create targets for stage or streamflow in Kilbride Creek.</td><td>It is not clear how the target levels for DP2, BP1, and BP2 shown on Graphs 10, 11, and 12 respectively of the Operational Guide Supplemental (December 2019) were calculated. Target levels were described as, ‘target water levels represent the pre-extraction levels of the extraction ponds that influence the water levels in the adjacent that are being protected’ [page 13, Operational Guide] …’target water levels in DP2 are set at historical water levels observed in the Central Pond (based upon SG3 levels) and water levels in BP2 are set at historical water levels observed in the West Pond (based upon West Lake Piezometer)’ [page 4, Operational Guide Supplemental]. Target levels on graphs 10, 11, and 12 appear to be offset from measured water levels. The IG is to include the corrected table(s), as applicable; the hydrographs are to incorporate installation details for each applicable station designated for MWLTs, WLTs, and WWL setting. Are the target levels to be fixed at an elevation determined from the average of historical levels shown on graphs 10, 11, and 12 or will they change with ongoing monitoring data? Clarification is required.

Per the January 17, 2020 meeting:
• JDCL’s procedures for adjustments to the MWLTs, TWLs, and WWL (i.e., based on longer-term pre-extraction data) are to be included in the IG.</td><td>Addressed in the revised Implementation Guide (August 2020)

The target levels are as follows.
<table><tr><td>BP1</td><td>Central Pond (SG2)</td></tr><tr><td>BP2</td><td>West Pond (West Lake Piezometer)</td></tr><tr><td>DS2</td><td>Central Pond (SG2 or SG3)</td></tr></table>
Prior to the finalization of the target levels there will be at least two additional years of data collected from which targets can be set. It is expected that once the targets for the mitigation sytems are set, they will not change as they represent historical, pre development conditions. Should historically low precipitation occur, the operator will have to set in motion the agreed protocol for low water conditions.

See Section 6.1.2.4 of the IG and Hydrographs 11, 12, and 13 in Appendix B. See section 8.1 of the IG which details how changes to MWTL, TWLs, and WWLs will be made.</td></tr>
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Applicant Response (Table October 2020, Site Plan November 2020)

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				Please provide additional information in the IG.	
12.	The report is silent on the methodology used to ensure that the required "hydrologic and hydrogeological limitations" will be followed. Where will water used to fill the excavation area come from?	Section 6	The water comes from storage in the existing ponds, the regional groundwater flow system and retention of storm water.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
13.	The report indicates there is a potential increase in groundwater discharge to Kilbride Creek and tributary post-closure. There should be some quantification of the potential increase as well as an impact assessment to the creek such as erosive impacts.	Section 6.1.2	Any increase will be subtle caused by a minor increase in hydraulic gradient. The Kilbride Creek system is very large and has an extreme range in flow measured in stream by Harden to be from 16 L/s to 783 L/s. Using Q = kiA where $k = 1 \times 10^{-4}$ m/s (bedrock), i = 0.00927 (existing gradient between Pond 3 and Kilbride Creek) a depth of 25 metres and a width of 150 metres results in the rate of groundwater flow is 3.5 L/s towards Kilbride Creek from Phase 1. If the water level in Phase 1 pond increases by 0.5 metre at the downgradient edge of the pond and all else stays the same, the groundwater flow increases to 4.7 l/s. Given the measured range of flow in Kilbride Creek, there will not be any potential erosion from this increase in groundwater discharge. It should be noted that surface water flow in Kilbride Creek is significantly affected by the control structure at the Robert Edmondson Conservation area.	See Items # 3 and 10 above. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). See responses to #3 and #10.
14.	The source of climate data used in the GSFLOW simulations is unclear; the report mentions interpolating from nearby Environment Canada Atmospheric Environment Service stations. Please confirm the source. The main Harden report, Section 2.1, argues that the Kitchener/Waterloo climate station is representative. Both reports should use the same climate data in the assessment.	Section 6.2	The water balance in the hydrogeology report uses an average climate condition to estimate on-site water balance changes. The climate dataset used in the integrated model was developed through interpolating 69 EC stations proximal to the model domain. An interpolated dataset was used for the integrated model for two reasons: 1) To capture spatial variability, if any, in the climate dataset; and 2) To create a continuous dataset - very few stations offer completely continuous period of record, which was required for our long	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved

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			term 25-year simulations, hence multiple different sources were required.		
15.	What is the direct source of the aggregate processing water and dust control water (page 35)? This volume could pose a significant impact on the seasonal water balance. Will wash water be recycled? Where will this system be located and designed? (not included on Page 2 of 5).	Section 6.3	Water used for dust control is assumed to evaporate and there is also entrainment of water in aggregate shipped from the site. This was accounted for in the model and also in Table 6.2 Operational Water Balance of the Harden Report. Wash water will be recycled. The washing plant will be located in Phase 5 and operated as a closed loop. Make up water will be pumped from P6 and/or P11.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
16.	Page 30 listed limitations should be clear and quantifiable. Measurable targets must be set (e.g., instead of “ensure that the amphibian pond levels recovered completely by early spring” a clear water level elevation target should be set for all the ponds). The corresponding monitoring proposed will need to ensure that the targets are being met.	Section 6	There is variability in the spring levels and we recommend reviewing all data prior to below-water-table extraction to determine minimum water levels for the spring time.	Per the January 17, 2020 meeting, JDCL’s procedures for adjustments to the MWLTs, TWLs, and WWL (i.e. based on longer-term pre-extraction data) are to be included in the IG and referenced in the Site Plan. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). Initial MWLT’s, targets and TWL’s will be established based on all available data accumulated prior to extraction occurring at the site. See Section 6.1 of the IG. The annual monitoring report will be the avenue through which change can be made with the approval of the appropriate agencies. See Section 8.1 of the IG.
17.	The effects of blasting on water quality within the ponds was addressed by examining chemical data from sub-aqueous mining at the Guelph Limestone quarry. A sample was taken within the quarry pond in the area of the broken rock pile four hours after detonation of explosives in 2012. The sample was analysed for metals, polyaromatic hydrocarbons, volatile organic compounds and hydrocarbons. Although Harden states that these water quality results are in Appendix E none were found in Appendix E. The results indicated that there were no exceedances of Ontario Drinking Water Standards for inorganic compounds. Exceedance of surface water standards were found for lead, zinc, and cobalt. These were thought to relate to the petroliferous Eramosa Formation which does not occur at the site.	Section 6.5.1, page 37	Sphalerite, a lead mineral, occurs in the Eramosa Formation at the Guelph Limestone Quarry as observed (and collected) by Harden staff in core samples and quarry rock samples. This lead mineral has not been observed in any core samples taken from the Goat Island or Gasport Formations. The depositional environments of the Eramosa Formation (inter-reefal) and the Gasport/Goat Island Formations (reefal) result in the significantly different mineralogy and the absence of concentrated lead, zinc and petroliferous compounds at the Reid Road site.	The absence of the Eramosa Formation within the Reid Road property suggests that a comparison of water quality results taken at the Guelph Lime quarry which contains the Eramosa Formation to the anticipated Reid Road Quarry water quality is inappropriate. There is no mineral analysis of the rock found within the Reid Road for comparison to the Guelph Lime quarry. Sphalerite is a zinc sulphide; galena is the lead sulphide. Water quality monitoring is addressed in the IG, Section 5.2.2. Additionally see Item #2 above.	Addressed in IG and Hydrogegology Addendum Report. The water quality analysis was done to compare a pre blasting condition to a post blasting condition for contaminants that could be expected in explosives. Lead and zinc are not components of explosives and therefore their presense in the Guelph Limestone Quarry water is related to the Eramosa Formation. See Addendum Report Section 6.5.1. We stand corrected in our chemical description of sphalerite and galena. There are no chemical components in the rock formations Eramosa or Gasport that could affect the water quality determinations before and within four hours after a blast. Therefore, the use of the Guelph Limestone Quarry data is reasonable. In the first year of blasting associated with Phase 1 and Phase 2, pond water

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					samples will be obtained and analyzed for nitrate and ammonia. Water samples will be obtained on monthly basis.See Section 4.2.1.7 of the IG.
18.	The report is silent on the levels of total suspended solids within the pond water as a result of blasting. If increased levels are experienced, the report should indicate what methods will be used to ensure this increased sediment concentration is not transferred to environmental features.	Section 6.5.1	The only potential mechanism for the transfer of TSS to the features is through the pumping system. Only clear, turbid free water will be pumped from the main ponds to Buffer Ponds 1 and 2 and Dispersion Trench 1 and 2. There are no direct connections between Kilbride Creek and the extraction areas therefore there is no potential to add turbidity to the surface water feature. Any subsurface connections will attenuate any turbidity in the water prior to discharge to Kilbride Creek. Turbidity levels measured in the Guelph quarry were very low (1-2 NTU) and observations at the time indicated that turbidity generated by blasting was local to the area blasted and cleared very quickly due to the large particle sizes created by blasting. Turbidity will be measured on a monthly basis (ice free) at SG9, SG10A and CB15.	It is agreed that there are and will be no direct surface water connections between Kilbride Creek and the extraction areas. The analysis to date fails to recognize the potential of groundwater movement through fractured bedrock capable of transmitting suspended solids from extraction areas nearest to Kilbride Creek to Kilbride Creek. No measures have been proposed to ensure that the act of pumping water into Ponds 1 and 2 will not result in turbidity from discharging water into these ponds. Section 3.3 3) Water Quality Mitigation Strategy of the IG proposes to separate water sources for mitigation from areas where turbidity may be generated by mining or blasting activities. Additional information is required on how this will be achieved. Per the January 16-17, 2020 meetings. The IG is to include an approach to monitoring water discharge conditions at key seeps west of the West Pond. Suspended solids/turbidity sampling has been included in IG with the addition of groundwater monitors in key locations and monitoring for turbidity as well as general chemistry. Mitigation measures for water quality impacts are outlined in Section 5.2.2 of the IG. See also Items # 2, 3, 10 and 13 in this table.	Addressed in the revised Implementation Guide (August 2020). Additonal detail has been added to the IG (Section 4.2.1.8) that addresses turbidity and seepage downgradient of the extraction areas. Appendix C of the IG includes details of transfer pumping stations offset from the main ponds to filter out turbidity. Also, the IG includes greater details on turbidity monitoring (Section 4.2.1.8).
19.	Water quality monitoring by the proponent has determined that increased chloride levels are already a concern. As such, the use of calcium chloride as a dust suppressant may not be supported. An alternative dust suppression mechanism is recommended.	Section 6.5.3	JDCL has agreed to only use water for dust suppression.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved

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20.	Four water samples were taken from the Guelph Limestone Quarry in April 2014 to evaluate the water quality impact of explosives in the pond. One sample was taken before the blast and three samples were taken at intervals after the blast. Samples were tested for nitrate, nitrite, total kjeldahl nitrogen (TKN) and ammonia. Results are summarized in Table 6.3, page 38). Samples following the blast were turbid and were not filtered prior to analysis. Low levels of nitrate and TKN were observed before and after the blast. From these results Harden concluded that 'The data therefore shows that the use of explosives in a subaqueous mining operation does not affect the nitrogen levels in the water of the quarry pond.' (Harden 2018, Section 6.5.1, page 38, 2nd paragraph). It is not clear how the results of this test compare to the proposed blasting operations in the Reid Road Quarry and whether the results reflect the solubility of decomposition products of the blast material.	Section 6.5.1, Table 6.3, page 38	The water samples taken before and after the blast observed, not only allow for the identification of chemical changes from that specific blast, but are also an indication of all previous blasts. The concentrations of nitrate, ammonia and TKN are low in each sample set, including the pre-blast sample, therefore there is no significant loss of these compounds to the surface water. This mining technique is very common in Florida, USA and occurs without buildup or retention of nitrogen compounds.	It is acknowledged that the water quality samples taken at the Guelph Limestone Quarry likely represent the cumulative impacts of previous blasting activities prior to taking of the water samples. It is not clear however, that the blasting activities at the Guelph Limestone Quarry is comparable to that proposed at the Reid Road Quarry Reservoir. Provide a comparison of the blasting at the Guelph Limestone Quarry to that proposed in the Reid Road Quarry in the Addendum Report.	Addressed in the Hydrogeology Addendum Report and the revised Implementation Guide (August 2020). A comparison is included in Section 6.5.1 the addendum report. The blasting techniques will be similar in that the same emulsion will be used, holes will be lined with cardboard sleeves and detonation process will be the same. The depth of holes will be greater at Reid Road, more similar to Hidden Quarry than Guelph Limestone. In Florida, drilling and blasting to depth of 30 metres is common. See also section 1.4.3 of the IG.
21.	There is no discussion of the blasting and excavation operations on turbidity within the excavated ponds and the potential for turbid water to be transmitted to Kilbride Creek through fractured bedrock especially in areas closest to the Creek such in Stage 1 and 2 of the quarry operations. Monitoring for turbidity has not been included in the recommended monitoring program. Harden acknowledges that samples taken in the Guelph Limestone Quarry at the time of a blast were turbid. Proposed dragline operations are expected to result in high turbidity within the excavated ponds.	page 37, last paragraph	There is a very brief period of time after the blast that the water is turbid. Photos taken within four hours of a blast at the Guelph Limestone quarry show clear water. Blasting is not designed to produce silt and clay sized particles and according to the Blaster's Handbook, none are created. Turbidity in the ponds cannot be transmitted to Kilbride Creek even through fractures as there is no bedrock outcropping in Kilbride Creek and any fine-grained material, although unlikely to be transported via fractures, will be filtered out before reaching the creek bed. Also, groundwater will flow into the extraction ponds, not out, thereby prohibiting the migration of turbidity into the bedrock.	It is acknowledged that blasting impacts on water turbidity may be limited and localized. The impact of drag line operations on rock excavation is however not clear. This may potentially be significant. No evidence has been provided that this will not be a potential source of impact to water quality. Groundwater outflow is anticipated during extraction from the West Pond toward Kilbride Creek if water levels are to remain within historical levels within West Pond during extraction. See also Items # 2, 3, 10, and 13 in this table. There is a lack of subsurface information between Phases 2 & 4 and Kilbride Creek and there is potential for increased flow through subsurface to Kilbride Creek and permanently lowering water levels in West Pond and Central Pond – Note that turbidity monitoring and general chemistry has been included IG Feb 2020 – Groundwater monitoring between Phase 1 excavation and Kilbride Creek is inadequate. Warning and trigger levels and mitigation for water quality parameters are required.	Addressed in the revised Implementation Guide (August 2020). A detailed turbidity measuring program has been included in the IG. We are recommending an intense period of turbidity monitoring during the initial months of Phases 1 and 2. (Section 4.2.1.8). See response to Comment #3 for details on turbidity, fracture propagation and mitigation. Water transferred from the ponds to the mitigation systems will have low turbidity by design.
22.	The report states there is a 6 L/s loss of flows in Kilbride Creek but there has been no indication as to where this flow is going. Is there an increase in West pond levels or an increase in flows to the small tributary? The modelling should clarify what is causing the loss and if excavation works onsite will result in an increase of this loss.	Section 7.4	See response to Comment #9.	See Item # 9 in this table.	See Response #9.

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23.	The table provides warning and trigger levels for protection areas but does not provide supporting documentation as to how these levels were determined. There is no correlation between the environmental monitors and the groundwater monitors used for warnings/triggers. Supporting information should be provided.	Table 7, page 63	The trigger levels are set at the lowest observed water level to-date. The warning level is estimated to provide a 14-day period before the trigger level is breached.	Additional information was provided in the Draft Environmental and Water Management Operational Guide, November 2019 (OG) and Draft Operational Guide Supplemental Monitoring Program, December 5, 2019 (SOG). Warning levels are set at 0.05m above the trigger levels and are intended to provide a two week warning before the feature's water level falls below the Minimum Water Level Threshold (MWLT). It is not clear how this was determined. It is also not clear what actions are to be taken once warning levels have been reached or exceeded. Refer to Item # 25 re: the need for clear response action framework. Please provide additional information in the IG.	Addressed in the revised Implementation Guide (August 2020). See updated MWLT in the IG – Section 6.0 and Hydrographs in Appendix B. The two week time frame is provided as a reasonable amount of time to react, if necessary to the approach of the threshold. The list of contingencies and protocol is included in Section 3.4 and Section 6.5 of the IG.
24.	Trigger and warning levels for monitor CB12 is listed as TBD. Please provide a methodology for determining these levels prior to commencement of quarry operations.	Table 7, page 63	CB12 will be installed to monitor water levels between the East Pond and the residence at 9256 Twiss Road where a dug well is used for a water supply. Water levels in the future location of CB12 are expected to decline as a result of lower water levels in the East Pond during extractive operations. It is estimated that drawdown in the vicinity of the private well will be less than 0.30 metres. Our observations to date are that annual variation in water levels is in the order of 0.6 to 0.8 metres, therefore the predicted water level change at the private well is less than natural variation. The private well survey will confirm the amount of available drawdown in the private well while the well is in service. There will be no long-term water level change at the well once operations at the site cease. Warning and trigger levels in CB12 cannot be set at historical values as drawdown east of the east pond is expected to occur during operations. The warning and trigger values will be set at the historical low plus the expected drawdown value. James Dick Construction Ltd. has committed to replacing this well with a drilled well should the need arise.	The applicant response has not fully provided clarification regarding the original JART comment; additional information is required and should be documented as an addendum to the Level 1 and 2 Hydrogeological Assessment Report, as part of the IG, and as a detail on the updated Site Plan. The proposed warning and trigger levels for the eastern Wetland Complex (OG, page 15, section 3.2.2 (November, 2019) assume that the Eastern Wetland Complex can tolerate 0.3m of drawdown. This requires a biological response. See Item # 40. Procedures for setting Warning and Trigger values for CB12 (i.e., that are yet to be determined from historical low values minus 0.3m) should be included in the IG and site plans. The warning and trigger level determination for CB12 should consider the historical variation in water levels as well as the available drawdown in the dug well supplying the residence at 9256 Twiss Road. As noted under Item 1 of this table, definition for "trigger" [i.e. as compared to "threshold "(per MWLTs) and "targets"	Addressed in the revised Implementation Guide (August 2020). The IG will eventually include any TBD values.See footnote #3 in Section 3.2 of the IG. Section 5.2.1 includes the proposed method to determine warning and threshold values for CB12.

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				(per TWLs)] should be included in the IG document, if it is to be used in the Site Plan. Please provide additional information in the IG, and indicate revisions on the updated Site Plan, as applicable.	
25.	The monitoring program must have more details and be clearly tied to wetland, stream and groundwater target set to meet the Environmental Objectives (noting there are further comments raised elsewhere with respect to the Environmental Objectives being proposed). The automatic level and temperature monitoring should have live feed to be able to proactively and effectively apply mitigation measures.	Tables 8.9 and 9.1	Water level recorders with connections to a cellular network will be used in key locations such as BP1, BP2, WP8, WP6, WP3, WP9, WP12, WP5, WP13, WP4 and WP14. This will allow real-time evaluation of the performance of the mitigative measures.	Additional information is required as discussed during the January 2020 meetings and as noted below. Monitoring program has been expanded to include Water Quality Objectives including turbidity monitoring at selected surface water and groundwater monitoring stations (Operational Guide, November 2019). Surface water stations SG9 and SG 10A are subject to external influences from the Kilbride Creek watershed and may not be useful in detecting influences from the subject property. See Item # 2 above. An implementation process tied to the proposed target, warning, and minimum water level thresholds for groundwater monitoring is lacking. It is therefore unclear how mitigation efforts will be implemented and documented. Per the January 16-17, 2020 meetings, the IG should include a response action framework (i.e., structured response including decision flow charts and step-by-step actions to be taken if threshold/target/warning level is breached). Can agency staff be provided access to the monitoring data? Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). Section 5 and Section 6.5 of the IG detail the response to low water levels and water quality changes. There is an annual report and upon a MWLT being breached, interim data will be shared with the agencies. See section 8.
26.	Dispersion Trench 1 and 2 will be constructed around the periphery of Central Pond P6 for the maintenance of minimum water levels in	Section 6.2.6, page 35	In general, the water levels obtained from the existing monitoring network can	There is no topographical data within the majority of P5 to the north of the property	Addressed in the Hydrogeology Report Section 2.6.

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	adjacent wetland P5 and the maintenance of baseflow to the tributary to Kilbride Creek respectively. Buffer Pond 1 (BP1) will be constructed at the edge of Central Pond P6 for the maintenance of minimum water levels in wetlands P7A and P7B. It is thought that 'Smaller ponds to the south and southwest of P7A and P7B benefit from the mitigation efforts in BP1' Harden 2018, Section 6.2.6 Ponds P10, P9, P4, P14, P8, page 35). The construction of Buffer Pond 2 (BP2) along the western edge of the West Pond P1 is intended to provide for the maintenance of spring discharges that provide baseflow to Kilbride Creek. It is assumed that minimum water levels can be maintained within the adjacent wetlands by pumping from the main ponds based upon the modelling results. The proposed monitoring network is inadequate for assessing the impact of the proposed quarry operations on the wetland features. It is not clear that sensitivity analysis has been completed to consider the range of operating conditions. The modelling of impacts is based upon the lower range of reported extraction rates of 350,000 tonnes /yr instead of the upper end of the anticipated extraction rate of 500,000 tonnes /yr.		adequately determine minimum water levels in each of the wetlands. However, it may be possible and advantageous to optimize the locations as discussed herein; WP8 is located within 20 metres of the lowest elevation measured in P5. It is our opinion that this provides adequate verification of water levels in P5, particularly when the greatest potential impact occurs along the southern edge of the wetland where WP8 is located. WP12 could be moved 40 metres to the northwest to capture water levels in the lowest ground surface elevation. WP5 could be relocated 40 m to the northeast where the ground surface is 14 cm lower. WP13 and WP14 are located on the upgradient edge of their respective wetlands, the edge closest to the proposed extraction. These do not need to be relocated.	upon which to evaluate the effectiveness of the proposed pumping mitigation measures. If off site monitoring locations are not possible, photographic evidence as part of the monitoring program would be useful in assessing the effectiveness of the mitigation measures in achieving recovery of amphibian pond levels by late winter (Environmental Objective 1) and maintaining 10% wetted area in amphibian ponds until July 31st of each year (Environmental Objective 2). Re. highlights to the left: Instead of "relocation", supplementation of monitors is a better approach to monitoring enhancement, as it allows building on the historical data moving forward.	The lowest part of the wetland occur on the licensed property as there is a former drainage channel designed to drain the wetland connected to the West Pond. Our observations from July 30, 2020 is that the wetland was dry except for a small area within the JDCL property boundary. The stated Environmental Objectives will be achieved. If the monitors are moved to lower elevations within the wetland, there will be a transition period to ensure that water levels are comparable.
27.	To the above, the licence proposal is for 990,000 tonnes /yr. Analysis should be undertaken using the proposed licence maximum.	Section 6.2.2, page 35	There is no intention of extracting 990,000tonnes/year from the site. The 990,000 tonnes per year is the sum of all shipped materials regardless of the origin of the materials or the year the materials were stockpiled. The tonnage limit is a composite of: 1. Material extracted above water table, processed and shipped in the calendar year, 2. Material extracted below water table, processed and shipped in the calendar year, 3. Material extracted in previous years, processed and shipped in the calendar year, 4. Material processed in previous years and shipped in the calendar year, 5. Material to be recycled that is received at the site, 6. Material recycled and shipped from the site. The 350,000 tonne number represents one scenario for item "2." in the list above. It is important to note that this quarry will operate in harmony with the ability of the environment to sustain it, based on the trigger levels established by the monitoring program. In a wet year more can be extracted from below water table, in a dry year less.	The tonnage specifics provided in the JDCL's response should be incorporated into the IG and the Site Plan notes, including the maximum limit of sustainable extraction identified by the model. The maximum annual extraction rate should be fixed at the limit used in the impact assessment and should not be exceeded in response to natural changes in annual precipitation. It is noted that the proposed on-site climate monitoring is only recommended for a five year period as stated Section 4.4 Climate Monitoring of the Environmental and Water Management Operational Guide November 2019, by JDCL. Without having onsite climatic data this would result in basing the extraction rate only on water levels within wetland ponds, which appear to react on a time delayed basis. This would put the sensitive wetland features in precarious situation of being subject to adverse negative water level changes if even on a temporary time delayed basis.	Addressed in the revised Implementation Guide (August 2020). Precipitation data is included in the on-site climate station. See Section 4.4 of the Implementation Guide. Table 12 has been modified to include precipitation. Direct monitoring of the main ponds has been added (SG1, SG2, SG4). These stations directly measure water levels in the main ponds. See Table 10 and Table 12. Minimum pond elevations will be established at two metres below the lowest observed historical elevation. There is no ecologically based water level requirement within the main ponds, however, as a target we are recommending a maximum drawdown of two metres. This is described in Section 6.1.2.4 of the IG.

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				An on-site climate station at the proposed scale house is included in Table 11 of the IG. Hourly monitoring of temperature and barometric pressure is included. Precipitation monitoring is lacking. More detail is required for the duration of monitoring. No direct monitoring of water levels has been recommended from the source of the mitigation waters, i.e. West Pond, Central Pond, and East Pond. This could potentially allow a dewatering situation in these ponds where increased pumping is required to maintain water levels within the wetland ponds. Confirm that the monitoring locations designated as surrogates for the main ponds provide representative water levels for the main ponds. Minimum ponds elevation (MPE) should be established for the existing pond to avoid excessive drawdowns. Per the discussions during the January 16-17, 2020 meetings, if aggregate extraction causes larger than anticipated drawdown in the extraction ponds, mitigation enhancement around the ponds may be necessary. The proposed BPs and DTs may be inadequate to support the entire wetland. As noted above, rapid-response contingencies (e.g., direct discharge to affected features via overland piping) should be planned well in advance. As such, an approach to rapid-response contingencies should be part of the IG. Please provide additional information in the IG, and indicate revisions on the updated Site Plan, as applicable.	
28.	Computer model simulations of surface water and groundwater changes in response to anticipated quarry operations were determined by Earthfx (2018). It was concluded by Earthfx that 'The model results indicate that there are sufficient quantities of water on-site to support the sensitive wetland features during operations.' (Earthfx, 2018, Section 11.6, page 85). From these results, and the results of the	Section 11.6, page 85	The proposed works consisting of pumps and berms is conventional construction practice. The construction of the proposed buffer ponds and dispersion trenches will not impact the wetlands as works remain out of the wetlands. The	The additional information provided as a result of the trial pumping test into Pond P5 suggests that pumping may be an effective mitigation measure against lowering of water levels within the excavation areas. The extent to which	Addressed in the revised Implementation Guide (August 2020). See Response to #2.

Applicant Response (Table October 2020, Site Plan November 2020)

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	Level II Natural Environment Report by GWS (2018), Harden (2018) determined that mitigation measures would be required to address anticipated impacts to the groundwater system from the proposed quarry operations. These measures are intended to maintain groundwater and surface water conditions within on-site and adjacent wetlands primarily for the protection of amphibian habitat. This is to be achieved largely by pumping water from the main ponds into constructed buffer ponds and dispersion trenches as part of the mitigation measures. This approach has not been proven effective nor is there an approach proposed to verify its effectiveness prior to extraction initiation.		efficacy of the works will be determined by water levels obtained in the wetlands and appropriate mitigation is proposed should trigger levels be breached. See also response to Comment #6 that describes how the mitigation has been proven to be effective in this environment.	pumping may be effective remains to be verified with longer term pumping trials. Per the discussions during the January 16-17, 2020 meetings, removal of a dike separating the West Pond extraction area from BP2 for the purpose of the Phase 4 extraction, may lower water levels in P1 and, consequently, alter seepage conditions west of the West Pond. Contingencies are to be planned for the seeps (also applicable to Item # 29 below) and an approach to supporting the western seeps needs to be built into the IG. See Item # 2 above.	The removal of the dike separating the West Pond and BP2 will only occur when water levels have stabilized and equilibrated.
29.	The hydrological or surface water component of the model (PRMS) is influenced by topography, soil properties, and land use. Earthfx notes that 'All the model parameter values were regionalized by the land use, soils mapping, or surficial geology mapping… A Monte Carlo approach was undertaken to identify optimal model input parameters.' (Earthfx 2018, Section 6.5 PRMS-only Calibration Results 3rd paragraph, page 35). No explanation is provided of the Monte Carlo approach. Data available for these parameters resulted in a more refined model grid in the order of 5 to 50m (Figure 3.4, Earthfx, 2018). The regional surface water model (SFR2) for streams was calibrated against the long term Bronte Creek stream gauge located to the south near Zimmerman (Station No.02HB011). The boundaries of the regional scale model were selected to include this stream flow station in order to have a surface water calibration point. The local scale stream module of the integrated model was calibrated against the measured onsite stream flow measurements as well as the flows of the downstream gauging station which in turn was integrated into the regional model. The limited on-site stream flow data covers a relatively short period of time from July 2016 to April 2018 and may not be representative of the long term range of conditions expected for the subject property. It is also not clear how/if the loss of stream flow along portions of Kilbride Creek was accounted for in the PRMS model.	Figure 3.4, Earthfx, 2018 Earthfx 2018, Section 6.5 PRMS-only Calibration Results 3rd paragraph, page 35	The loss of water over the short reach of Kilbride Creek was not modelled. See also response to Comment # 9. The model adequately identifies groundwater flow towards Kilbride Creek and an increase in streamflow between SG9 and SG10. The approach was more of a quasi-monte carlo approach because Earthfx has previously developed an understanding, through experience in the area (i.e., the Milton Tier 3 Study), which parameters are the most sensitive and what reasonable starting values for different parameters might be. Suitable PRMS parameter values were identified by iteratively completing PRMS submodel simulations and varying parameters over range in values. The value that produced the best streamflow statistics (Nash Sutcliffe, Log-Nash Sutcliffe, % Vol difference) was selected. The results of the PRMS submodel (before integration) are presented in Section 6. A full optimization of the PRMS submodel was not completed because the PRMS submodel does not simulate groundwater processes and final calibration could only be completed in GSFLOW. There seems to be some confusion with how streamflow was represented in the model. A GSFLOW model consists of a groundwater submodel (MODFLOW) and a hydrologic submodel (PRMS). These	The lack of full optimization of the PRMS model and the discounting of the apparent streamflow loss along Kilbride Creek suggests a level of uncertainty in characterizing the surface water/groundwater interaction in the area of Kilbride Creek and the subject property between SG9 and SG21. This is an area of particular concern with respect to impacts on Kilbride Creek from on-site extraction activities particularly in the area of the West Pond and the Phase 1 extraction. See Items # 3, 10, and 13 in this table. Per the discussions during the January 16-17, 2020 meetings (and as noted under Item #28 above), direct supplementation may be required to alleviate any observable impacts in the western seeps and Kilbride Creek's flow. An approach to dealing with potential needs of this nature should be built into the IG and documented in the Site Plan. Please provide additional information in the IG and include in Site Plan.	Addressed in the revised Implementation Guide (August 2020) and Hydrogegology Addendum Report. Additonal monitoring including KC1, KC2, CB16S/D and CB18S/D have been recommended /installed to confirm flow conditions between the extraction areas and Kilbride Creek. See section 4.2.1.1 of the IG. The flow in Kilbride Creek upgradient of the site is significantly greater than any groundwater discharge occurring from the site. There are now several agreed upon dedicated monitors to verify that groundater flow conditions are maintained between the extraction areas and Kilbride Creek. The understanding of the relationship between groundwater discharge to Kilbride Creek and the proposed extraction areas has been improved with the installation of KC1, KC2, CB19S and CB20. Details of the additional studies will be included in the addendum report Section 2 and the monitoring plan will include threshold values to ensure that groundwater flow to Kilbride Creek is not diminished. See section 6.1.4 of the IG.

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			submodels are initially developed and pre-calibrated in a standalone manner, and then brought together to form the integrated GSFLOW model. In GSFLOW the two submodels communicate with one another on a daily basis. SFR2 is the streamflow routing module in the MODFLOW submodel. During a GSFLOW simulation the SFR2 streams receive runoff and interflow from the PRMS soil zone and interact with the groundwater system via head dependant leakage/discharge. Figure 3.4 from Earthfx is purely conceptual showing that the hydrology component of the GSFLOW model (PRMS) may be constructed on a grid resolution ranging from 5 to 50m. The PRMS model was constructed on a 30m grid, while the MODFLOW model used a variable cell.		
30.	The GSFLOW integrated model was initially calibrated against the measured on-site water levels as described in Section 8 of the Earthfx 2018 report. Water level simulations were compared to and calibrated against measured stream flows, baseline surface water levels, and groundwater levels observed on-site between July 2016 and April 2018. Comparisons between simulated and measured baseline surface water and groundwater levels as shown on Figures 8.2 to 8.15 produce a reasonably good match to the timing of flows and baseflows at the two downstream monitoring locations SG10 and SG13. The GSFLOW model match to measured stream flows at the upstream location SG9 is poor. Earthfx attributes this to difficulties in measuring flow at the natural channel location compared to downstream culverts. It is noted that the few measured stream flows at SG 21 downstream of SG9 are consistently lower than upstream at SG9 suggesting that Kilbride Creek is losing water to the groundwater system within this area. This condition may have contributed to the poor correlation between measured and simulated water levels at SG9 although it is not clear what the impact of this condition has on the model. This suggests a level of uncertainty with the predicted impacts on surface water and groundwater levels within this portion of the property. The climatic data is based upon data collected from locations removed from the property and may therefore be limited in representing on-site conditions.	Earthfx, 2018, Section 8	Calibration of the GSFLOW model occurs in two stages. First the MODFLOW and PRMS submodels are pre-calibrated as independent models to a reasonable level, then the two submodels are integrated and the GSFLOW model is then final-calibrated. Both sub models achieved a good calibration to regional static groundwater levels and WSC Streamflow gauges, respectively. The PRMS submodel performed well at the Bronte Creek catchment scale, which represents an area of 242km² (Figure 6.3). In contrast, the Killbride creek catchment upstream of SG9 is less than 10km². Testing the calibration against small catchments with low streamflows magnify the uncertainty in the model. The issues related to the calibration and effects analysis at SG9 are discussed in detail in the response to Comment 3 (above). The climate data used in the model made use of 69 Environment Canada sites proximal to the model domain. The strong regional calibration of the PRMS submodel gives confidence that the climate dataset used in the model was an adequate representation of the Bronte Creek watershed. There will	The level of uncertainty in characterizing the hydrogeological setting on a local scale appears to be magnified when testing regional calibration against small catchments. The modelling effort appears to have limitations to accurately reflecting local conditions due to the necessity of calibration to regional control points. A comprehensive ongoing site monitoring program is essential especially in areas of conflicting data not accounted for in the integrated surface water/groundwater model completed for the subject property. A complete monitoring plan is to be included in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). We are in the process of updating the Site Plans to incorporate the monitoring program outlined in the IG.

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			always be uncertainty surrounding the distribution and continuity of climate data. We acknowledge it is always useful to have local data but our long-term simulations would have required on-site data collection to have begun more than 25 years ago. The issue of less streamflow at SG21 vs SG9 is described in response to Comment 22.		
31.	The simulations presented in Figures 9.2 to 9.5 and 9.7 to 9.9 show the wetland water levels approximately 10 to 15cm lower under closure conditions. Examination of hydrographs suggest that Wetland P7B and Wetland 5 will reach the threshold levels specified in Table 10.1 an increased number of times due to the lower predicted water levels. There is no discussion of the significance of the predicted lower water levels within wetlands after quarry closure with respect to the recommended threshold levels. The corresponding groundwater analysis showed that deepening of the existing ponds would result in a lowering of groundwater levels. The largest change is observed along the north edge of the east pond where expansion of the pond area results in a lowering of the groundwater level by about 0.5m (Figure 9.1). It was concluded that long term changes in shallow groundwater levels are relatively minor. No actions were recommended for long term closure. Long term monitoring locations in the predicted area of greatest drawdown are lacking. This is considered a deficiency in the proposed monitoring program.	Earthfx, Section 9	Upon closure, modelling indicates that the probability of Ponds 5 and 7B retaining 10 cm of water over 10% of the wetland until July 31st decreases by 8% and 20% respectively. The threshold of maintaining 10% inundation to 10 cm depth is intended to provide sufficient time for salamanders to transform into juveniles. The decrease in Pond 5 by 2 years out of 25 is not considered a limiting factor to salamanders. Salamanders are long-lived (20 to 30 years) and individuals typically breed in alternate years or even longer intervals. A small reduction in the number of years when the threshold is attained will not affect the viability of the breeding population of Pond 5. In addition, 10% of Pond 5 represents approximately 2,700 m2 of pond area. In years when the threshold is not attained, it is possible that there will still be adequate water present to allow salamanders to transform. Pond 7B currently does not support salamanders due to the presence of predatory fish such as pumpkinseeds and largemouth bass. As part of the mitigation, a pea-gravel barrier will be constructed between Pond 7 and the Central Pond. This will prevent additional fish from accessing Pond 7B, but the existing population may still be able to persist. The occasional drying out of Pond 7B will eradicate the local population within this basin and may eventually result in this pond becoming suitable for salamander breeding. Under closure, it has the potential to have a hydroperiod long enough to produce salamanders in 72% of years. At present, it is suitable in 0% of years due to the presence of fish.	No consideration was given to the possibility of permanent lowering of water levels in the West Pond due to increased lateral groundwater flow toward Kilbride Creek. See Item # 3 in this table. Given that the targets used to direct the mitigation approach are based on professional opinion, assumptions should be validated through baseline monitoring. The proposed methods and approaches can be provided in the Operation Guide and Implementation Plan. Additional input should also be provided regarding mitigation approaches, monitoring, and contingency plans for changes in hydrology associated with anticipated drawdown of the water table in the east wetland, south of the east pond. See Item # 29 in this table. Please provide additional information in the IG.	Addressed in the revised Implementation Guide (August 2020). See Comment #3 for a response to contingency for lower than expected water level in the West Pond. The 10% coverage by July 31st is a professional opinion and detailed baseline monitoring will continue to be conducted until extraction commences. All methodologies for baseline studies are in the IG. There is additional detail provided in Section 3.1.3 regarding Dispersion System 3 adjacent to the Eastern Wetland Complex. Table 7 includes the following statement in regard to implementation of DS3. When drawdown occurs beneath the EWC and the ground flora consists of 40% upland plant species.

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32.	Wetland bathymetry or ground surface elevations as shown on Figures 2.5 to 2.8 in the Harden report does not correlate with the Minimum Bed Elevations in Table 10.1 of the Earthfx report. The assumed 10% Inundation Threshold elevations for wetlands indicated on column 4 of Table 10.1 are questionable and should be confirmed (as noted in comments on the Natural Heritage System report, there are further ecological questions related to the appropriateness of this mitigation measure). It is also not clear how 10 cm of water within each of the wetlands translates into the 10% inundation threshold on Table 10.1. It is anticipated that the geometry of each pond bottom would have a significant effect upon the 10% inundation threshold which should be unique to each pond. It follows from this description that the 10% inundation threshold would be 10cm higher in elevation that the Minimum Bed Elevation of Table 10.1. This is not reflected in Table 10.1. The rationale for the 10cm inundation criteria is described by GWS 2018 (Section 4.5.2 Amphibians, page 31, last three bullet points). However, it is unclear as to how this criterion is sufficient.	Figures 2.5 to 2.8 Section 4.5.2 Amphibians, page 31, last three bullet points GWS 4.5.2	The difference in bathymetry between minimum surveyed elevations and minimum modelled elevations is unlikely to have a significant effect on the overall conclusions and comparison of pre and post hydroperiods presented in Table 10.5. This is because the pre-development analysis was conducted with the same overall wetland basin geometry, substrate hydraulic conductivity and ET rates as for the post development analysis. Therefore, although the simulated number of pre development years that the wetlands have 10 cm of inundation over 10% of the surface area may be different with a better match to surveyed wetland geometry, the % change between pre and post development will be similar because the overall geometry, properties and processes are the same. The geometry of each wetland is unique and modeled as such. It does not necessarily follow that 10% inundation with a minimum depth of 10 cm occurs with 10 cm of water above the minimum elevation stated in Table 10.1. For example, 10 cm of inundation over the minimum elevation stated may only occupy 1% of the wetland area. In order to inundate a larger area, the water level must be higher as reflected in the threshold values in the right-hand column of Table 10.1	The bathymetry of wetlands P7A and P7B have limited elevation data to define the surface of these wetlands as per Item #5 above. It is not clear how the elevations in the right-hand column in Table 10.1 provides an accurate representation of 10% inundation area for these wetlands when there are no more than two elevation points to define the geometry of these wetland surfaces. Similarly, in wetland P5, the available surface elevations are clustered in a relatively small area of this wetland along the southern boundary of the wetland within the subject property and do not provide a characterization of the entire wetland. It is not clear how the elevations in the right-hand column of Table 10.1 were determined. Per the discussions during the January 16-17, 2020 meetings: In addition to the point-based water levels' monitoring, wetland-by-wetland site reconnaissance including photographic records, are to be included in the ecological monitoring plan to ascertain sufficient inundation during critical periods for amphibians, and to observe vegetation-conditions long-term. The supplemental-monitoring tasks are to be built into the IG. Please provide additional information in the IG.	Addressed in the revised Implementation Guide (August 2020). The IG has been updated to include the precentage areas covered by the MWLTS – See Table 1, Section 1.4.1.
33.	The modelled impact analysis was based upon operational assumptions. This included a maximum annual excavation of 350,535 tonnes of bedrock material. Drawing 2 of 5 Operational Plan, note 1.2.27 indicates that the maximum annual tonnage limit to be shipped from the property is 990,000 tonnes. Harden notes that 'Although the potential shipping tonnage is 990,000 tonnes per year, the anticipated rate of extraction from below the water table will more likely be between 350,000 and 500,000 tonnes per year. The rate of extraction will ultimately depend on observed water level conditions in the ponds and in the nearby wetlands.' (Harden, 2018, Section 6.0, Level 2 Hydrogeological Assessment, page 30). The Operational Plan, page 2 of 5 provides no mention of the modelled extraction rate upon which the impact assessment was based. Extraction rates other than that used in the impact assessment should not be approved without a corresponding impact analysis of the requested extraction rate of	Section 6.0, Level 2 Hydrogeological Assessment, page 30	There is no intention of extracting 990,000tonnes/year from the site. The 990,000 tonnes per year is the sum of all shipped materials regardless of the origin of the materials or the year the materials were stockpiled. See response to Comment #27.	It is clear that the annual tonnage shipped will not necessarily be equivalent to the annual tonnage of material excavated. The maximum limit of excavated tonnage should be fixed to that used in the impact analysis and should not exceed this limit according to annual weather conditions, as suggested in the JDCL response to Item # 27 in this table. The tonnage-related specifics provided in the JDCL's response should be incorporated into the IG and Site Plan notes, including the maximum limit of	Addressed in the revised Implementation Guide (August 2020). See section 1.2.4 of the IG. We are in the process of updating the Site Plans.

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	990,000 tonnes /yr and should be accompanied with a comprehensive water monitoring and management strategy.			sustainable extraction identified by the model. Please provide additional information in the IG, and indicate revisions on the updated Site Plan, as applicable.	
34.	Table 11.1 from Earthfx, 2018, shows extraction ratios for the major ponds including the equivalent total water demand in m^3/yr. This includes rock excavation as well as water pumping to buffer ponds and dispersion trenches from South Pond (new) Phase 1, Central and West Ponds (Phase 2 & 4) and East Pond (Phase 3 & 5). Also included is the estimated amount of water pumped for dust control. Missing is the estimated amount of aggregate washing water. Harden estimates a potential consumption of 75,000 L/day for aggregate washing that is estimated to occur for 200 days per year. Table 11.1 includes all of the major extraction Phases. Extraction Phase 4 and 5 represent extraction in areas previously filled during extraction Phase 2 and 3 respectively to accommodate aggregate processing and storage facilities. It is not clear that this approach accurately reflects the proposed sequence of extraction. Nor is it clear that the actual impacts of the specific phase of extraction will result in the predicted impacts. For example, it is not clear whether the extraction phases will be completed sequentially rather than simultaneously. Splitting up the expected annual aggregate extraction over three phases rather than concentrating the extraction in one area, is expected to have significantly different local impacts on groundwater and surface water levels. For example, impact of extraction of Phase 1 which, at the beginning, would have limited benefit of pond water storage that is available for Phase 2 and 3. The existing West, Central, and East ponds will have the benefit of stored pond water to buffer the impacts on surface water and groundwater levels. Without the buffering effect of pond water storage, draw downs in adjacent areas could be higher than in situations where there is a relatively large reservoir of surface water to offset the removal of rock water equivalent. It should be confirmed that the integrated surface water and groundwater model reflects the proposed operational phases for purposes of quantifying potential impacts on the surface water and ground water system of the subject property and adjacent areas.	Section 6.3.1, Water Taking For Aggregate Processing, page 35	Table 11.2 of Earthfx report is mislabeled - the Dust control column includes the aggregate washing operations and associated losses. The integrated model was configured such that buffering capacity is supplemented by all of the ponds where necessary. Section 11.2 of the Earthfx report states: "In developing this general extraction framework plan, it was assumed that rock extraction and pumping from the four ponds are equivalent (interchangeable), because the ponds will be either hydraulically connected or it will be possible to move water from one pond to another." In other words, as rock is removed from one pond, water can be supplied from the others to offset the effects. Please consider the following example with extraction occurring in the Phase 1 pond. Table 11.1 indicates that the total yearly volume of water and rock-water equivalent extracted was 333,679m^3/y, 139,239m^3 of which was rock-water equivalent and 194,440 m^3 was for buffer ponds, dispersion trenches and dust/plant operations. Table 11.2 indicates that the Phase 1 pond is relied upon for providing a volume of 66,736, much less than the 139,239m^3 described above. However, the East and the Central/West ponds together are capable of supplying a total of 266,944m^3, a surplus of 72,504m^3 over the 194,440 m^3 required for the other site features. This surplus would then be added into the Phase 1 pond allowing the extraction rate of 139,239 m^3 with no additional drawdown because the net rock-water extraction does not exceed	The underlying assumption of hydraulic connectivity of the various on-site ponds is not unreasonable for the large existing West Pond (P1), Central Pond (P6), and East Pond (P11). However, Pond P3, Phase 1 of the extraction sequence, is to be significantly enlarged and is located somewhat remote from the three large existing ponds. The assumption is therefore not applicable to the site as a whole. As indicated water can be pumped between ponds to approximate the underlying aggregate extraction rates upon which the groundwater/surface water model is based. This enters a level of complexity of extraction operations that the model may not necessarily reflect. The differences between the modelled extraction scenario and efforts to operationally mimic the modelled extraction rate provides some uncertainty with respect to site specific predictions of impact from a groundwater level perspective. As stated, the 'ultimate extraction rates will be governed by the trigger levels and the ability of the natural environment to sustain the extraction rate.' The mechanism for controlling the extraction rate in response to monitoring data collected on an ongoing basis is not well documented or spelled out in detail. If the warning and trigger levels are to be meaningful, a mechanism for ensuring that the appropriate water levels are maintained within the wetlands, within the proposed mitigation facilities (Buffer ponds and Dispersion trenches), and within the excavated ponds West Pond, Central Pond, and East Pond is required. This will require detailed training of operational staff and diligence in obtaining and responding to changes in on-site trigger and warning levels for both	Addressed in the revised Implementation Guide (August 2020). Each of the wetlands will have a cellular telephone system based monitoring device. The data will be reviewed on a regular basis to determine if warning levels are being breached and if contingencies need to be invoked. See section 6.5 of the IG for the Response Action Framework.

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			66,736m³. The same logic could be applied to the other ponds. With Phase 1 being completed first, the reviewer is correct in stating that without the buffering effect of pond water storage, drawdowns will be larger. To counter that point, however, less water from the other ponds will be required to offset the drawdowns because volume of the excavation will initially be small. As the size of the excavation grows, so does its buffering capacity. Regardless of the size of the ponds, the simulation confirmed that there is sufficient water to offset the extraction volume. We acknowledge that the model does not account for the temporary loss of storage in the East pond during construction of the processing area. This will likely reduce the ability of the east pond to buffer itself against extraction and supplementation driven drawdowns, particularly during Phase 2-4. All other extraction rates from Earthfx Table 11.1 being equal, this would reduce the ultimate extraction rate, however, it may be possible to achieve higher rock or rock water equivalent extraction rates from the other ponds and during wetter periods. In the same respect, the model does not credit the excess water available during the filling of the East Pond. Nevertheless, the ultimate extraction rate will be governed by the trigger levels and the ability of the natural environment to sustain the extraction rate. As noted, the model was used to demonstrate that there is sufficient water and buffering available to support the proposed extraction rates and wetland supplementation strategy across a range of seasonal and inter-annual variation in climate. The extraction rate proposed in Earthfx report does not necessarily reflect the maximum achievable rate. Ultimately extraction rates will be dictated by monitoring and the effectiveness of the mitigation measures.	water levels and water quality. Clarification is required. A response action framework is required (as identified under Item # 25 in this table).	

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35.	The computer model simulations of operations cover a 15-year time span with climatic data taken for the years 2003 to 2017. Model simulated drawdowns in the West Pond P1, Central Pond P6, East Pond P11 and Phase 1 area predicted that water level drawdowns of less than 1.0 m would occur in all ponds during operations. The model simulations are based upon operational conditions summarized in Table 11.2. The total annual rock extraction rate is 139,239.4 m3/yr. of rock extraction water equivalent. This is equivalent to 350,535 tonnes/yr of rock extracted. It is not clear why the modelling did not consider the impacts of the upper range of extraction of 500,000 tonnes/yr stated by Harden, or the 990,000 tonnes /yr representing the maximum extraction rate requested. The extraction of rock is spread out over several months from April through November of each year. Earthfx concluded that there is sufficient water on-site to support the sensitive wetland features during aggregate operations. The modelling analysis did not take into consideration reasonable seasonal variations in extraction rates over any given year. Groundwater recharge/discharge conditions and surface water through flow conditions for water level simulations within the wetlands are not stated. Harden reports both vertically upward and downward hydraulic gradients within the property. It is therefore uncertain whether this has been taken into account and the proposed pumping scenarios will result in the desired water levels in adjacent wetlands.	Table 4.3, page 20	The modelled extraction (rock water equivalent) is specified as $894.4m^3/s$ for April and May, $804.9m^3/d$ for June – Sept, and $715.3m^3/d$ for October and November. Earthfx acknowledges that the maximum extraction rate may change based on seasonal and inter-annual availability of water and corresponding monitoring levels. Earthfx elected to take a conservative approach and evaluate specific extraction rates that are expected to be achievable across a range in 15 years of real climate conditions. See also response to Comment #27. Regarding the second part of the comment, wetlands are fully represented in GSFLOW as lakes. The model simulates a complete water balance for each wetland on a daily basis which includes, seepage into and out of the lake (i.e., gradient driven interaction with the underlying aquifer), precipitation, evapotranspiration, surface runoff, and supplemental pumping of water into the wetland. Vertical gradients develop between the lake stage and the aquifer – these can be upward or downward depending on difference between the simulated groundwater level and the simulated lake stage. We do not specify any of these gradients or quantities. The integrated model handles every aspect of the wetland/aquifer interaction. Loss (or gain) across the bottom of the wetlands, is controlled by the gradient between the wetland stage and the head in the underlying aquifer, the K of the underlying aquifer, the thickness of the wetland “bed”, and the K of that bed. The “bed” refers to a virtual layer of material separating the open water within the wetland from the aquifer. The assumption is based on the likelihood that the bottom of the wetland contains lower permeability muck-type material.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
36.	Proposed mitigation for the maintenance of wetland water levels is by pumping from the existing ponds into buffer pond 1 and 2 and into dispersion trenches 1 and 2 through a triggering mechanism. Warning and triggering water levels are to be monitored at selected locations.	Section 8.0	The proposed works consisting of pumps and berms is conventional construction practice. The construction of the proposed buffer ponds and dispersion	An implementation process for mitigation and contingency measures need to be established and documented, and incorporated into the site plans and IG as	Addressed in the revised Implementation Guide (August 2020).

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	This approach has not been proven effective nor is there an approach proposed to verify its effectiveness prior to extraction initiation.		trenches will not impact the wetlands as works remain out of the wetlands. The efficacy of the works will be determined by water levels obtained in the wetlands and appropriate mitigation is proposed should trigger levels be breached. See also the response to Comment 6 regarding effectiveness of mitigation.	part of the site operations (refer to Item #25 in this table, “response action framework”). Please provide additional information in the IG, and indicate revisions on the updated Site Plan, as applicable.	The on-site protocol for identifying issues is found in Section 6.5 of the IG. Contingency measures are also detailed in Section Section 6.5 and Section 3.4.
37.	The proposed measures assume that the pumped water will be distributed throughout the wetlands. The analysis does not consider the possibility of disproportionate distribution of the pumped water due to the underlying pervious materials. Even though the wetlands are generally underlain by organic soil, the thickness, lateral extent and continuity have not been verified. Without proof to the contrary, it is possible that the underlying highly permeable sand and gravels and /or fractured bedrock may restrict the distribution of the pumped water to a limited area around the point of discharge from the buffer ponds and trenches. The implications of this have not been addressed. Operational contingency measures have been proposed in the Harden report. There is no demonstration that the proposed mitigation measures will be effective, nor is there a clearly defined implementation process for the recommended contingency plan.	Page 62 first paragraph	See Comment 6 for a description of the demonstration of proof of concept undertaken at the site this fall. The introduction of even small quantities of water was observed up to 30m away from the introduction point.	See item # 6 response in this table. Per the discussions during the January 16-17, 2020 meetings, in addition to the proposed BPs and DTs, direct supplementation may be required to alleviate any observable impacts on wetlands. The efficacy of the mitigation and any contingencies are to be verified by means of a complete and integrated (groundwater, surface water, ecology) monitoring program (refer to Items # 2 and 32 in this table).	Addressed in the revised Implementation Guide (August 2020). We have added the provision of direct supplementation in Section 3.4 of the IG and discuss the potential of backflow to the Central Pond in Section 3.4 of the IG. Proposed water distribution system for rapid response is shown on Figure 6. The monitoring program has been updated and is outlined in the IG Sections 4.0, 5.0 and 6.0.
38.	Earthfx recognizes that ‘The model is, however, a simplification of the real world and should be considered an approximation of the system behavior and response.’ Given the relatively flat topography of the site and the on-site wetlands, a small variation in water level elevation may result in a significant difference in the degree and extent of saturation of the wetland areas. Given that the modelling results represent an approximation of site conditions, actual site conditions in terms of wetland inundation may vary significantly from the predicted inundation thresholds. There is very limited data of the wetland ground surface for wetlands P7A and P7B upon which the minimum bed elevation and 10% Inundation Threshold of Table 10.1 are determined. No mechanism is provided for an adjustment to the monitoring and mitigation program should the water levels within the wetlands and ponds not respond as predicted.	Page 51, Section 8.3 Calibration Conclusions, Earthfx 2018	Section 8.0 lists several contingencies that can used to address deficiencies in the mitigation program. Moreover, at this site because only minor long-term changes are anticipated, following the suspension of below-water-table extractive activities and relatively brief recovery period for the main ponds, pre-extractive conditions will be achieved. This allows environmental conditions during the operations to dictate how much and when extraction can occur with only temporary (if any) impact.	The operational modifications to address environmental impacts to adjacent areas appear reasonable. They do not however consider the possibility of alteration of lateral groundwater flow between the West Pond and Kilbride Creek. Given the relatively short distance between the western limit of extraction in the West Pond and Kilbride Creek (especially after Phase 4 is extracted) there is potential for permanent alteration of the groundwater flow path due to blasting activities especially if the intervening material between Kilbride Creek and the West Pond includes bedrock. There is currently insufficient subsurface information within this area to confirm the presence or absence of bedrock within the intervening materials. This concern may also apply to the area between the northwestern limit of the Phase 1 extraction area and Kilbride Creek. See associated comments for Items # 3,10,13,18, 21, and 28. Per the January 16-17, 2020 meetings (and as noted in Item #9 of this table), the IG is to include an approach to monitoring	Addressed in the revised Implementation Guide (August 2020). Please see response to Comment #3.

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				key seeps west of the West Pond and within the Kilbride Creek. Please provide additional information in the IG.	
39.	The monthly water elevation minimums for Buffer Pond 1 (BP1) shown in Table 8.1 correspond to minimum measured water levels at SG2 with the exception of March and May minimum water levels. The minimum March water level on Table 8.1 should be 291.02 metres above sea level (masl) measured in March 2018 instead of 291.14 masl on Table 8.1 (from Table 2.3, of the Harden report). The May minimum water level should be 291.24 masl measured May 18, 2017 instead of 291.14 masl on Table 8.1. (from Table 2.3 of the Harden report). These are also noted as typographical errors in the row below. These levels should be confirmed and corrections made to the Monitoring and Mitigation Notes, page 3 of 5 of the site plans.	Tables 2.3 and 8.1 Monitoring and Mitigation Notes, page 3 of 5 of the site plans	JDCL concurs.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
40.	It is not clear why the Trigger Level in the Eastern Wetland Complex for operational modifications 'was calculated as the lowest recorded water level elevation in WP9 (290.51 m AMSL) minus the predicted 0.3 metre water level change occurring during active extraction.' (Harden 2018, Section 8.1.3, page 54, 1st paragraph, 4th line). This suggests that the wetland can tolerate the predicted 0.3 metre drawdown without adverse impacts in addition to the lowest water level under driest conditions. This requires clarification and/or justification. This is a particular example of a proposed measure not included in the Natural Environment Review Report. A detailed assessment of the data collected related to the lowering of the water table and the impact on the wetland features, plant species, and wildlife species present in this area should be undertaken and provided.	Section 8.1.3, page 54, 1st paragraph, 4th line	See Response to Comment #67 in Natural Heritage Section.	See Natural Environment Comment Response #67.	Resolved
41.	It is assumed that the maintenance of the recommended minimum water levels in BP1 will maintain minimum water levels within wetlands P7A, P7B, P10, P9, P8, and P14. Questions remain regarding the effectiveness of the proposed mitigation measures of pumping into buffer ponds and discharging to wetlands. Those wetland ponds located farthest from the point of discharge of pumped water are at greatest risk of not benefiting significantly from the proposed discharge of pumped water from the buffer ponds. Harden has suggested 'Direct pumping into wetlands may occur with approval of MNRF and Halton Conservation'. This alternative has been proposed without full analysis or consultation with Conservation Halton (CH). The suite of backup options needs to be appropriately considered, and the contingency plans proposed be incorporated into the site plans drawing notes as part of the site plan operations (along with plans for obtaining whatever additional permissions may be required).	Section 8.1.2, Active Actions, page 51, footnote	There is a surface water channel between the Central Pond and Ponds 7A/B that is up to a metre deep (below the water level). This channel extends into both of the wetlands from the Central Pond and by maintaining water levels in the channel via connection to BP1, water levels in Ponds 7A/B will be also maintained. The wetlands farthest from mitigation are also farthest from potential impact. Once licensed the *Conservation Authorities Act* is not operable on the site and only approval from MNRF would be required.	Does this not require a Permit to Take Water and Approval from the MECP if additional pumping is required? PTTW requirements should be identified on the Site Plan. As noted in Item #6 of this table re. classification, consolidation and integration of Water Management System (WMS) components with mitigation/contingency functions and monitoring program, as may be required for the MECP's permits (PTTW and ECA) and the need to incorporate the integrated figures in the Site Plan and the IG.	Addressed in the revised Implementation Guide (August 2020). A PTTW will be required for this site. Any potential additional pumping will be accommodated within the PTTW and ECA. No additional sources listed on the PTTW will be necessary should rapid response be necessary. See Section 3.5 of the IG.

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				Please provide additional information in the IG, and indicate revisions on the updated Site Plan, as applicable.	
42.	Harden has recommended a Contingency Plan in the event that minimum water level elevations are not maintained at the specified monitoring locations. These include the following: a) Modifying the rate of below water-table extraction on a seasonal basis, b) Mining in a different Phase, c) Match extraction rate to pond-filling rate (Phase 1 and 5), d) Relocation of pumping, e) Internal water exchange between Phases, f) Increase pumping rates to Protection Areas The above contingency measures may have the potential to address the issue of water level maintenance within the wetlands. This is contingent, to a large extent, on monitoring water level changes within the ponds created throughout the various phases of excavation and water levels within wetlands. It is not clear how the above mitigation measures will be triggered and implemented. There are no provisions for adaptive management in the event that measures are found to be not as effective as anticipated. The proposed monitoring is inadequate to ensuring that a robust monitoring network would be present to address these items both during extraction and post-closure.	Section 11.1 Recommended Site Plan Notes, page 61	The contingencies are triggered by constraints provided in Tables 3, 4, 5, 6 and 7 which detail minimum acceptable threshold water levels for wetlands, buffer ponds, the Kilbride Tributary and future monitor CB12. The ultimate safety response is suspension of extraction below the water table where after water levels will return to pre-development conditions.	As noted in items # 3, 10, 13, and 38, in this table, the potential for permanent alteration of the lateral groundwater flow between the West Pond and Kilbride Creek has not been considered. There is insufficient subsurface information within the area between Kilbride Creek and the West Pond to rule out this possibility. There is also insufficient monitoring surface water and groundwater proposed within this area to identify impacts on Kilbride Creek. See Item# 2 above. Per the January 16-17, 2020 meetings, the IG is to include rapid-response contingencies (e.g., direct pumping into the natural feature, to address unanticipated effects promptly). Additional groundwater monitors are recommended in the IG. See associated comments in Items # 3, 10, 13, 18, 21, 28, and 38.	Resolved
43.	An annual monitoring report should be produced, as noted on page 59 and Site Plan 3 of 5; however, the content should be established in consultation with review agencies after all technical comments are addressed.	Section 11.1 (3)	JDCL concurs with this comment.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
44.	The monitoring program proposed is summarized in Table 9.1 page 57, Harden 2018. This has been included in the site plan notes as recommended by Harden. The recommended monitoring program is lacking monitoring stations that reflect water levels within the three main ponds over the period of time during which extraction will occur. For example, SG1 at the edge of East Pond P11, is located within an area that is to be filled for the construction of the aggregate processing facilities. This area is Phase 5 of the excavation sequence. SG1 will be of little value in monitoring water levels in the East Pond during Phase 3 excavations as it is located in an area to be filled. SG2 located at the eastern edge of Central Pond P6, has not been included in the monitoring program and there are no other surface water monitoring stations that will record the water level in Central Pond P6 during the various phases of excavation. No surface water monitoring stations are recommended for West Pond P1 during various stages of excavation.	Table 9.1 page 57	Surface water stations for the main ponds may need to be re-located and surveyed to the geodetic benchmark. See Comment 26 with respect to the adequacy of the wetland monitoring locations.	Surface water monitoring locations should be identified and located prior to approval and should provide baseline data against which future water levels are compared. These should be identified in the IG and on the Site Plan. Changes have been proposed to the monitoring program within the IG. Additional monitoring issues are identified in Item # 2, above. Please provide additional information in the IG, and indicate revisions on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). All surface water stations in the main ponds have been added and are being monitored. These are identified as SG1 (East Pond), SG2 (Central Pond) and SG4(West Pond). See Sections 4.2.1.5, Table 10, Table 12, and Table 17 in the IG.

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	The adequacy of the recommended monitoring locations within the wetlands is questionable.				
45.	No water quality monitoring is recommended by Harden for the ponds to be excavated (West Pond P1, Central Pond P6, East Pond P11, and P3). There is no provision for monitoring turbidity within the excavated ponds as well as discharges into and out of the buffer ponds and dispersion trenches as well as down gradient monitors and receiving wetland ponds and Kilbride Creek. Turbidity of the receiving water bodies such as Kilbride Creek and the unnamed tributary of Sixteen Mile Creek has not been addressed from a monitoring or mitigation standpoint.	Section 9.0 and 11.0	There is a very brief period of time after the blast that the water is turbid. Photos taken within four hours of the blast at Guelph Limestone quarry show clear water. Blasting is not designed to produce silt and clay sized particles and according to the Blaster's Handbook, none are created. Turbidity in the ponds cannot be transmitted to Kilbride Creek even through fractures as there is no bedrock outcropping in Kilbride Creek and any fine-grained material, although unlikely to be transported via fractures, will be filtered out before reaching the creek bed. Only low-turbidity water will be discharged to the buffer ponds and dispersion trenches. See also response to Comment 18.	It is agreed that turbidity resulting from blasting activities will likely be temporary and localized. Excavation activities from the proposed backhoe and/or dragline operations is of greatest concern with respect to resulting in high levels of turbidity within the existing ponds. The conclusion that fine grained material will be filtered out before reaching Kilbride Creek appears to be based upon speculation rather than evidence. No evidence has been presented to support the conclusion that any fine grained material will be filtered out before reaching Kilbride Creek. There is a lack of subsurface information in the area between the West Pond and Kilbride Creek to confirm the presence or absence of bedrock materials separating the West Pond from Kilbride Creek. It is noted that the West Lake Piezometer and WP7 are located between the West Pond and Kilbride Creek. They are 0.95m and 0.64m deep respectively, which suggests overburden materials of this thickness, although there is no description provided for the materials encountered in the completion and installation of these monitors. Given the irregular bedrock surface noted on the property, this does not preclude a bedrock pathway for groundwater movement between the West Pond and Kilbride Creek. Turbidity should be included in water quality monitoring in both the overburden and bedrock in the area between West Ponds and Kilbride Creek. This should include the West Lake Piezometer and/or WP7 and groundwater seepages between the West Pond and Kilbride Creek. Groundwater and surface water temperature monitoring should also be considered within this area. See also related comments in Items # 3, 10, 13, 18, 21, 28, and 38.	Addressed in the revised Implementation Guide (August 2020). A detailed turbidity monitoring program during the initial stages of extraction in Phase 1 and 2 has been added. See Section 4.2.1.8 of the IG.

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46.	Above surface water monitoring deficiencies and omissions prevent verification of the predicted impacts of the proposed aggregate excavations on surface water levels and surface water quality.	Section 9.0 and 11.0	Table 8.1 clearly identifies which monitors will be used to verify water level conditions between the site and Kilbride Creek. It is our opinion that off-site water quality sampling is not necessary as no water quality changes are anticipated. In response to water quality concerns, JDCL will obtain an annual water sample following the last blasting event of the year will be obtained from the active extraction area. The water quality parameters will include, anions, metals, pH, conductivity, turbidity, TSS, Total Petroleum Hydrocarbons, nutrients (nitrate, nitrite, TKN, ammonia).	Surface water quality monitoring has been added to include SG9 and SG10A in the May IG (Section 4.5.3.2 pages 22-23). Turbidity monitoring has been included for these monitoring stations. SG9 is located near the upgradient edge of the property. This may potentially be impacted but may also represent baseline conditions. SG21 located directly opposite the West Pond should be added to serve as a potentially impacted location. Baseline water quality is lacking for the existing West Pond (P1), Central Pond (P6), and East Pond (P11). Water quality including temperature should be monitored within these ponds during extraction. The IG includes water quality sampling in the West, Central, and East Ponds during extraction. Water quality sampling within these ponds and within BP1, BP2, DT1, and DT2 is considered Incomplete. See related comments in Item # 2 above.	Addressed in the revised Implementation Guide (August 2020). We have added KC1, KC2 as permanent monitoring locations within Kilbride Creek. A detailed seepage monitoring program is detailed in Section 4.2.1.8 of the IG. Water temperature monitoring in the main ponds is being undertaken with data loggers. Water quality in the main ponds both baseline and during extraction is included in the IG see Table 10, Table 12 and Table 17. A minimum of four surface water samples (seasonally distributed) will be obtained prior to below-water-table extraction. The water transferred from the main ponds to BP1, BP2, DS1, DS2 and DS3 will be inspected daily and will have turbidity measurements obtained weekly as stipulated in Section 4.2.1.8 of the IG.
47.	The recommended wetland monitors adjacent to the three main ponds will be influenced by the proposed dispersion trenches and buffer ponds. These water levels are not considered to be representative of the water levels within the ponds themselves during active excavation. These wetland monitors may be useful in measuring the local effect of the mitigation measures and/or changes resulting from the proposed aggregate operations. They will be of little use in monitoring the drawdown impacts of aggregate extraction on the three main ponds.	Section 9.0 and 11.0	As discussed in response to Comment 44, existing surface water stations in the main ponds may need to be re-established to geodetic datum if they are moved to accommodate extractive activities.	See Item # 44 in this table.	Agree. Stations SG1, SG2 and SG4 have been established and leveled relative to a geodetic datum. See also Response #44.
48.	The recommended annual monitoring report does not provide sufficient guidance for documenting the implementation of contingency measures and the resulting changes in wetland water levels or water quality impacts. If impacts have been observed such that warning and trigger levels have been reached, there is little guidance provided in the Harden report for implementation of various possible contingency measures. A contingency measure protocol should be developed and integrated into the monitoring plan and ongoing monitoring results rather than waiting for an annual report to take actions. Also missing is a clearly defined mechanism or procedures as well as the appropriate level of documentation required for implementing mitigation measures and/or contingency plans.	Section 9.0 and 11.0	Contingency and mitigative measures will be invoked should a threshold water level be breached. As recommended in Comment 25, there will be several monitoring stations reporting via a cellular network. This will be checked on a daily basis and response initiated if necessary.	A protocol designating reporting requirements, responsible parties, and specific actions requires more detailed documentation as part of the site plan. An implementation document (i.e., the IG) should be completed and become part of the Site Plan (refer to Item # 25, “response action framework”. As noted during the January 17, 2020 meeting, the annual report to MNRF, MECP, CH, HR, and Milton (per JDCL’s November 2019 Guide) should include, but not be limited to, the components provided in the “draft implementation-related document listing”.	Addressed in the revised Implementation Guide (August 2020). See Section 6.5 and Section 8.0 of the updated IG. The Site Plans are currently being updated and will be provided to JART.

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				Please provide additional information in the IG, and indicate revisions on the updated Site Plan, as applicable.	
49.	Flooding is mentioned along the north side of Hwy. 401. Has the source been confirmed? Will discharges to creeks flowing in this direction continue unaltered to assist with assimilative capacity?	General comment	There is no discharge to creeks and permission to discharge water off-site is not being sought. The flooding north of Hwy 401 is sourced from the KOA Tributary flowing southward from Sideroad 10. The MTO is presently (August 2019) conducting works to prevent road bed deterioration from flood water levels and the Town of Milton has replaced the blocked culvert causing the flooding at Reid Sideroad.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
50.	A door to door private well survey would improve the dataset. On page 41 it is predicted that there will be quantity impacts on two dug wells on Twiss Road. A well inspection and monitoring is recommended. However, a conclusion is drawn (page 57) that there will be no impacts on private wells. This conclusion is unlikely given the previous statements.	General comment	The predicted drawdown at the nearest dug well is less than 0.3 metres. It is our opinion that this is not likely to impact on the functioning of the well and this will be confirmed through the well survey. The following condition is on the site plan: A door-to-door well survey for the wells shown on Figure 3 of Harden Environmental Services Ltd. Correspondence to the Ministry of the Environment Conservation and Parks (December 7, 2018) will be conducted prior to any extractive operations. Water quality samples will be obtained from the wells. The water samples will be analyzed for the following parameters: general chemistry (pH, conductivity, anions), metals, nutrients, microbiology and BTEX. The well survey and water quality sampling is subject to landowner permission and is access dependent.	The applicant response has provided clarification regarding the original JART comment; JART recommends that turbidity be added to the water quality sampling during the well survey for a more complete baseline characterization. It is recommended that turbidity be added to the water quality sampling during the well survey for a more complete baseline characterization. As discussed during the January 16-17, 2020 meetings and per the “draft implementation-related document listing” discussed during the January 17, 2020 meeting: • Turbidity monitoring should be part of the long-term water quality monitoring plan and is to be included in an addendum to the hydrogeological assessment, the IG, and the Site Plan. • See Item #2 above. • The private water supply protection and mitigation strategy should be inclusive of: water supply monitoring and early warning response strategy; communication protocols & water supply interference procedures, and augmentation plans. The IG February 2020 shows the extent of the proposed well survey. The area southwest of the site is identified as down	Addressed in the revised Implementation Guide (August 2020). Turbidity is included baseline water well survey. Turbidity is included in all water quality analysis. See sections 4.2.1.6 , 4.2.1.7, and 4.2.1.8. The extent of baseline water well survey has been expanded to include wells potentially downgradient of the site on 1st Line Nassagaweya, Campbellville Road and Guelph Junction Road as shown on Figure 5 and Table 13 of the IG.

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				gradient from a groundwater perspective (Harden, 2018, Figure 4.8). It is considered an omission to not include this area within the well survey area. This includes the area in and around First Line Nassagaweya. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	
51.	Mitigation using buffer ponds and trenches is proposed and more specific detail is required to understand the impacts of the water source used, the pumping periods and rates, and the impacts on the source pond water levels and surrounding wetlands.	General comment	The East and Central ponds will be the main sources of water and through the integrated surface water/groundwater model it is shown that extraction can occur and water levels can be maintained to the wetlands within ecological constraints recommended by the natural heritage specialists. This is all subject to verification monitoring. Upon cessation of water taking or aggregate extraction, the water levels will return to pre-extraction conditions.	Additional information is required to address the original JART comment, as discussed during the January 2020 meetings and as noted below: It is indicated that 'Pumps will be located in clear water locations separated from areas where turbidity may be generated by mining or blasting activities to minimize turbidity being discharged to wetland features.' (Environmental and Water Management Operational Guide, Section 3.4, pg. 18.) There is no provision for monitoring the turbidity of the source water for ensuring that the discharge of water into the buffer ponds and dispersions trenches does not have high levels of turbidity. The water quality of the buffer ponds and dispersion trenches should also be monitored for turbidity to ensure that high turbidity water is not discharged into the wetland ponds or to the groundwater system within the wetlands. See response to Items # 2, 3, 6, 10, and 50 in this table with respect to water levels returning to pre-extraction levels. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). The pumps are designed to be off-line from the ponds with filtration system between the pond and the pump. There wil be monitoring of turbidity as stipulated in Section 4.2.1.8 of the IG.
52.	Additional information is needed to demonstrate that the proposed mitigation measures will be effective. Verification testing of the ponds and trenches, with appropriate groundwater and surface water monitoring stations, should be required prior to extraction as they must	General comment	Verification of the effectiveness of the proposed mitigation works was undertaken in the field this fall. See response to Comment 6.	Additional information is required to address the original JART comment, as discussed during the January 2020 meeting, and as noted below:	Addressed in the revised Implementation Guide (August 2020) and Hydrogeology Addendum Section 6.5.1

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	be shown to work as designed and not just circulate pumped water back to the source pond.			Although it was shown that dispersion trenches can influence water levels in P5, the same test showed a response in water levels in well CB7D, which has a top of the screened interval at about 24 metres depth. This suggests that there is a good connection between the wetland and the underlying bedrock aquifer. See Item # 69 in this table. Also, extracting the rock in the area adjacent to P5 can increase the wetland water losses and blasting close to P5 can increase the hydraulic conductivities in the P5 underlying bedrock aquifer (halo effect), again, increasing P5 water losses. This may require changes to the water handling on site and should be investigated prior to extraction. We recommend that using the numerical model, a sensitivity analysis is completed and contingency measures provided in IG. See Item # 6 in this table. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, and the IG, and indicate revisions on the updated Site Plan, as applicable.	Although we do not arrive at the same conclusion that the short test in P5 resulted in a water level change in CB7D, we concur that the potential for greater return flow to the Central Pond should be addressed. We have included Section 3.4 in the IG to address this concern. The halo effect from blasting is very limited and expert opinion on this matter is that the halo extends 20 borehole diameters from the blast hole. Given that the blast hole will have a diameter of 75mm, the extent of the halo effect will be 1.5 metres.
53.	Although impacts on private well water quality are not expected (page 42, s.7.1.2), there is no discussion on the possible ecological receptors and potential negative impacts. Please discuss.	General comment	Turbid water will not be introduced to the wetlands at any time and turbid water will not discharge to Kilbride Creek or its tributary. The water quality in the extraction area is not expected to be harmful to ecological receptors.	Additional information is required to address the original JART comment, as discussed during the January 2020 meeting, and as noted below: Water quality monitoring for turbidity within the pumped water has not been recommended. This should be included in the monitoring program to ensure turbid water will not be discharged to Kilbride Creek, its tributary or the wetlands. See related comments in Items #2 and 50 in this table. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). Turbidity monitoring at each Transfer Pumping Station will occur as stipulated in Section 4.2.1.8 of the IG.
54.	Contrary to Section 3.9, the site is at least partially within a significant groundwater recharge area and a highly vulnerable aquifer as reported	General comment	A septic system will be installed near the shop for washrooms to be used by	Additional information is required to address the original JART comment, as	Addressed in the revised Implementation Guide (August 2020).

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	page 42, Section 7.1.3). However, there is no discussion on the implications of this and possible negative impacts on the quantity or quality of the drinking water source based on proposed site activities. For example, it is proposed that used asphalt will be stockpiled on site and fuel will be stored in various locations. It would be helpful to understand better the quantity of fuel on-site, the exact locations and proximity to water and wetlands, and the measures in place to prevent negative impacts. Furthermore, what sewage system(s) will be used on-site?		employees. This will be designed to satisfy the Ontario Building Code. A June 17, 2019 letter sent to the MNRF regarding fuel storage and recycling is found in Appendix B.	discussed during the January 2020 meeting, and as noted below: Proposed new monitor CB14 has been recommended for installation down gradient of the proposed recycling area only if recycling is to occur (Environmental and Water Management Operational Guide, Section 4.2, pg. 19). Details are lacking regarding the level and type of monitoring to occur at this monitor should it be installed. Per the January 17, 2020 meeting, testing of CB14 for PAH is to be built into the monitoring plan if asphalt is to be used as part of the planned on-site aggregate-recycling. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	The water quality monitoring of proposed monitor CB14 is detailed in Section 4.2.1.6 and summarized in Table 12. PAH's are included in the parameter list for CB14.
55.	What would the impact be on the proposed quarry operations and mitigation measures if extreme weather events/conditions are experienced (e.g., more intense rain storms, warmer winter with more rain, more extreme temperatures in summer, more drought periods)? How will these changes impact surface water and groundwater levels, the need for additional mitigation measures, the water cycle (e.g., evaporation)? This evaluation should be documented in a monitoring, mitigation and contingency plan.	General comment	Any increase in precipitation rates or storm intensity will decrease the pumping into the buffer ponds or dispersion trenches. All of the wetlands have been observed to be dry except for the channel area in P7A/7B. With extreme dry conditions it is likely that extraction rates would decrease and pumping rates increase thereby keeping the wetland wetter than atmospheric conditions would otherwise allow. The only additional pond evaporation occurs from the proposed Phase 1 pond. The increase in evaporative losses is small relative to existing conditions and will have an unmeasurable effect off-site.	Minimum water level thresholds should be identified for the extraction ponds in the event of extreme dry conditions when an increase in pumping rates are addressed. Clarification is required. Per the January 16-17, 2020, meetings, rapid-response contingencies (i.e. direct pumping) may cause greater than anticipated drawdown at constructed ponds. • JDCL should demonstrate [through the IG] how the integrated WMS system would best facilitate meeting all environmental objectives, etc. Please provide additional information in the IG.	Addressed in the revised Implementation Guide (August 2020). We have recommended that the ponds not be lowered more than 2 metres below historical low water levels. However, at this level it is likely that environmental constraints will not be able to be met and contingency measures invoked, including cessation of below water table extraction. If rapid pumping is required, it is likely that below-water exctraction has ceased. See section 3.4 and 6.5 for a summary and explanation of the contingency measures.
56.	The surface and groundwater dataset for on-site water levels, temperatures, water quality is small (< 2 years) and there is no discussion as to what trends exist, seasonal variability, what would be expected due to year over year changes in weather, or discussion on how the monitored and modelled data compare with data normals for the area. Please note that Section 8.22.2 of the Earthfx report, page 50, last paragraph mentions lack of data making it difficult to fully	General comment	Warning and trigger water levels will be established immediately prior to below-water-table extraction to allow for the review of the largest dataset available. This will allow for the longest period of monitoring to establish water level and hydraulic gradient threshold values.	Limited data currently exists for setting warning and trigger levels. These levels may not be representative of longer term conditions. See item # 1 and 2 in this table.	Addressed in the revised Implementation Guide (August 2020). All warning and thresholds will be set prior to below water table extraction occurs, thereby allowing the longest

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	assess seasonal behaviour for wetlands P4 and P9. Also, water levels will change faster during rock extraction and data should be collected at all stations more frequently using dataloggers to establish baseline and to track operational influences. Following improvement of the dataset, it is suggested that these assessments be completed and the measured dataset placed in context for the site. Baseline conditions should be quantified, including creek levels, groundwater/surface water interactions, vertical and horizontal gradients, and natural variations for comparison with data collected during operation. Finally, using a larger more detailed dataset, the relevancy of the warning and trigger thresholds provided should be confirmed.			Warning levels, Trigger Levels, and Minimum Water Level Thresholds (MWLTs) need to take into account longest period of onsite water level data available prior to commencing operations. Refer to Item #1 in this table (i.e., protocol for thresholds/targets adjustments.	period of data collection. See section 6.1, paragraph 2 of the IG.
57.	Direct pumping of water into the wetlands is proposed as a contingency measure if the buffer BP1 does not maintain water levels. Please provide the specifics on the infrastructure required, construction details, and the criteria that will be used to initiate this mitigation measure.	General comment	The infrastructure needed would be either flexible or rigid piping between a pump and each wetland. Discharge will occur via a diffuser to minimize erosion at the discharge location. The short test conducted pond P5 confirms that discharge to a wetland can maintain or increase water levels in the wetland.	See Item # 6 in this table.	See our response to #6.
58.	A comprehensive document should be developed to assist local agencies in the understanding of when and what actions will be taken should the mitigation measures fail to meet their objective and when and how the agencies will be notified. The ultimate action is the cessation of extraction until the situation is rectified.	General comment	The site plans are the comprehensive document that governs operations on site. Meetings are being held with commenting agencies to describe the implementation details of the mitigation and contingency measures.	See Item # 48 in this table. The site plan must include a compendium of all the threshold and trigger levels and monitoring requirements, and must reference the IG, where the detailed information can be found. Refer to Item #25 in this table (i.e., “response action framework”). Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	See response to #48 and response to #25. The Site Plan is currently being updated with the monitoring program outlined in the IG.
59.	The internal use and movement of water between extraction phases should be described in more detail for our understanding.	General comment	The only internal movement of water between extraction phases presently considered is between Phase 2/3 and Phase 1. As rock is extracted out of Phase 1 it may be necessary to compensate with water from either Phase 2 or Phase 3 in order to maintain hydraulic gradient to Kilbride Creek. Otherwise, the internal movement of water is only anticipated between the three existing ponds and the proposed buffer ponds and dispersion trenches.	The applicant response has provided clarification regarding the original JART comment. The IG should take into account “direct supplementation” as a component of the internal movement of water. Please provide additional information in the IG and Site Plan.	Addressed in the revised Implementation Guide (August 2020). See Response #37.

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60.	The “Recommended Procedures for the Prevention and Mitigation of Contaminant Spills at Reid Sideroad Quarry” does not include the release of blasting emulsion to the environment as a contaminant source. Please discuss the implications of a release of blasting compound to the environment on land and in the water. Will the same blasting compound be used for blasts above the water table in Phase 1? What is the efficiency of the blasts using the specified emulsion and what is the fate of the nitrogen compounds? What is the flux of water into and out of the ponds (i.e., flow-through period for dilution of contaminants left in the water)?	General comment	There is no evidence that blasting emulsion will become a contaminant source. It is expected that 100% combustion of the emulsion will occur. The same blasting materials will be used in Phase 1 above the water table as in the other Phases. There is no evidence to suggest nitrogen compounds from the emulsion explosives contaminate the pond water. The flow through rates have not been estimated considering that during active extraction groundwater will flow into the pond, not out. JDCL will obtain an annual water sample following the final blast of the year as detailed in response to Comment 46.	Additional information is required to address the original JART comment, as discussed during the January 2020 meeting, and as noted below: Target water levels should be proposed for the extraction ponds to ensure that groundwater would flow into the ponds and ensure no potential contaminants leave the pond. Since the ponds are proposed to be used as a source of water for mitigation measures (buffer ponds and dispersion trenches), a pond water quality monitoring and threshold levels for (turbidity and nitrates) should be proposed. See items # 2 and 46 in this table. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). We have not recommended target water levels at this time to ensure that the water level in active extraction ponds are lower than surrounding water levels. If this is not the case, then mitigation systems will not be necessary. We have recommended in Section 4.2.1.8 of the IG that turbidity limits be place on pumped water. We have also recommended that a detailed water quality program regarding nitrate and ammonia be undertaken in the first year of blasting in Phase 1 and Phase 2. We are recommending that Total Suspended Solids in the discharge water not exceed 15 mg/L. Nitrogen compounds will be monitored in the extraction ponds, however, no threshold limits are necessary as no water will be discharged off-site. See Section 6.3 of the IG and Tables 10 and 12.
61.	Water well complaint procedures should include providing water supply that is equivalent to the complainant’s normal water supply immediately and throughout the investigation.	General comment	The complaint protocol is clear that residential, agricultural and industrial water supplies are safeguarded. Only minor water level changes will occur on-site, let alone off-site. No change to any private water usage is expected to occur.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time. As noted during the January 17, 2020 meeting, trucked-in water is not considered to be an appropriate long-term water supply augmentation in Halton Region.	Resolved
62.	It is recommended that private wells be added to the monitoring plan for both water quality and quantity for such duration and frequency as might be warranted to protect private water supplies. The data will then be available to assist with a well complaint investigation, should one be received.	General comment	Dedicated monitors are more suitable for recording water level conditions between the site and private wells. The site is not being dewatered; therefore, only minor water level changes can occur. A baseline water quality program will be undertaken to obtain baseline water quality in nearby downgradient private wells. See also response to Comment #50.	Turbidity analysis should be included in baseline water quality characterization for private wells. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	Addressed in the revised Implementation Guide (August 2020). See section 5.1 of the IG.

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63.	Upon closure, the buffers and trenches will be left in place. Is there a requirement for the buffers and trenches to remain post closure or can they be removed? Are there benefits to leaving them in place?	General comment	There is no hydrogeological advantage to maintaining buffer ponds or dispersion trenches. Once water levels in the main ponds equilibrate, the water levels in BP1 and BP2 will be the same as the main ponds and will be removed.	Should water levels within the main ponds not return to predevelopment levels when expected, there may be a requirement for the buffer ponds and trenches to be left in place until such time as the water levels return to pre-development levels or other adequate contingency measures should be provided. Rehabilitation and related contingencies should be included in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment, the IG, and indicate revisions on the updated Site Plan, as applicable.	Agree. See response to Comment #3.
64.	Please compare groundwater quality analysis results to Ontario Drinking Water Quality Standards currently in use where they differ from the old Ontario Drinking Water Standards.	General comment	Current Ontario Drinking Water Quality Standards are available from the most up to date release of Ontario Regulation 169/03. Our review of the latest version and comparison those values presented on Table 2.7 do not reveal any different drinking water quality standards.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
65.	Does the cascade flow map coalesce with the stream alignment and flow as described in the Harden Environmental report section 3.6.1? It is unclear if the Sixteen Mile Creek tributary (designated as KOA in the Harden report) flowing south under Highway 401 and Reid Side Road is represented in GSFLOW as described in the main Harden Report section 3.6.1, 3rd paragraph.	Appendix F, Figure 6.2	The GSFLOW stream network corresponds to Harden Report Section 3.6.1 (Figure 3.3) across the site and until south of the 401 however a KOA segment is not shown on the modelling figures. The flow from the KOA site exits the model through 16 Mile creek. There is an error in the model here. The stream network does correspond to Harden Report Section 3.6.1 (Figure 3.3) until south of the 401 where the stream ends and does not connect to Sixteen Mile creek at Campbellville Road. It goes to far field flow (i.e., out of the model) rather than being routed through to Sixteen Mile creek. Flow still accumulates naturally in Sixteen Mile creek, however the flow is not as high as it would be had the stream segment been properly connected. The consequence on the flow system of not routing streamflow through is believed to be minimal because water levels here are already at surface. Had the stream network been connected there would have been opportunity for flow to be exchanged across the streambed. That opportunity still exists to some extent as the GSFLOW model allows for discharge to surface, which may then in-turn be routed to a stream via overland flow.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved

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			Overall the change to groundwater levels would be subtle and not significant enough to influence flow on the Reid Road site.		
66.	Porosity values seem to be rather high for some of the soils. Are these total porosities or effective porosities? Also, the Harden report states that porosity for dolostone ranges between 2 and 15% at the site with the upper 1 to 2 metres of the rock highly fractured. Has this been represented in the model or is the dolostone porosity a constant 10% value for all the model dolostone layers?	Appendix F Figure 6.3	Each model cell in the PRMS submodel are assigned a land use, geology, and soil texture type codes. Table 6.1 through Table 6.3 represent the model input parameters associated with each land cover type, surficial geology type, and soil texture type code, respectively. Additional parameters such as slope and aspect ratio (angle to the sun) are assigned from other data sources such as the DEM. All of these PRMS soil zone properties are independent from the groundwater submodel properties, which were primarily assigned by hydrostratigraphic unit. The PRMS submodel computes a soil water balance and determines quantities of ET, runoff, interflow, and groundwater recharge at each cell. None of either porosity, field capacity, or wilting point are direct input parameter for PRMS. They are all auxiliary parameters we use to give context to the modeller for defining the size of the PRMS soil zone reservoir. The PRMS soil zone reservoir is broken into two main components: 1) The capillary reservoir, and 2) the gravity reservoir. Conceptually, the capillary reservoir is the amount of water stored between wilting point and field capacity and is available for evapotranspiration. The gravity reservoir is the amount of water stored between field capacity and saturation and is available for interflow and groundwater recharge. The storage capacity of these reservoirs depends not only on these three parameters but also on the soil zone thickness of each cell (assigned by land use type in Table 6.1). While there is generally a close correspondence between the soil zone properties and groundwater properties, in reality there are different processes, inputs and model simulation representations. For example, ET, frozen	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved

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			ground, interflow and percolation processes in the PRMS soil zone are different than the 3-D groundwater flow formulation in the groundwater model. Further discussion of groundwater model properties and porosity are discussed in response to a similar question below (question 70).		
67.	The KOA tributary section flowing south under Highway 401 and Reid Side Road does not seem to be represented as a stream on Figures 7.1 and 7.2. On Figure 7.1, KOA is shown to flow into Kilbride Creek and on Figure 7.2 it does not have an outfall.	Appendix F Figure 7.1	7.1 shows KOA as it is shown on all agency mapping including Halton Conservation Watershed Base Map. Figure 7.2 accurately shows KOA Tributary not to be continuous.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
68.	Hydraulic conductivities seem to be a couple orders of magnitude higher in Layers 3 through 6 under the Railway Line and in-between Central and West Lakes. Staff cannot locate in the report an explanation why. Have the hydraulic conductivities been adjusted for effects of blasting around the quarried areas, as a halo effect?	Appendix F Figure 7.5	During preliminary calibration simulations we noted that the native bulk K produced a larger head difference between the ponds. The measured difference between the east and west pond varied by only 0 - 25 cm. We were able to improve the match to observed conditions by increasing the hydraulic conductivity between the ponds allowing for better connectivity. There is some anecdotal evidence of interconnection, increased weathering or perhaps even an increase in K related to railway operations. Under extraction and closure conditions, a blasting halo was represented in the lake bed conductance parameter. The lake bed is a virtual model layer that separates the open water from the underlying aquifer/aquitard. The lake connectivity described above was not included to represent any form of blasting halo, rather to improve the match the current day conditions.	See item # 52 and 69 in this table. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment.	See our responses to #52 and #69.
69.	The results of hydraulic conductivity testing for dolostone (as presented in the main Harden report Tables 2.5 and 2.6) are as high as 6.29E-04 m/s, meanwhile as presented in Table 7.1, the reported hydraulic conductivities in model layer 7 through 9 are 3.00E-05 m/s. Have the hydraulic conductivities been spatially distributed to account for local variations and to represent the site specific investigation? The Harden report states that the upper 1 to 2 metres of bedrock is heavily weathered, suggesting hydraulic conductivities even higher than the ones estimated in competent bedrock, has this been represented in the model?	Appendix F Table 7.1	The model does not account for spatial variation in the reported hydraulic conductivities due to the spatial uncertainty associated with bedrock fractures. Accurately mapping fractures is a difficult task, and one that is even more difficult to model, particularly in a regional context. The MODFLOW submodel uses an equivalent porous media approach to represent bedrock where it assumes that the rock matrix, as a whole, behaves	Comment partially addressed. It is usual practice to complete onsite hydraulic properties testing to characterise the underlying aquifer/s. It is unclear why an average regional hydraulic conductivity is preferred to model a local response of underlying aquifers with onsite wetlands and streams. Considering that the model is used to show the wetland and stream response to	The model was used to confirm that extraction of aggregate and occurance of lower water levels in the main ponds could be mitigated given a reasonable hydraulic conductivity of the overburden and bedrock beneath the wetlands. The detailed monitoring of the wetlands will be used to ensure that water levels in the wetland remain within acceptable limits.

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			similar to that of a porous media at a large enough scale. We therefore apply a bulk value for hydraulic conductivity that attempts to honour the overall behaviour of the unit. Note that lower down in the table where the layer column states "Where Bedrock Present". The hydraulic conductivity of the upper 3m of bedrock was adjusted across the model. The value assigned to the weathered bedrock depended on which unit was encountered. In the vicinity of the Reid Road Quarry, the weathered bedrock corresponded to "Weathered Gasport" with a value of 8.0E-5 m/s.	extraction, as a sensitivity analysis it is recommended that the model be run as per discussions at the January 16-17th meeting (i.e. when conducting sensitivity analysis in specific areas of concern) with adjusted hydraulic properties using the onsite data. In particular, an area of wetland P5 which is up-gradient of the Central Pond and where testing in CB7 showed higher hydraulic conductivities. It should be noted, that coincidently in the same general area, hydraulic conductivities were increased under the railway tracks and between the West and Central ponds due to problems with calibration. See Item # 52 in this table. Please provide additional information in an Addendum to the Level 1 and Level 2 Hydrogeological Assessment.	
70.	Please review the following, provide explanation and/or adjust the values if needed: • Model Layer 3 has a low hydraulic conductivity typical for fine grained deposits, however the corresponding specific yield at 0.4 is indicative of coarser grained deposits. • Layer 7 - specific yield for Eramosa is reported at 0.1 equaling porosity as reported in Table 6.3 for rock with no room for retention. Layer 7 specific yield for Upper Amabel is reported at 0.05 (porosity of 0.1 in Table 6.3) suggesting half of water within the rock would be retained, a value closer to 0.1 would be expected.	Appendix F Table 7.1	Specific yield can be thought of similar to porosity. Unconsolidated fine-grained deposits like silt, clay or till often have a higher porosity, and in turn a higher specific yield. Todd (1980) and Freeze and Cherry (1979) give the following for porosity: Gravel: 0.25-0.5 Silt: 0.35-0.5 Clay: 0.4-0.7 Silt Till: 0.34 Sand Till: 0.31 While fine grained soils tend to have a high porosity, the specific yield refers to how much of the porosity is readily drainable. The Wentworth till (Layer 3) is a sandy silt till. While 0.4 may be slightly high we do not feel is it is an unreasonable value for this type of material because the sandiness limits the capillary forces, giving it a lower retention. Generally, however, the Wentworth till is	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved

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			not present in the model area and thus the upper till more likely corresponds to Newmarket Till. Tightly consolidated Newmarket till is more likely to have a low specific yield because the material has been heavily worked and a large portion of the water may be retained through capillary forces. Hence while it may have a high porosity, the drainable porosity (i.e., specific yield) is' quite low. The specific yield value of the groundwater model should not be confused with or related to the porosity value in table 6.3. Table 6.3 summarizes soil zone parameters for the PRMS hydrologic submodel. The PRMS model computes a soil water balance and determines quantities of ET, runoff, interflow, and groundwater recharge. Porosity is actually not even an input parameter for PRMS. It is an auxiliary parameter we use to give context to what is referred to as the "gravity reservoir". The gravity reservoir refers the soil water above field capacity but below saturation. This water is allowed to percolate out of the gravity reservoir in the form of groundwater recharge or interflow. The size of the reservoir, which is all that PRMS is concerned about, is calculated at each HRU as the difference between porosity and field capacity multiplied by the soil zone depth (Table 6.1). Conceptually, "rock" is not an overly compatible material for representing the soil zone because it does not always retain water similar to a porous media. Fortunately, the only areas with surficial soils classified as rock were located over 5km east of the study site and did not influence the local hydrologic behaviour in any way. Water from the gravity reservoir is transferred to the MODFLOW submodel. Porosity is not an input the groundwater model and the values listed in table 6.3 are in no way intended to represent porosity values of the hydrostratigraphic units of the groundwater model. The groundwater model is only concerned		

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			about Specific Yield, which were determined independently.		
71.	The anizothropy value of 10 for the upper most bedrock layer (model Layer 7), which as stated in Harden Report is heavily weathered seems to be high. A Kh/Kv value of 2 would be more representative. It is unclear how the weathered bedrock has been represented in the model.	Appendix F Table 7.1	The upper 3 meters of bedrock is considered "weathered" and has an anisotropy of 2. See the values posted in "Weathered" rows in the lower section of Table 7.1.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
72.	This section does not discuss water quantity impacts on private wells. As per the Harden report there are two private dug wells servicing residence on Twiss Road. Have the well depths and potential groundwater level lowering been assessed to show that there is enough available drawdown during and post extraction?	Appendix F Section 11	A fulsome water well survey will be conducted with owner's permission. There is limited drawdown anticipated at any private well, including the dug wells along Twiss Road. There is a dedicated groundwater monitor (CB12) that will be used to gauge potential offsite impacts near the dug wells. JDCL has committed to replacing the dug wells with drilled wells at their expense should the need arise. See also response to Comment #50.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
73.	There are no details provided of how the dispersion trenches and buffer ponds were represented in the model. The results of borehole drilling show that there is between 8 and 10 metres of sand and gravel, which suggests it may be difficult to avoid seepage back into the ponds. More details are needed to show the construction of the buffers and trenches and how they were represented in the model.	Appendix F, Section 11.3	Dispersion trenches: these were modelled as direct diversions into the receiving feature at a prescribed rate in Table 11.2. Buffer ponds: where overburden existed, the buffer ponds were sunk into the existing material. In the event that a berm was needed to enclose the pond, elevation was added to layer 1 of the groundwater model and the hydrologic model topography was modified. The berm material was given the same properties as layer 1 recent deposits. The buffer ponds themselves were represented as small MODFLOW lakes. The lakes allowed for all the integrated components of the hydrologic cycle including, precipitation, ET, runoff, interflow, groundwater seepage, and pumping.	The applicant response has provided clarification regarding the original JART comment. No additional information or documentation are required at this time.	Resolved
74.	(Additional discussion during November 1, 2019, JART meeting: Municipal Source Water mapping.)		It was agreed that the site is outside the municipal well head protection areas and that municipal water supplies will not be affected by the proposal.	It was agreed that the site is outside the municipal well head protection areas. No additional information or documentation are required at this time.	Resolved