



## Memorandum

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Foth Infrastructure & Environment, LLC  
2121 Innovation Court, Suite 300  
P.O. Box 5126 • De Pere, WI 54115-5126  
(920) 497-2500 • Fax: (920) 497-8516  
www.foth.com

September 25, 2019

TO: Melanie Humphrey, Michigan Department of Environment, Great Lakes, and Energy

CC: David Anderson, Aquila Resources Inc.  
Ken Bocking, Golder Associates, Ltd.  
Kebreab Habte, Golder Associates, Ltd.

FR: Steve Donohue, Foth Infrastructure & Environment, LLC  
Andrea Martin, Foth Infrastructure & Environment, LLC

RE: Clarification of September 11, 2019 Response to EGLE Request for Additional Information Dated August 9, 2019

On August 9, 2019, Michigan Department of Environment, Great Lakes, and Energy (EGLE) Office of Gas and Minerals issued to Aquila Resources Inc. (Aquila) a Request for Additional Information related to Aquila's Mine Permit Amendment Application (MPAA). On September 11, 2019, Aquila provided to EGLE a response to EGLE's request. That response consisted of a memorandum prepared by Foth Infrastructure & Environment LLC (Foth) and supplemental information prepared by Golder Associates, Ltd. (Golder). The purpose of this memorandum is to clarify information contained in Aquila's September 11, 2019 response to Comment 1.

EGLE's August 9, 2019 Comment 1 requested an assessment of the risk to the public health and environment associated with potential embankment failure of the Contact Water Basin and Tailings Management Facility (TMF), response measures to be followed in such an event, an evaluation of various modes of failure, and cost estimates for responding to failures. In responding to this request, Foth summarized information from the Part 632 permit application addressing the risk of failure and cost estimates for responding to failure included in the Part 632 financial assurance calculations. Golder provided a preliminary "potential failure mode analysis" (PFMA) that identified potential modes of failure that theoretically could occur. As the Golder document makes clear, however, the PFMA starts with the premise that failure will occur, even though each of the failure modes identified are "highly unlikely" to occur based on the TMF design (*see* Golder memorandum dated September 11, 2019). The PFMA identifies specific risk reduction measures for each failure mode to even further reduce this risk.

It is within this context that the PFMA's identification of failure based on liquefaction and the potential for impact to wetlands "and possibly impact the Menominee River" must be understood. It is highly unlikely that such an event could occur based on TMF design, and this already very low risk is further mitigated by the additional risk reduction measures for this failure mode identified in the PFMA. Thus, in terms of assessing the risk of any of the identified failure modes, the risk is low. In terms of TMF design features that make the risk of failure exceedingly low, the following must be considered:

- ◆ The TMF design was undertaken to achieve factors of safety against instability (for both static and pseudo-static (earthquake) loading conditions), which exceed the minimum values that are accepted in standard engineering practice.
- ◆ Construction of a liner and leachate collection system at the base of the facility to drain water from the facility and eliminate hydrostatic pressures and liquefaction potential in the perimeter walls that could trigger events related to the identified potential modes of failure.
- ◆ Construction of the perimeter of the tailings facility with run of mine rock, as opposed to tailings (conventional practice), to buttress the facility and to eliminate erosional related modes of failure and liquefaction.
- ◆ Deposition of a high density thickened tails as opposed to a low-density slurry. This results in rapid consolidation of the tailings and less water to manage.
- ◆ A spillway from the tailings facility to the collection sump and from the collection sump to the mine to eliminate potential overtopping for the collection system.

Additional risk reduction measures identified in PFMA that even further diminish the risks of this particular failure mode include complete static and seismic liquefaction analysis between dyke raises along with other testing and monitoring that will be performed (*see* Golder memorandum dated September 11, 2019).

Based on the design and monitoring that will take place during operations, if any potential failure were to develop, it would be detected at an early stage followed by prompt corrective action and remediation. As such, tailings and water would never reach lands adjacent to the Project or the Menominee River. An Emergency Action Plan (EAP) to assure no impact to adjacent lands will be submitted to EGLE prior to construction of the TMF under provision of the Dam Safety Permit.