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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**.

| | Initial JART Comments (July 2019) | Page / Section | Applicant Response (December 2019) | JART Response (May 2020) | Applicant Response (October 2020) *no change to the Blasting Responses since June 2020 Interim Response* |
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| **Report: Blast Impact Analysis – June 2018** | | | **Author: Explotech Engineering** | | |
| 1. | In their executive summary, Explotech states that they have reviewed the available site plans. They should append that in their report so that it can be crossed referenced in the review. | Executive Summary | Agreed. Revised BIA contains the site plans. | The responses and updated draft BIA have answered and satisfactorily addressed the peer view comments.<br><br>It is agreed that there should not by any risk of fly rock if common best practices are followed as outlined in the BIA.<br><br>It is agreed that vibration and noise from blasting may be noticeable but should not be a significant concern to residents living in Campbellville given the Ministry limits that have to be satisfied.<br><br>It is agreed that complaints can be effectively dealt with through the usual regulatory mechanisms in place. The Town would like to see this better explained for public information. JDCL agrees to incorporate this into publicly available information. | Resolved – revised BIA has been provided and reviewed by JART. |
| 2. | In their executive summary and introduction sections and cover page, Explotech has identified the legal description of the property as Part of Lots 6, Concession 2. This should be corrected to correspond to information in the site plans. | Executive Summary; Introduction | Corrected in the revised BIA. | See Item # 1. | Resolved |
| 3. | The current elevations and the final elevation of the proposed quarry floor cannot be confirmed from the Aerial Photograph of Property and Environs Operational Plan in Appendix A of BIA report. | Appendix A | The elevations are located on the site plans which has been put in the revised BIA. | See Item # 1. | Resolved |
| 4. | Explotech has consistently based their predicted Peak Particle Velocity (PPV) calculations on the use of 76 mm diameter drill-holes for depths in excess of 22 m. The proposed drill-hole size is questionable, if not applicable, particularly for the proposed extraction method (drilling and blasting in wet) for the following reasons:<br>• Expected drill-hole deviation for depths greater than 10 m. | Proposed Aggregate Extraction, pg. 7 | All of the concerns listed will be mitigated through the use of best practices, including observing drilling performance, selection of appropriate; drill technology and procedures, hole diameter, the requirement to use water resistant blast | See Item # 1. | Resolved |

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| | • Expected difficulties loading holes for depths greater than 10 m.<br>• Expected inconsistency in maintaining the burden and spacing between drill-holes along the depth of the drill-holes for depths greater than 10 m.<br>• Expected hole-to-hole propagation resulting in detonation of more than one hole per delay period, should the holes intersect each other at depths.<br>• Difficulty in employing liners to control migration of bulk explosives in regions of rock-mass beyond the blast-hole, particularly in strata layered rock-mass formations. Type of liners (sleeves) should be identified.<br>Difficulty in rectifying collapsed or plugged drill-holes. | | hole casing, the diameter of the casing in conjunction with the drilled hole etc. Phases 2 through 5 will be drilled though a shot rock layer that will require casing. | | |
| 5. | Explotech indicates that quarries in Ontario employ drill-hole size ranging from 76 mm to 152 mm. Although employing larger diameter drill-holes will alleviate problems associated with the smaller diameter drill-holes, particularly for the proposed extraction method, and depths in excess of 10 m, it will necessitate a good control on the quantity of explosives per delay period by introducing multiple decked charges within a single borehole in order to meet the vibration and overpressure level requirements. In this respect, Explotech should include a table identifying allowable quantities of explosives per delay period for given standoff distances as a guideline based on their vibration prediction formula. | Proposed Aggregate Extraction, pg. 7 | Agreed. There are three tables in the revised BIA that satisfy this concern. | See Item # 1. | Resolved |
| 6. | Based on experience and analysis of large volume of vibration data, USBM concludes that generally vibration character is most affected by the blast design, shot geometry, charge weight per delay period, delay sequence, and other blast design parameters at distances closer to the blast, whereas, at large distances from the blast, these parameters become less critical and transmitting medium will play a more dominant role in the character of the vibration wave. It is therefore important to collect vibration data at various standoff distances from the blast, far, close and in between, in order to establish a more reliable attenuation curve. | Blast Vibration and Overpressure Limits | Agreed. The original AND revised BIA include the following recommendation: An attenuation study shall be undertaken by a competent independent blasting consultant during the first 12 months of operation in order to obtain sufficient quarry data for the development of site specific attenuation relations. This study will be used to confirm the applicability of the initial guideline parameters and assist in developing future blast designs. | See Item # 1. | Resolved |
| 7. | Using vibration data from other quarries with similar ground characteristics would be typical when developing vibration prediction models for new operations where site-specific data is not available. Explotech has used their in-house vibration data collected from such quarries. The attenuation curve presented in Appendix C of their BIA report is based on 43 data points from various quarries. We question the reliability of the attenuation curve based on such limited number of data points. In addition, we are not sure what percentage of this data was collected in relation to subaqueous blasting. It is our understanding that the proponent is presently operating a quarry in Guelph area using subaqueous blasting method. It would be prudent to include vibration data acquired from this operation, if such data is available. | Blast Vibration and Overpressure Limits; Appendix C | The revised BIA includes nine (9) equations which accommodate a range of geological conditions and blasting methodologies. All equations are evaluated utilizing the initial blasting parameters and the maximum calculated value is provided. | See Item # 1. | Resolved |

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| 8. | Although use of empirical formulas such as United States Bureau of Mines (USBM) model in determining range of flyrock escaping the blast site is useful, there is no replacement for careful site assessment prior to every blast. This is because, empirical models lack critical site-specific conditions, such as presence of loose material on top bench and potential depleted burden at the face and along the first row. Use of models such as USBM model for determination of flyrock range as a function of shot conditions is a norm in the industry for predicting flyrock range as a tool at the startup of the operation. The question will remain that Explotech has only provided model's estimated safe range for 76 mm diameter holes. In addition, since the upper 5 m of the top bench will be exposed, presence of water will have no influence on the range of flyrock produced from cratering on top bench. | Blast Mechanics and Derivatives; Appendix C | Through proper blast design and diligence in inspecting the geology before every blast, flyrock can readily be maintained within the quarry limits. It may be necessary to increase collars when blasting along the perimeter. The operational plan for the quarry has been designed to retreat towards the closest receptors thereby projecting flyrock and overpressures away from the receptors. | See Item # 1. | Resolved |
| 9. | In their BIA report, Explotech indicates that the quarry will not be dewatered, and as such, extraction will take place in single bench. This will subsequently eliminate the possibility of reducing the quantity of explosives per delay period by employing multiple bench blasting. The single bench height varies from 22 m+/- to 35 m+/-, with initial blasting (sinking cut in Phase 1A) having a 30 m+/- bench height. Since the elevation of existing water table is estimated to be at or slightly below the top of rock, drilling will be possible from dry area for some portion of the proposed extraction. However, majority of, if not all, blasting will be underwater (note the close proximity of the existing Central Pond). Assuming, 76 mm diameter holes can be drilled for a depth of 30 m+/-, and allowing a 2 m+/- collar, and explosive density of 1.25 g/cc (for most emulsions) a single explosive deck charge of 134 kg will be required per hole. This will exceed the allowable quantity of explosive per delay period based on Explotech's suggested regression formula (decking the charges for sinking cuts, particularly in heavily saturated ground is not recommended). | Proposed Aggregate Extraction | For a maximum 32m bench, and the utilization of a 76mm to 153mm diameter blast hole, emulsion would provide 180kg to 720kg of explosives per loaded hole. Given the configuration of the proposed quarry relative to the surrounding receptors and the plan not to dewater, decking of blast holes will be necessary. With decking being required underwater, an enhanced level of diligence will be required in all stages of the drill blast process. The utilization of decks will ensure the maximum load per period is reduced to a level at which the blast will remain compliant with MECP guidelines as blasting operations migrate across the quarry. The distance to the closest sensitive receptor will determine the number of decks required per hole. | See Item # 1. | Resolved |
| 10. | Drilling 76 mm diameter holes are only possible using top-hammer drill rigs, with questionable drilling accuracy for drill-holes greater than 10 m in depth. Drilling accuracy increases significantly using In-The-Hole (ITH) drill rigs. The cost of drilling will also decreases significantly using ITH drill rigs. The only problem is that, presently use of ITH is limited to drill-holes greater than 89 mm (3.5") in diameter. | Proposed Aggregate Extraction | The intent is to use top hammer drills to drill blast holes on site. We can cite numerous examples where blast holes were successfully drilled to these depths with minimal drill deviation using top hammers. Should drill deviation prove to be an issue, there are several options available to efficiently eliminate the concern. These include the implementation of down-the-hole (DTH) hammer drills which have been proven to significantly mitigate drill deviation and are currently available to diameters below 76mm allowing for an abundance of blast design modifications to meet MECP guidelines and operational constraints. | See Item # 1. | Resolved |

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| | | | Additionally, the option exists to drill larger diameter holes and sleeve the hole to a smaller diameter using rigid water-resistant blast hole casing if reduction in explosive loads per delay is necessary. Sleeves would also be utilized in the event of voids in the rock mass in order to prevent bulk explosive product migration. | | |
| 11. | Nearly all commercial explosives contain compounds that are considered groundwater contaminants toxic ingredients, such as nitrates, hydro-carbonates and ammonia. What type of explosives will be used as part of blasting operations? Packaged or Bulk? | | Suitable explosive products will be employed. It is the intent to use both bulk emulsion and cartridge explosive products. Explosive products must be resistant to dead-press and sympathetic detonation as well as display excellent sleep times in case of delays between loading and detonation. The appearance of wet holes at quarries in Ontario is extremely common such that blasters are familiar with best practices required to address the condition and a variety of explosive products are readily available which are formulated for these conditions. Detonators employed shall be restricted exclusively to electronic detonators or similar type products that may be developed in the future which can conclusively assess product performance post-blast to ensure that all holes are detonated as designed. | See Item # 1. | Resolved |
| 12. | If bulk explosives are used, more information with respect to mitigating measures to ensure confinement of explosives in the borehole and to eliminate the risk of migration of explosive-source-contaminants in the water, should be discussed. | | The option exists to drill larger diameter holes and sleeve the hole to a smaller diameter using rigid water-resistant blast hole casing if reduction in explosive loads per delay is necessary. Sleeves would also be utilized in the event of voids in the rock mass in order to prevent bulk explosive product migration. | Once explosives are detonated there is no residual that can contaminate water. Use of common best practices such as appropriate explosive products, “sleeving” of blast hole and good housekeeping in the blast area should ensure that water quality is protected. JDCL agrees with this approach – the BIA has been updated to reflect this. This commitment should be noted on the *ARA* Site Plan. | |
| 13. | If the quarry is not dewatered, there exists a potential for migration of water within the quarry to aquifers supplying the existing wells in the area. What mitigation measures will be put in place to address this should monitoring results confirm exceedance(s)? | | Please see the Harden Environmental response #20 in the hydrogeology. There is a Spill Response Protocol Appendix G and a Well Complaint Protocol in Section 11 Recommendations item #7. | See Item # 1. | Resolved |
| 14. | Although rare, in any blasting operations, detonation failure of one or more hole(s) may occur. How would the quarry operator ensure the | | Prevention of this from occurring is by use of best practices following the recommendations in the BIA. Part of the | See Item # 1. | Resolved |

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| | undetonated explosive products are identified and handled to minimize contamination of water within the quarry? | | mitigation is the use of double priming and electronic detonators which appears in recommendation #7 of the BIA. Electronic detonators provide knowledge of detonation post blast to the computer. Best practices involve removal of the material during the excavation process. Any material contained in the blast sleeve in the muck pile will be removed during the excavation and once on the surface will be removed by the blasting technician. A water monitoring program will be in effect as well. | | |
| 15. | What would be the potential effect of repeated (cumulative) exposure of the water within the quarry to explosive products, particularly from the established free-face region, and spillage from top bench? | | There is no cumulative effect expected. Please see Harden Environmental response #20 in the hydrogeology replies. Using best practices for loading with care for hygiene practices will minimize any exposure on the surface. The water monitoring program will provide detection prior to anything reaching drinking water quality levels. | See Item # 1. | Resolved |
| 16. | Who will be monitoring changes to existing well and ground water in the surrounding area during the extraction operations? What monitoring protocols will be in place? | | The site plans contain the monitoring program on page 3 in the Hydrogeology section. It is proposed to have a combination of on-site staff and Harden Environmental perform monitoring and analysis. | See Item # 1. | Resolved |