STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
UPPER PENINSULA DISTRICT OFFICE

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

March 2, 2018

VIA E-MAIL

Aquila Resources Inc.
E 807 Gerue Street
Stephenson, Michigan 49887

Submission Number: 2NN-5PE0-MT3W
County: Menominee
MiWaters Site: 55-Aquila Resources Inc-Back Forty Project
Project Name: Back Forty

Dear Mr. Hildred:

SUBJECT: Public Comment

The Department of Environmental Quality (DEQ), Water Resources Division (WRD), held a public comment period and public hearing for the above referenced application submission in accordance with the requirements of Part 301, Inland Lakes and Streams, and Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act 451 of 1994, as amended.

The WRD heard testimony from 88 individuals during the hearing and received approximately 3,420 written comments. Since the close of the public comment period on February 2, 2018, the WRD has reviewed the submitted comments for consistency with the proposed project and synthesized applicable comments related to the regulatory and technical review. The WRD is providing you an opportunity to directly address comments that will be taken into consideration as part of the application review.

The attached comments are organized by subject and coordinated to sections of the application submission. Each comment, or synthesized comment, is displayed in grey italics and may be further clarified with a comment from the WRD pertaining to specific information that may address or further clarify the basis for the comment. The information provided in your responses to the public comments will be included as part of the regulatory and technical review for the proposed project. To have your responses taken into consideration for statuatory permitting criteria on the proposed application, please submit your responses to the WRD no later than March 23, 2018.

If you have any questions or would like to discuss this comment response process, please contact me at 906-236-0380; WilsonK17@michigan.gov; or MDEQ, Upper Peninsula District Office, 1504 West Washington Street, Marquette, MI, 49855, Marquette, Michigan 49855.

Sincerely,

Kristi Wilson
Upper Peninsula District Office
Water Resources Division

Enclosure: 2NN-5PE0-MT3W Public Comments
cc: VIA ELECTRONIC TRANSMISSION
Andrew Boushey, Aquila Resources
David Anderson, Aquila Resources
Steve Donahue, Foth, Agent
Kris Baron, Foth, Agent
Matt MacGregor, King & MacGregor Environmental, Agent
Jeff King, King & MacGregor Environmental, Agent
Kim Fish, MDEQ
Jerrod Sanders, MDEQ
Ginny Pennala, MDEQ
Jill Van Dyke, MDEQ
Mike Pennington, MDEQ
Colleen Okeefe, MDEQ
Melaine Burdick, USEPA

PUBLIC COMMENTS

Back Forty Project – Wetlands Application

The following comments were submitted to MDEQ during the public notice and public hearing comment periods for the application for permit submitted by Aquila Resources under Part 31, Water Resources Protection, Part 301, Inland Lakes and Streams, and Part 303, Wetlands Protection of the Natural Resources and Environmental Protection Act 451 of 1994, as amended. Comments were received, reviewed for applicability under the above referenced Parts, and summarized for consistency.

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Joint Permit Application

Written Summary of Proposed Activities

The last paragraph discussed treatment of non-contact stormwater associated with the overburden stockpile, and how it will be collected and rerouted. In the next sentence it reads that non-contact water will be routed to two (2) stormwater detention ponds prior to discharge to wetland. The next sentence states that stormwater will be discharged to upland immediately adjacent to wetland WL-A1. Our question therefore is, "does this stormwater discharge directly to the wetland or to upland?"

Provide response.

Project Area

Section 2: Permit Application, Table 1 is titled: Tax Identification Numbers & Location Information for the Back Forty Project Area. There are a number of identified parcels on this table that are not included on Figure 4-1 or 4-2, showing the project area and land ownership, of Section 2 or Section 4. Specifically, there are locations on the table in the south half of 35N/28W, the west half of 34N/28W, the northeast quarter of 35N/27W and the southeast quarter of 36N/27W.

Clarify what relation these properties have to the proposed project, why they are defined as properties within the project area on Table 1, and why they do not appear on any related figures depicting the Project Area throughout the application.

Project Plans

Several cross-sections show the proposed fill as "approximate design grade".

Indicate if the current plans are the final project plans and design.

Is there a contingency plan in the event of an unforeseen spill, damage to infrastructure, or accident that may impact wetlands and aquatic resources?

Provide response.

Is River Road proposed to be deadened or is it proposed to be removed? Will any removal of termination of River Road involve the dredge or fill of adjacent wetlands; specifically WL14/14a?
Will River Road will serve as a haul road and as a local access road?
Will any upgrades to remaining portions of River Road be required to accommodate the anticipated use of River Road as related to the proposed mining operations?

Please respond.

The collection sumps are now in new locations, including one in the North and one in the Northeast corner of the facility that are very close to wetlands (WL-C1, WL-40/41). This may pose a risk to wetlands that has not been evaluated, such as the potential for uncaptured leachate to settle in wetlands or the potential for sumps to lower the water table.

Provide analysis on how the revised collection sump locations may impact wetlands. Specifically address how pumping will be designed and monitored to avoid impacts to surface and groundwater resources.

A new mine waste storage area is shown on figures on the southern perimeter of the pit. Is this where "waste rock will be temporarily stored above ground"? Or is it to continue to be a location for "overburden and soils stockpile" as described in previous versions of the wetland permit? There does not appear to be an area for soil stockpiles in the new design.

Please respond.

Also of concern are some of the limits of the Mine Waste Storage Areas, divided only by an 11' metal chain-link fence.

Figure 4-9: Cross section E-E (WL-B1) shows a fill which is + 4' above existing topography, +/- 12' from the fence, with slopes of 3:1. How will this fence keep the fill material from entering the WL-B1 Lobe?

Provide response.

Why is there no mention of the proposed power plant that is to be located east of the proposed mine?

Provide response. Include any information or updated project plans that show the location of the proposed power plant [substation].

The project plans have changed [from the plans originally submitted with this wetlands application] to account for changes in the site facility. The changes increase the impacts to regulated wetlands and streams. Aquila stated that they rejected plans for the previous site in part because the waste would be less dense. There is no explanation for what is behind the anticipated change in waste material density that drove the need for the greater area required for waste disposal… or how this changes the impacts to wetlands.

Provide an explanation on any data collected that indicates the necessity for changes in waste material density. Provide additional clarification as to if this site plan was submitted as a final design or if additional feasibility analysis of the layout and design is ongoing. Provide further clarification on why this data supports the necessity for additional wetland impacts from the previous proposal.

Project plans show a non-contact water basin between an overburden stockpile and wetland A3.

Provide further detail on what materials constitute "overburden". Where does the non-contact water originate? Will it be pumped or routed to these basins? How and where will the basin discharge?

Figure 4-13, Treated Water Discharge Pipeline Outfall Detail, shows the placement of three feet of riprap below the existing grade. Is any dredging proposed at this location?

Please respond.

Tables and Figures

Section 3, Table 3-1

Table 3-1 shows the delineated size of wetlands 14 and 14a, which are proposed as a complete take, as different from the total impacts proposed to those wetlands. Figure 4-1 shows the total take for WL-B1 as 1.18 acres instead of the 1.17 shown on Table 3-1. WL-4a goes from 1.8 acres to 1.79 acres.

Please clarify.

Figure 4-4 (and associated figure 5-62)

Figure 4-4 includes the following statement: "Proposed River Road Dead End and Connection to Site Access Road". Figure 4-4 does not show a "site access road".

Please clarify.

Notes we found on the bottom left of digital orthophotography (specifically Figure 4-4 and 4-5) show a horizontal datum as NAD-83. What vertical datum was used to describe topography in with of those figures or in subsequent figures?

Please clarify.

We note Figure 1 (mitigation site search overview map) through X19 in Appendix B are marked "draft" in red font. Have Aquila's consultants created a final for each?

Provide response.

Wetlands

Wetland terminology is misleading. The permit application uses the undefined phrase "upland wetlands". Supporting information appears to claim that these "upland wetlands" are perched, or disconnected from groundwater, and comparatively, "valley bottom" wetlands are connected to groundwater. The term "upland wetland" is misleading as "wetlands" and "uplands" are widely understood in wetland delineation to be opposites and are recognized as such in Part 303, Wetlands Protection of the NREPA.

Provide a clear definition of "upland wetlands" and how this wetland type or classification is distinguished for the purposes of this application.

Off-site wetland complexes located on adjacent property were identified in the permit application as "inferred wetland" and the wetland watershed area boundary included privately owned lands, off the project boundary, that had not been delineated.

How were these wetlands inferred? Was any wetland area beyond the project area confirmed? How were the wetland communities determined? How were the wetland watershed recharge impacts calculated for these portions of the wetlands that were inferred?

WL 40/41

According to Volume 1, "Table 3-2, Aquila Wetlands Determination of Potential Wetland Impacts – Operations Phase", the applicant claims that "WL-C1 Complex that includes WL 40/41 is a valley-bottom wetland, and MODFLOW fluxes were used. However, the "upland southwestern tip" of wetland WL-40/41 which lies within the project boundary was defined as an upland wetland, and the Darcy Flux method was used to analyze this portion of the wetland separately. The applicant's definition of wetlands by their topographic position is not supported. Wetlands of the same complex are not simultaneously perched and tied to groundwater.

Provide additional evidence and support for the hydrological inputs for this wetland complex.

WL 6

Volume 1, Figure 4-8, Cross-section D-D' shows a proposed road up to the proposed impacts area of WL 6. The road cross-section shows a roadway that is approximately twenty feet high and fifty feet wide. Even if this was a single-lane road, the side slopes on this roadway would be greater than one-on-one, which is too steep as a feasible side slope.

Is Figure 4-8 the final drawing for the proposed roadway and impacts to WL-6? If so, please provide further detail on the proposed construction of the roadway with side slopes and design that ensures that portions of the roadway do not erode into adjacent wetlands areas. If Figure 4-8 is not the final overview and cross-section for the proposed impacts to wetland W-6, please provide the final project plans. Project plans should include the road width, including shoulders, height and side slope. Project plans should also include any ditching that is associated with the movement or containment of stormwater associated with roadway and infrastructure development.

Wetland 68

Wetlands 68 is a "settling base" for the Northern Pike as well as other fish and amphibians. This wetland sits on the bank of the Menominee River and is downstream from the mine site and proposed effluent discharge pipe.

Has a baseline assessment been conducted on Wetlands 68? Provide details on any proposed assessment or monitoring for this wetland.

Indirect Impacts to Wetlands

Aquila's original Part 632 Mine Permit application stated "Contaminated areas around Waste Water Treatment Plant (WWTP) will total 65,088 square meters." The source of the anticipated contamination was not explained. Dust? Contaminated water? Treatment chemicals? We previously commented on this concern, but our comment was not addressed in the DEQ's response. Now, in the Wetland Permit application, the facility site design has adjusted the location of the Waste Water Treatment Plant,

bringing it even closer to wetlands. In terms of the Wetland Permit specifically – what will be the environmental impacts of the WWTP's 65,088 square meter "contaminated area"? Since the WWTP will be located near the Shakey Lakes ERA, near Wetland 2b, and close to the south boundary of the Impacted Area (property boundary), demonstrate how far the impacts will be experienced, and whether the "contaminated area" would extend off-site, or impact the large wetland complex south of the Project, which Wetland 2b feeds?

Provide response.

According to The ERM Fish Community Study, "Fish tissue analysis for contaminants was performed at two Menominee River locations, two Shakey lake locations and the uppermost station on the Shakey River. Hexachlorobenzene and PCBs were detected in approximately 50 percent of the samples and 4-4'0DDE and 2,3,7,8-TCDD were detected in each sample. Mercury levels exceeded wildlife benchmarks in all sample locations." According to the EPA, methylation within the watershed can experience profound changes due to the interaction of sulfate (unregulated at this site), and mercury: "Watershed and waterbody conditions can undergo significant changes in capacity to transport, methylate, and bioaccumulate mercury. Examples of this include regions where sulfate and/or acid deposition rates are changing (in turn affecting methymercury production independently of total mercury loading), and where the trophic status of a waterbody is changing. A number of other water quality parameters have been correlated with increased fish tissue concentrations (e.g. low pH...)"

How will MeHg cumulative impacts further impair the Menominee River watershed? What are the human health concerns (mercury exposure), given the strong reliance upon fish in the diets of many residents, including treaty-protected rights to hunt fish and gather?

Provide response.

Does the proposed long-term wetland monitoring address mercury methylation (MeHg production) in freshwater wetlands at the Back Forty site?

Provide response.

In the remaining Back Forty wetlands, what are the anticipated rates of MeHg production or MeHg accumulation?

Provide response.

In the mining permit, non-acid generating (NAG) waste rock was to be used to build the waste storage area embankments containing the thickened tailings mixed with waste rock (EIA Vol I, Section 5.6). Greater volume of this material will now be required. Approximately 75% of the waste rock was determined to be potentially acid generating (PAG). An analysis needs to be conducted to determine whether there is enough NAG material to construct sound embankments.

The embankment material needs to be both NAG and not subject to leach contaminants. Previous testing determined that several contaminants will leach from tailings or waste rock. Copper, cadmium, selenium, and zinc do not require acidic conditions to leach and are highly toxic to aquatic life. Arsenic and copper can leach under neutral pH if conditions are anoxic, as could be expected in pore spaces of an embankment. Scenarios under which PAG material or NAG material that leaches contaminants is

necessary to construct the embankment would put wetlands at a long term risk, potentially enough risk to warrant a new analysis of off-site milling.

The highly acidic (pH=3.0) and the amount of heavy metals (Sb, As, Cd, Cu, Pb, Hg, Se, Au, Zn) in the leachate from the mining permit data are pertinent to the wetlands application because tailings and waste rock are proposed to be either grading or filling-in many of these wetlands. The criticality of enabling and dumping such toxic wastes hundreds of feet from the banks of the Menominee River is irresponsible. In addition to the recklessness of this, Aquila should have to employ better recovery of these heavy metals (Sb, As, Cd, Cu, Pb, Hg, Se, Au, Zn) that are proposed to be present in the tailings leachate.

Provide significant detail on the minerology and any leachate testing performed on the NAG material proposed for placement within or near wetlands and/or streams for the construction of embankments. Specifically address the locations native onsite material will be used for embankment construction and where runoff from embankments may discharge to wetlands or overflow from uplands to wetlands and have the potential to or may alter surface water or ground water chemistry that supports aquatic resources. Provide details on how material will be contained in a manner to avoid chemical alteration or loading in wetlands and streams.

Dewatering the pit. The pit is to be dewatered by sumps on the pit floor rather than through dewatering wells. Logistically this seems like it could be difficult. The applicant should provide examples of where this has been done at other mines. If, after permitting, it is determined that dewatering wells are needed, there will be impacts to wetlands, as it will cause a drop in the water table ("cone of depression" is well documented at most mine sites).

Provide response.

The indirect impacts on wetlands did not consider the impact of dust – both non-toxic road dust and mineralized dust from ore stockpiles – on wetland vegetation. Figures (e.g. Vol I Figure 3-1) do not even show where access roads and roads throughout mine-site are planned. It is common for mining operations to determine wind directions, strength, and estimate dust volume and direction. Some mitigation (e.g. wetting stockpiles) can reduce dust in summer, but may be implausible in winter. Dust entrained in snow and ice may cover vegetation once snow is melted.

Another source of dust will be the waste rock piles. There is no description of what will be placed in the "mine waste storage area" on the southern perimeter of the pit, but it would make the most sense for the mining company to place waste rock here. Due to the proximity to wetlands, this is a potential source of dust impacts.

The applicant's air quality permit application states: "Although particulate matter will be controlled by air pollution equipment and fugitive dust practices, a small portion will disperse and deposit in the areas surrounding the Project.

Material will fall directly on the water bodies with some falling on their watersheds. The analysis considers that over the course of a year, the constituents will be geochemically liberated from the particulate matter that either falls directly on or drains into the annual water flows. This approach is conservative in that it ignores plant and soil uptake of constituents. Using an upper bound facility

emission rate basis is also conservative. Additionally, the time frame of full constituent liberation can take longer than a year.

With constituents potentially liberated and entering the waterways, the water quality at those locations may be impacted significantly. The four metal constituents (copper, zinc, lead and mercury) were compared directly to the applicable water quality standard. Sulfur, a non-metal, would weather by several chemical reactions resulting in conversion to a sulfate ion.

The data Aquila provided clearly shows wetlands and waters outside the mine site will have the wetlands on those properties diminished and contaminated with lead, mercury, arsenic and other known carcinogens and toxins.

Provide response. Include detailed information on how any airborne particulates may accumulate into wetlands and how wetland communities may be impacted by these materials. Include information on the known or modeled extent of airborne deposition that may occur by the proposed activities.

Sump pumps to collect seepage from the TWRMF are now in different locations, including very close to some wetlands, including Wetland C1 and Wetland 40/41 (Vol I Figure 3-1). Was any analysis done to determine if the sumps could impact wetlands hydrologically?

Provide response.

The [wetland hydrology] report states: "The purpose of this evaluation is to assess the potential for indirect impacts to wetlands and streams that are outside of any proposed direct activities due to the project construction and operations. …Under operation conditions, depth to groundwater remains minimal for valley-bottom wetland C1 and 2b/A1/A3, due to their distance from the pit."

What exactly is minimal?

"Wetland WL-6, located in eh southwest part of the project area, was delineated on-site, but was not delineated off-site."

How can the applicant access potential impacts off-site if the wetland was not delineated?

"None of the remaining wetlands under consideration would have more than 50% of its watershed removed", and "A second, semi-qualitative estimate of indirect wetland impacts was made. This estimate includes these wetlands immediately adjacent to project areas that would lose over 50% of its watershed due to site conditions", and "Potential indirect impacts to wetland functions and values… in close proximity to wetlands."

What is the criteria for 50% of a watershed? How is it determined that this is an impact? What is impacted when 50% of a watershed is lost?

Provide response.

Off-site Impacts

The applicant provides no relevant evidence to back up its claim that NO Indirect Impacts will extend off-site; its claims to this effect contradict hydrology, Aquila's original groundwater modeling, and relevant fact-based research. Many of the parameters used in the hydrology data were collected off-site or were estimates and assumptions, not supported by local, relevant or adequate data.

The groundwater model requires local data in order to accurately predict impacts to wetlands: precipitation, evapotranspiration, run-off from uplands, run-on to wetlands, vertical hydraulic conductivity, and stream flow. None of this data was collected onsite.

The modeling underestimates the extent of groundwater drawdown. The Back Forty mine will have much greater impact on wetlands than acknowledged in the permit application.

Please respond. Provide detail on how the extent of impacts to hydrology have been determined.

Least Environmentally Damaging Practicable Alternatives Analysis (LEDPA)

The applicant did not sufficiently examine alternatives that demonstrate other off-site or on-site configurations, size, extent, costs, or wetland impacts are not feasible and prudent as required by law under sections 324.30311(4)9b) and 324.30311(5). Table 4-1 say simply "ore body inaccessible" through Alternative A, yet the narrative says "a large portion of the primary orebody would be inaccessible."

"Economic Viability" is not sufficient grounds for rejecting a feasible and prudent alternative.

The applicant claims the impacts are unavoidable – no feasible alternatives. Feasible Alternatives A, B, C, D, E, F, G, and H were all discarded as either "not economically viable" or "not prudent" – strongly suggesting that the driving reason for rejecting alternatives is reducing cost, rather than reducing the impacts to wetlands.

Under Michigan regulations, Aquila bears the burden of demonstrating that wither (a) the proposed activity is primarily dependent upon being located in the wetland, or (b) there are no feasible and prudent alternatives, and they must show that they are using all practical means to minimize impacts to wetlands. An economic analysis needs to be conducted to determine the feasibility of moving the mill out of wetland areas.

Further, the LEDPA states: "Direct impacts to these wetlands are unavoidable to a large extent, as will be described in this document." The LEDPA does not specifically address why impacts to wetlands are unavoidable or specifically minimized. The LEDPA offers statements such as: "close to the mine pit in order to minimize the overall Project footprint, and subsequent impacts to wetlands, streams, and other environmentally sensitive media. In addition, a more compact footprint reduces internal transportation (materials handling) costs", but these rationale fails to document how the proposed site layout avoids and minimizes impacts to wetlands and aquatic resources.

The project proposed 5.6 acres of wetland impact due to waste storage and 3.56 acres of wetland impact for holding contact water (from both processing and extraction). Section 12 of the Joint Permit Application states: "the proposed project has been designed to avoid wetland impacts where possible and to minimize and mitigate unavoidable impacts." However, the analysis in the LEDPA does not

provide detail on how wetlands and aquatic resources are avoided or minimized in any of the alternatives within the narrative.

Rather than give serious consideration to Alternative B – or any other alternative – the applicant neatly dismisses each alternative as not feasible. According to the Michigan Administrative Code Review Criteria, alternatives may be considered a feasible and "least environmentally damaging practicable alternative" (LEDPA) – even in cases where this would require property not currently owned by the applicant, and even in situations where the LEDPA is not the most profitable for the applicant. Rule 281.922a (Permit application review criteria) of Michigan's Administrative Code states:

> *(8) Unless an applicant clearly demonstrates otherwise, it is presumed that a feasible and prudent alternative involving a non-wetland location will have less adverse impact on aquatic resources than an alternative involving a wetland location.*
>
> *(9) An area not presently owned by the permit applicant that could reasonably be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity is a feasible and prudent alternative location.*
>
> *(10) An alternative may be considered feasible and prudent even if it does not accommodate components of a proposed activity that are incidental to or severable from the basic purpose of the proposed activity.*
>
> *(11) An alternative may be considered feasible and prudent even if it entails higher costs or reduced profit. However, the department shall consider the reasonableness of the higher costs or reduced profit in making its determination."*

The applicant failed to include basic economic information necessary to substantiate their claim that the selected facility design is the project's only economically feasible alternative. Aquila's review of LEDPA alternatives failed to evaluate economically feasible solutions used (or proposed) by other nonferrous metallic mines in the region. For example, milling facilities could be moved to another location, to minimize impacts to wetlands – but the applicant's review of feasible alternatives failed to identify any non-aquatic sites or sites where there would be less impact to aquatic resources.

Aquila has dismissed the alternative of off-site milling that would significantly reduce their profit margin and make the project uneconomical. However, their conclusion that it is uneconomic is unwarranted because they have not considered other costs.

Provide additional detail on how the LEDPA addresses how the wetland impacts are unavoidable and how the preferred alternative minimizes impacts to wetlands and aquatic resources.

"Construction of the mine waste storage area liners will involve the direct and unavoidable filling of approximately 4.37 acres of wetland complex WL-B1/B1c/52/B2 (including 253 linear feet of intermittent stream segments) east of the mine pit"

Provide specific detail on how mine waste storage liners are unavoidable impacts to regulated wetlands. Additionally, design for the mine waste storage liners are not shown on the project plans or cross-section for impacts to this wetland complex. The proposed impact should be accurately and adequately represented on the project plans so a feasible and prudent alternative may be identified and documented or the applicant can demonstrate that no alternative exists.

LEDPA: "South of the mine pit, approximately 1.23 acres of wetland WL-6 and 3.26 acres of wetland WL-4A will be filled due to waste rock storage liner and contact water basins (Figure 4-3)."

Provide specific detail on how mine waste storage liners and contact water basins are unavoidable impacts to regulated wetlands. As previously stated, design for the mine waste storage liners are not shown on the project plans or cross-sections for impacts to this wetland complex. The proposed impact should be accurately and adequately represented on the project plans so that the proposed impacts to regulated wetlands so either a feasible and prudent alternative may be identified and documented or the applicant can demonstrate that no alternative exists.

Approximately 1⁄2 mile east of the proposed mine site is a large block of state forest land. The wetland information in the permit application does not include data on this parcel of land, but it appears to be largely upland forest. Aquila appears to control the minerals on this property, which is adjacent to other Aquila-owned lands. An alternative that was not considered during previous analyses is moving the mine facilities to an upland site to minimize impacts to wetlands. This location is close enough to the proposed mine site that the increased transportation costs should not significantly impact the economics of the project. The Preliminary Economic Assessment for the mine shows that change in cash flow is least sensitive to the capital and operating costs, and most sensitive to the metal price and grade (PEA 2012, Figure 1-1).

It appears that most of the stream and wetland impacts might be avoided if the mine facilities could be moved further uplands to a dry site, possibly other state lands.

The development of the mine and mill site property will require the destruction of 28 acres of wetlands and over 900 linear feet of streams (Vol II, Section 6). Approximately ½ mile to the east of the proposed mine site is a large block of state forest land. The referenced wetland information does not contain data on this parcel of land, but it appears to be largely upland forest.

An alternative that was not considered during previous analyses is moving the mine facilities to this upland site to minimize impacts to wetlands. This location is close enough to the proposed mine site that the increased transportation costs should not significantly impact the economics of the project. The Preliminary Economic Assessment for the mine shows that change in cash flow is least sensitive to the capital and operating costs, and most sensitive to the metal price and grade (PEA 2012, Figure 1-1).

Please respond. Provide significant detail on why this area was not included in the LEDPA analysis and examined as a feasible and prudent alternative for non-wetland dependent activities. Include any information or documentation for consideration of this property as a feasible and prudent alternative for avoiding and minimizing impacts to wetlands and streams.

Applicant's "Feasible and Prudent (Least Environmentally Damaging Practicable) Alternatives Analysis (LEDPA)" relies on significant changes to facility design. Before impacts to wetlands can be permitted, the applicant must review alternatives – but the applicant failed to consider moving the mine facilities to an upland site to minimize impacts to wetlands. Moving the mill to an upland site would avoid a number of problems with the current plan, including greatly reducing impacts to wetlands and streams, eliminating potential for uncaptured leachate to reach wetlands and groundwater, and avoiding releasing contaminated water to the river.

Provide detailed clarification on upland alternatives considered in the LEDPA and on why further consideration or exploration of upland alternatives, including a detailed analysis of off-site milling and waste storage or disposal alternatives, were not included as part of the LEDPA.

The applicant misinterprets Michigan's Review Criteria. First, an alternative must be considered as potentially feasible and prudent if "the alternative is available and capable of being done after taking into consideration cost, existing technology, and logistics" AND "the alternative would have less adverse impact on aquatic resources." Independent review provided by the Center for Science in Public Participation (CSP2) dismisses the applicant's claim that potential alternatives are not economically feasible or prudent. In order to accurately compare economic feasibility of different mines, the ore must be described as AuEq, the gold equivalency (industry standard), rather than % or grade. The applicant did not express economic feasibility in standard terms, making accurate and verifiable comparisons difficult. The applicant dismisses several potentially feasible alternatives, and does not give due consideration to "feasible and prudent alternatives (which) may include any or all of the following: "(i) Use of a location other than the proposed location. (ii) A different configuration. (iii) Size. (iv) Method that will accomplish the basic purpose."

In their review of Alternative B, it becomes evident that the applicant's consideration of off-site milling is extremely limited (REQUIRING an existing idled mill plant, REQUIRING an abandoned open pit mine, REQUIRING the use of subaqueous tailings disposal, REQUIRING long-distance transportation to the mill site). Wetland impacts are hardly mentioned. Multiple arbitrary limitations (a set of at least four difficulties, bundled together) preclude serious consideration of Alternative B. There is no mention of simply processing ore on a property somewhere nearby, for example – or processing at an idled mill where tailings storage would need to be constructed – or building a new processing plant adjacent to an old spent pit mine, and so forth. The applicant overlooked more options than were evaluated.

Please respond.

LEDPA: "This approach also reduces impacts where practical to other non-aquatic (but nonetheless valuable) resources including upland forests and cultural resources, as well as viewsheds.

"The design and layout of the tailings and waste rock storage facility has been optimized on-site to achieve a combination of minimal footprint, limited vertical extent to protect viewsheds, and compact location near the pit and beneficiation facilities so as to reduce vehicle movement and associated haul distances and dust generation, as well as to minimize the overall surface disturbance and areal extent of the combined facilities."

Provide additional detail on how these considerations meet the objectives of the LEDPA.

The former site plan (now Alternative D) segregated oxide and flotation material to "optimize leachate management". How has leachate management now changed, and specifically what is the difference with respect to impact to wetlands due to moving, managing, and treating leachate?

Provide response.

The former site plan was discarded in part because waste would be "less dense" than anticipated. There is no explanation for what is behind the anticipated change in waste material density that drove the need for the greater area required for waste disposal, or why a change in anticipated density drove the separation of oxide and flotation storage facilities, or how this changes the impacts to wetlands.

Previously the tails were to be dewatered to 73-81% solids (Mining Permit Application Appendix H Section 4.7). There is no description of whether the tailings management or water content has changed, and whether that is part of the reason that waste will be "less dense" than previously calculated. There is an alternative (Alternative H) for thickened tails co-disposal with waste rock, rejected because of the need for an "intricate system" of access roads. A more complete description, weighing economic and environmental impacts is needed to determine whether the thickened tails option is feasible and prudent. Additional water content from tails may pose an additional risk regarding embankment integrity, which in turn is a risk to wetlands.

Provide detailed response. Include clarification on changes to the waste material density and further considerations on Alternative H. Provide details on the "intricate system" of access roads and considerations to how this alternative may avoid and minimize impacts to regulated wetlands. Include a comparison on the amount of wetland and aquatic resource impact for each option. Include the alternative layout for access roads that provides for the practicable alternative for design with the least amount of resource impact.

It is confusing that Alternative F (separate waste rock facility) was discarded but this new waste area for unspecified waste was incorporated into the wetland permit mine site design. The separate waste rock facility was eliminated in part because of the additional cost of a liner. How will this new storage area be designed? Will it be lined (thickness?) with leak detection? How is this area different, economically and environmentally, from Alternative F?

Please clarify.

An obvious benefit to wetlands would be to move the ore processing off-site (Alternative B), resulting in a much smaller footprint. The alternative for processing ore off-site was rejected with no real analysis in either the 2015 Environmental Impact Assessment or the 2017 Wetlands Permit application.
A detailed economic analysis needs to be conducted to determine whether an off-site location could be feasible and prudent. The alternatives analysis stated that going off-site would increase environmental risk due to spills, increase greenhouse gas emissions, and that although there are former processing facilities that ore could be taken to, upgrading the mills would have technical challenges and be uneconomical based on the low grade ore. However, details are lacking. A detailed analysis could include some or all of the following:

- *State the value of the ore as gold equivalent (AuEq – 48% of the project revenue is due to gold projection, PEA, 2012) in order to compare transportation cost and profit against similar mines. Ore value is currently presented as the grade of each individual metal in specific zones, which makes it impossible to compare to the AuEq grade of nearby mines.*
- *Provide economic analysis, complete with maps of land ownership, of nearby upland locations where milling could occur without impact to wetlands.*
- *Provide detailed economic analysis that shows the distance to the closest former mines or towns where ore processing could occur, along with the cost for truck and/or rail transport.*
- *Are there opportunities to utilize former mine facilities that would reduce or eliminate the cost of needing to install a liner? What other costs could be offset?*

All of the project objectives (Vol II, Section 6) can potentially be met with an off-site facility, and some objectives could be enhanced (e.g. local jobs).

Provide response.

Section 6 of the LEDPA is written as follows, regarding the termination of pit dewatering: "As a result [of stopping pit dewatering operations], the pit will flood, thereby submerging the relocated waste rock and thereafter isolating it from oxygen." Since dewatering is necessary to keep the mine dry during operations, clearly the hydrologic gradient (and resulting conductivity and groundwater flow) is positive and connected to the groundwater system. The groundwater system is not anoxic, but had a stable dissolved oxygen concentration that will be continually replenished by flowing groundwater.

Provide response.

Project purpose: "Increase domestic production of copper, zinc, and gold for American markets, which are currently heavily dependent on foreign imports… As of 1990, domestic zinc accounted for only 5 percent of total worldwide production, in spite of the fact that the U.S. is the greatest consumer of zinc (United States Geologic Survey [USGS], 2016a). While the U.S. is not the greatest consumer of copper, the U.S. is a net importer, producing only 7 percent of worldwide production of new copper, with the majority of production occurring in Arizona (USGS, 2016b). For gold, the U.S. is the fourth leading producer worldwide (USGS, 2015). To address these production and consumption imbalances and displacements of zinc, copper, and gold, the Back Forty Project seeks to increase domestic production of these metals. The expansion of the U.S. mineral availability in the public interest."

Aquila is a Canadian Company. Where will the copper, zinc, and gold ore go once it leaves the mine/ mill site? Lundin's Eagle Mine ore does not come back to the USA, at least directly. Eagle Mine's ore concentrates goes to Canada and then possibly overseas markets. So when Aquila states that they want to "increase domestic production" of these metals, yes, it is increasing the domestic production, but is it helping the USA by keeping the mined ores in the USA? If the metal ores are to be refined/ smelted in Canada, does the USA benefit by buying back these metals as imports? Eagle Mine transports all their Cu-Ni concentrates to Canada or overseas? It is misleading to quote the USGS and tout the Back Forty's contribution to the USA metals market because the nearest copper refinery in the USA is in UT – is Aquila going to transport their Cu concentrate to UT for refining, while Aquila's industry correlative Eagle Mine transports their Cu-Ni concentrates to Canada?

Aquila states "All concentrates will be packaged and transported by truck to customers for further processing" (EIA Vol II). Nowhere does the EIA state that the concentrated ores will stay in the USA, which is what Aquila is championing in the "Project Purpose" of the Wetlands Permit [application]. What are the transport plans for the ore to market (Rail, truck?) Is the ore going to be transported to Sudbury, Ontario, Canada?

Provide response. Include further clarification on how the proposed project meets the project purpose of increasing domestic production of copper, zinc and gold.

Mitigation

Mitigation Site Search

The approach for finding mitigation sites was cursory and not compatible with historic land use.

The mitigation site search conducted by Stantec was incomplete. The GIS search excludes several large restorable areas identified as high restoration potential according to MDEQ's Wetlands Map Viewer. In addition, site search maps were missing from the mitigation plan (Z10, Z11, AA10 and AA11) and maps provided were difficult to read. The applicant should provide a new site search showing all High Potential Restoration areas over 10 acres in size according to MDEQ's Wetlands Map Viewer. The applicant should also contact property owners of suitable sites to determine interest in selling parcels or conveying conservation easements.

There is a larger area on the Oxbow (Weber Property) that could be used for mitigation. Why was this not considered? It is closer to the affected area and perhaps a better exchange for the land and soil values. Have these factors been studied or considered?

Provide response (see questions above).

No demonstration that mineral rights are secured. Additional concerns must be raised in the context of property's ownership. Has the applicant demonstrated their ownership of mineral rights on the [proposed preservation] property?

Please respond.

<u>Justification for Preservation</u>

The preservation proposal does not meet standards outlined in Michigan Admin. Code R 281.925 4(d).

Neither of the parcels analyzed in the application (one parcel is 268 acres and the other is 480 acres, collectively referred to as the Mitigation parcel) perform exceptional functions, nor are they a rare or endangered ecological wetland type. The application states that the functional values of the wetlands to be preserved are comparable to the wetlands impacted by the proposed mine project, there is little mentioning any exceptional values performed by either proposed mitigation parcel (the East Parcel has good habitat structure, but that was all that was noted in regards to exceptional functions). Additionally, the wetlands impacted by the mine project are of rare ecological type, some pose vernal wetlands (or pools) and support state listed species.

Provide additional justification that the site meets the three criteria for wetland preservation. Specifically, provide additional justification on the exceptional physical or biological functioning of the site. Data that could be used in conjunction with the MiRAM scores to document that the site is exceptional and therefore worthy of preservation could include: comprehensive vegetation surveys, use of floristic quality assessments (FQA), and surveys for threatened and endangered species. Also, provide more detail on potential threats to the site (e.g. evidence of ATV use, value of timber on site, potential for development, invasive species presence, etc.)

How will the beneficial functions of the proposed mitigation parcel serve to provide beneficial function and value within the watershed and for the aquatic resources? How does this mitigate for the loss of wetland function and value near the project site?

Provide response.

Wetlands are being proposed for a land swap to a conservation easement of 292 acres approximately 15-20 miles away from the impacted area. There will still be significant loss of wetlands due to not creating replacement wetlands.

The functions these [onsite] wetlands provide will be lost and will do nothing to help mitigate the likely pollution that will be a result of this proposed project in its current condition.

Please respond. Include details on why the proposed preservation site mitigates for the proposed loss of 28.4 acres of wetland habitat within the wetland mitigation watershed. Include additional detail on why preservation is the preferred alternative for mitigation for this project.

Threats to Proposed Mitigation Parcel

Aquila has not demonstrated that the parcel they are offering as mitigation is under threat of loss or degradation, nor are there any destructive land trends occurring in the region.

The applicant controls the property that contains the proposed mitigation site through its broker, Northern Michigan Land Brokers (NMLB). They claim that they intend to preserve the wetlands in perpetuity and that these wetlands are threatened by "development", but these claims are unsupported.

Surrounding properties along the river appear sparsely developed. The property contains riparian wetlands subject to flooding – so the property cannot be under a significant development threat, as must be demonstrated.

Provide further clarification on the identified threats to the wetlands within the proposed preservation parcel. Threats should include existence of evidence of destructive land use changes which are consistent with local and regional land use trends. Provide details on how the permanent protection of the proposed preservation area will ensure how the wetland functions will not be lost or substantially degraded. Provide clarification on how proposed logging activities degrade or impair wetland function and value.

Provide additional information on the current or foreseen demonstrable threats to the wetlands within the proposed preservation site.

MiRAM

The first page of the MIRAM rating form states: "The MiRAM was designed to be used during times when adequate plant growth allows for proper identification of most plant species within the Wetland. Typically, this follows the growing season for a particular region. MiRAM evaluations conducted outside the growing season will receive an additional 10 points due to the inability to properly identify all wetland features during this time of year. MiRAM is not designed to be used in times of snow cover. "MiRAM forms for the proposed mine site that include dates indicate that most of these wetlands were surveyed from May 1-4, 2017. Conducting the MiRAM surveys of the wetlands on the proposed mine site this early would have resulted in many missed species and artificially lowered ratings for these wetlands, even with the 10-point compensation added in. The MiRAM evaluations were poorly prepared. Additional problems were noted:

● Boxes under "Checklist of features and conditions to observe during the field inspection" were ignored.
● Box indicating whether or not an "approved" threatened and endangered species survey has been completed is checked "No" on all of these forms – despite the fact that area-wide rare species surveys were supposedly done in 2015, as part of the Environmental Impact Assessment of the site. Clarify: are the area-wide surveys of 2015 considered "approved threatened and endangered species surveys"?
● The MiRAM forms do not indicate which wetland they apply to. Instead of "WL-14" or similarly clear, each wetland is identified as "Back Forty Mine" with T/R and Section #s. This data cannot be readily referenced to maps of the site, or diagrams showing each wetland.

Please respond.

On page 25 of Appendix A-1 (see Vol VI) the applicant states that the MiRAM ranking system "provides a set of narrative and quantitative rating metrics to evaluate wetland value and function", including "Rare species and habitats." Yet in every case they acknowledge on the MiRAM form that no approved T/E survey been completed for the wetland. How can the wetland be assessed for "rare species and habitats" if no approved T/E survey was done? The surveyors habitually responded "No" to the "Rare species and habitats" question, on all forms, despite the fact that one facultative wetland (FACW) plant (Vasey's rush, Juncus vaseyi), State-Threatened, is documented from the mine site. Vasey's rush is found in wet and seasonally wet prairie and 15 savanna-related ecosystems in Shakey Lakes savanna. It has a FQI coefficient of 10 (on a scale of 1 to 10), which means that it has a strong affinity to these natural, unaltered communities.

Please respond.

In reviewing the MiRAM, a number of math errors were identified including on the following pages (of 645 document pages):12, 13, 50, 56, 69, 70, 95, 108, 115, 129, 135, 144, 147, 186, 200, and 487.

Provide clarification.

<u>Cultural Significance of Impact Site</u>

Back 40 Mine MiRAM does not acknowledge important cultural value of the site. In the Back 40 Mine site Rapid Assessment data sheets (MiRAM) located in Documents 5R, there is an evaluation of fifteen wetland areas within the mine project area. Of all fifteen wetland areas assessed by Applicant, none of the assessments acknowledge the cultural significance of the wetlands.

Provide updated MiRAM data sheets acknowledging the cultural significance of the wetlands within the project area.

River Road is considered a "scenic area' and part of the Escanaba Forest Special Conservation Area (SCA). Impacts to these areas should be included in assessments of the cultural, scenic and recreational values of wetlands within this corridor and the impacts to these values are attributable to this project.

Describe how consideration was given to management goals and objectives within the Escanaba State Forest corridor and for the assessments of wetlands on State of Michigan lands. Include details on

considerations given to cultural, scenic, and recreation values. How did this consideration express itself in the MiRAM assessments conducted within the project area?

Appendix A

Water Balance Model

Applicant states that "The water balance model was run on a monthly basis for a total of two years under existing, operating, and closure conditions." Clarify was is meant by "two years under existing" conditions? Are the "existing conditions" limited to wetland hydrological data from monitoring data collected in summer of 2017 only?

Please respond.

Clarify comment "5.2.1 - Wetlands Modeled the model was run for the following 14 wetlands or wetland sub-divisions" – did the water balance model determine that 5 of the 14 wetlands (summary listed below) were "not influenced by regional groundwater elevations" or did that determination ("upland" versus "valley-bottom") actually precede the water balance modeling?

Please clarify. Detail how it was determined that certain wetlands complexes or portions of wetland complexes are not influenced by the regional groundwater model?

Why does the applicant conclude that the bottom of the wetland was reached? Both Piezometer and Soil Borings were done using "HAND AUGER" – not a mechanical auger. Hand-augering stopped at "resistance." Best practices dictate that soil borings must be done in order to demonstrate a site's "infiltration capacity characteristics" or to "determine the depth to groundwater and bedrock." The applicant asserts that the groundwater level is deeper than the bottom of the soil borings, in all cases, but none of these soil borings extended deep enough to "determine the depth to groundwater" or otherwise demonstrate that bedrock had been reached. All boreholes ended in silty sand; none of these shallow boreholes reached the level of the water table.

Clarify how the soil borings were used to demonstrate the depth of groundwater in relation to the wetland complex, the location or existence of restrictive features that would cause perched or "upland wetland" conditions, and infiltration (recharge) rates and wetland capacity data that support the water balance model.

Despite a lack of physical evidence, the applicant concludes that the bottoms of wetlands are resting on "confining layers" or impermeable aquitards. None of the sites included as "Soil Borings" recovered samples of the bottom conditions, however. None of the Soil Borings drilled through a clay lens or demonstrated an impermeable bottom layer. Physical evidence does not support the applicant's conclusions about "Upland Wetlands." For the applicant to reach defensible conclusions about wetlands, Soil Boring Logs would need significantly more detail and interpretation.

Provide a detailed response.

Groundwater elevations and other hydrological data collection, gathered in support of the Part 632 Environmental Impact Assessment (EIA), cited in the preparation of this Wetland Permit application, took

place during a number of drought years, roughly 2007-2011. Is the underlying data understood to be accurate – or is the applicant underestimating water levels in groundwater? See [Figure 2, Cross-section B-B'], which mixes water table data from 2011 with wetland water elevation data from 2017. Drought mapping info from NOAA confirms that this part of the U.P. remained in drought throughout the EIA preparation years.

Please respond.

The applicant's hydrogeological water and soils studies are insufficient to conclude that there will be no significant impact to wetland levels, groundwater or river. There are insufficient boring and monitoring wells in wetlands, groundwater, and stream flow and flow monitoring. Moreover, there are insufficient "fence diagrams" showing that wetlands and mining, and dewatering, are not connected to the groundwater and/or seeps, creeks, river.

Provide response.

It is not clear from the consultant's report what share of the wetlands to be preserved are forested.

Please clarify.

Wetland Watershed Modeling

The Applicant states: "Frozen soil conditions during the winter months and snowmelt in the spring were accounted for in the model. Precipitation was summed between December 1 and March 31, and applied equally over the 30 days in the month of April". By applying four months of summed winter precipitation evenly over the whole month of April, the applicant may have been, effectively, adding (precipitation) water into the groundwater system where it never actually entered. There are numerous unconsidered variables with this model including sheeting and flash run-off, concretized soil conditions due to refreeze and frost reductions in absorption and permeability, undetermined hydrology (such as channelized flow), and limited (and undefined) wetland holding capacities. Soils thaw from top down and if frost is in the ground, this results in increased runoff quantities from saturated surface soils because infiltration cannot occur.

The [wetland watershed budget] model assumes that all snowmelt will leave evenly over a 30 day period in April, and this will recharge the groundwater (Vol R, Sections 5, 6). There is no observational, historical, or on-site evidence that this assumption is adequate. There are several problems with this.

- *If ground freezes before snowmelt, much more will run-off than will recharge groundwater.*
- *If sediments are muck, silt, and clay, snowmelt will run-off rather than recharge groundwater.*
- *If the wetland is already flooded, additional water will runoff, not infiltrate.*
- *There is no assessment of actual snow-water-equivalent (SWE), which makes it impossible to determine the amount that could be available to recharge wetlands.*
- *There is no assessment of weather or climate trends, which indicate increased periods of heat and drought. Evapotranspiration will be higher in droughts and snowmelt recharge will be lower if precipitation occurs as rain in the fall rather than snowmelt. These need to be included as part of a range in assessing hydrologic impacts.*

Provide detailed response. Include information on considerations to winter conditions, frost, permeability of wetlands soils, infiltration, evaporation, and storage capacity within the wetland watershed modeling.

Other than piezometer data, no information that went into the water balance was collected on site. Precipitation is from Stephenson, MI 1971-2000, using 1965 (flood year) rainfall distribution (Vol R Section 5). Run-on (to wetlands), evapotranspiration, and run-off (from uplands) were not data collected on site but from USGS reports (1974, 2012) and other sources. Evapotranspiration was also estimated using an online calculator for irrigated alfalfa and data from a lakeshore, resulting in a range from 18"-34" per year. Run-off (to wetlands) from USGS and NRCS ranged from 6" – 14" per year, depending on soil types and the purpose of the study (USGS – determining runoff, NRCS – determining stormwater flows).

Provide clarification on why wetland watershed modeling was not supported with onsite meteorological or site specific data.

The following statements are from Volume 6, Section 6

Paragraph 1: "The analysis is therefore limited in that it does not have the ability to assess changes in wetland ecology or losses in wetland values and functions which need to be factored into the wetland mitigation plan for the Project." How then do they feel confident enough to submit the report? If the analysis is not good enough to do this, how can we assure there won't be damages outside of the proposed impact areas?

Provide response.

Paragraph 2, Bullet 2: "The model uses a conservatively low estimate of runon into the wetlands which tend to overestimate hydrologic impacts to the wetlands." I am concerned that theses runons will be loaded with contaminants due to the location of the wetlands with respect to the; Mine Pit, Collection Sump, Mine Waste Storage Areas, Overburden Stockpile and facilities related to the Process Plant.

Provide response.

Paragraph 3: "Overall, modeling results show indirect hydrologic impacts likely to occur to wetland lobes WL-C1 Lobe and WL-A1 West-North Lobe during operating conditions." This is of great concern to us, as adjacent property owners that share the WL-A1 Lobe and its associated WL-2b Lobe, both of which connect off-site. How do they plan to deal with these, "indirect hydrologic impacts" off-site?

Provide response.

Paragraph 4: "This estimate included those wetlands immediately adjacent to Project Area that would lose a moderate percentage of watershed due to site conditions ..." I would like to know what "a moderate percentage" is. Certainly much more a concern to the owners of said, "wetland immediately adjacent to Project Area". How do they plan to mitigate this?

Provide response.

"Confirmation of the above findings pursuant to the model can only be accomplished by wetland hydrology and vegetation monitoring during mining operations". So what they are saying is that they are not sure until something actually happens, if something is going to happen. Once again, how are they going to [account for impacts] off-site?

Provide response.

Environmental baseline studies were conducted between 2007 and 2017. The project area experienced abnormally dry springtime (early April or May) conditions 5 years (2007, 2011, 2012, 2013, 2015), with moderate or severe drought conditions occurring two years (2010, 2009). Only four out of the eleven years (2008, 2014, 2016, and 2017) had a spring with no drought recorded, and these patterns are due to highly variable winter precipitation conditions (US Drought Monitor). As the area recovers from intermittent dry weather between 2007-2015, with no springtime occurrence of drought on 2016 and 2017. Recent drought occurrences may also influence Aquila's flood modeling and estimation risk for mass failure.

Provide response on how these weather patterns have been taken into consideration with wetland watershed modeling, data collection during dry periods, and in the site wide water balance.

The project proposes the disruption of a few small streams that originate within the project boundaries and then flow beyond them. These streams are essential sources of water for the wetlands that exist outside the project's perimeter. Since 2006 a citizen's monitoring project has focused on several small streams in the vicinity of the Back Forty project. The data that has been collected during that time shows these streams to be critical habitat for a broad array of macroinvertebrates that form the basis for the ecosystem that borders the Menominee Rover. Regardless of how dry the conditions were during our monitoring efforts, even the smallest of streams maintained a steady flow of water. This water is essential for downstream wetland formation and maintenance of healthy riverine habitats. Not addressing the impact of upland stream and wetland disruption [loss of wetland and stream watersheds] on downstream wetland health is a serious omission and should be corrected before a permit is granted.

Please provide response.

Beyond the lack of clarity in derivation of groundwater levels, the uncertainty in the groundwater elevation characterization and the lack of information on the relationship of groundwater levels to wetlands led us to wonder how "upland" wetlands had been determined. There seems to be no boring data for most of these "upland" wetlands. Some of the piezometer data that does exist indicates that some wetlands classified as "upland" are supported by upwelling from deeper groundwater, see upward gradients in Table 4-2 of "6 R- Wetland Permit Application Nov 2017 reduced App A1 rev Dec 2017.pdf". For example, wetland WL-14 has PZ-01 and PZ-01A installed at depths of 9.52 and 13.85 feet, respectively. Table 4-2 states that the gradient is "mostly up". With an upward gradient from a depth of 13.85 ft, it is unclear how WL-14 could be isolated from the deeper groundwater as claimed on page 17 of "6 R- Wetland Permit Application Nov 2017 reduced App A1 rev Dec 2017.pdf".

> *"These wetlands were not incorporated into MODFLOW because these wetlands are positioned well above the regional water table (as previously described), and therefore, are not affected by water table lowering due to pit dewatering."*

Provide a response that further clarifies the how groundwater elevations were derived for the wetlands classified as “upland” wetlands. Include further clarification on how hydrostatic gradients were used to determine wetland hydrology sources.

The Darcy Method

The applicant used the "Darcy Method" – a fundamental principle underlying the study of water flow in porous media – to help determine wetland type, and wetland impacts. Explain why the Darcy Method was selected for the use in determining certain wetland sites, while other wetland determinations incorporated the MODFLOW groundwater model?

“Darcy's Law that was derived originally empirically 160 years ago, has been used successfully in calculating the (Darcy) flux in porous media throughout the world. However, field and laboratory experiments have demonstrated that the Darcy flux employed in the convective disperse equation could only successfully predict solute transport under two conditions: (1) uniformly or densely packed porous media; and (2) field soils under relatively dry condition. Employing the Darcy flux for solute transport in porous media with preferential flow pathways was problematic. (...) Darcy's Law inherently merges momentum and in that way erases information on pore-scale velocities. For that reason the Darcy flux cannot predict flow in media with preferential flow conduits.” (A Review of Darcy’s Law: Limitations and Alternatives for Predicting Solute Transport. Steenhuis, et al., 2016)

Far from being either “uniformly or densely packed” or “field soils under relatively dry condition”, the applicant’s Soil Boring logs identified ALL of the wetlands as “wet” (water-saturated soils) from wetland surface to the bottom of the boreholes; no boring sample or other physical evidence about whether there is “uniformly” or “densely packed porous” soil is provided for the zone between the bottom of wetlands (where auger was refused and the applicant claims an aquitard exists), and the underlying groundwater.

Provide clarification on why Darcy’s Law was chosen to represent hydrologic transport in the wetland watershed modeling. Provide detail on if any testing supported the conclusions of the modeling. Include specific detail on how a determination of groundwater connectivity, or lack of groundwater connectivity, was achieved in the wetlands that were modeled using Darcy’s Law.

MODFLOW Modeling

Reviewing groundwater data in Volume VI, Appendix A1, and comparing Figure 5-3 and Figure 5-5, there is an unexplained change in the elevation of groundwater, suggesting modeling errors or manipulations of MODFLOW constraints. Table 5-3 and 5-4 claim "Hydrograph indicates soil saturation in the spring and seasonal water level fluctuations during operations that do not deviate from existing conditions." Under wetland WL-14, the loss is greater than 10 feet. The applicant has attempted to isolate the wetland from the underlying groundwater – in order to limit their Indirect Impacts? – But this claim is not demonstrated.

Provide response.

The groundwater model used to simulate groundwater flow through the area uses constant head boundaries around the model perimeter in ways that allow extra water to flow through the system. This resulted in about 30% more water flowing through the system during steady state calibration than

should have flowed. This results in calibrated conductivity values that are much too high, which limits the drawdown near the wetlands.

Provide response that addresses the constant head boundary conditions of the model and how this reflects on drawdown conditions in or near wetlands areas.

The applicant's explanations only further confuse the question: "Comparisons of drawdown for this sensitivity run to those obtained from the calibrated model have not been made because there is no reference water table available to use as the starting point for a drawdown calculation, as the model for these parameter sets is out of calibration."

Please clarify.

Groundwater levels beneath the wetlands were artificially prevented from being drawn down by the dewatering because the model simulated the wetlands as River boundaries which provides too much water to the model domain. In other words, the model creates water that may or may not be there, and simulates a hydraulic connection in such a way as to limit the extent of drawdown. This allows the model to show almost no drawdown beneath wetlands that will probably end up dry, at least seasonally, when they otherwise are wet.

The RIVER boundary provides too much water to the groundwater and limits the drawdown beneath the wetland. While Foth (2015) claims the amount is limited to the average recharge rate for the area, the reality is that they overestimate the vertical conductivity through the bottom of the wetland, which allows the RIVER boundary to provide water to the groundwater table and prevent it from receding.

Provide response. Include details on how the definition of river boundaries/cell definitions and the establishment of these features in MODFLOW represent the site wetland conditions. Include detailed information on how the hydraulic conditions of the River boundary cell definitions represent the hydraulic conditions documented in onsite wetlands and the adjacent water levels during site operations in the wetland areas compared to the river bottom definitions at the wetlands. Specifically draw a correlation between the vertical gradients documented in onsite wetlands and how that information is represented in the river cell definitions representing the wetlands in the MODFLOW simulation.

The model uses appropriate boundary conditions on the domain boundary only in layer one, where it assumes no-flow conditions occur where there is a topographic (assumed to also be a groundwater) divide and a RIVER boundary where there is a river. Foth (2015) presents no data or information to suggest that the groundwater divide does not extend to deeper layers, therefore a no flow boundary should be used in all layers beneath a topographic (groundwater) divide. Groundwater does not flow through a divide, therefore the modeler should have used a no flow boundary.

Rather, Foth (2015) used a constant head (CH) boundary in layers 5 through 7 wherever layer 1 had a no flow boundary, therefore groundwater could enter or leave the model domain through the divide. Even in their response, Foth explains that no flow boundaries should have been used. "No Flow Boundary Conditions are commonly used at locations where an aquifer ends and there is no flow perpendicular to the boundary, or at groundwater divides, again where there is no flow perpendicular to the boundary" (Foth 2017, p 2, 3). Through the remainder of the model layers, they should have used no flow

boundaries because a divide is likely observed throughout the model domain unless there is evidence of fracture flow or other flow into the domain.

Provide response. Include details on how the establishment of the model without no flow boundary conditions below layer 1 may impact the model results.

The CH head on the boundaries was set equal to contoured groundwater table elevations (Foth 2017, p 10). The CH will therefore force the model to simulate head levels equal to the observed heads near the boundary. A CH will maintain the head at a set elevation by providing whatever flow is necessary to the model domain. If the flow is low, the only error could be the failure to simulate discharge to the river, leading to an underestimate in that discharge. However, if there is significant flow across a CH boundary that should have little flow, the boundary could mask a problem. Foth does not even present the flow through the CH, so the casual reader of the report cannot assess whether there is an error. I analyze the water balance for the model below, using the model files. The CH boundaries allow a flow through the model domain, which increases the overall flux and affects the model parameterization.

Foth (2017) claims that "boundary conditions were assigned along the model perimeter where they are required in order to allow solution of the finite difference equations" (Foth 2017, p 10). This suggests that the modelers had difficulty making the model simulation converge, so they used a CH to force convergence. Their justification, "[b]ecause the watershed boundaries were assumed to correspond to groundwater divides only for the Quaternary deposits, these surface features were not used to define internal or perimeter boundary conditions for the deeper layers …" (Id.). As noted above, CH could provide flow to the model domain at locations where there is none as it forces the heads to be as observed in some locations.

Provide additional comment on how the use of constant head boundaries without defined parameters of boundary conditions in lower layers could contribute to flow within the model as water moves between watershed boundaries or groundwater divides below layer 1.

Foth calibrated the groundwater model only in steady state mode. Steady state calibration involves adjusting the parameters so that a steady state simulation gives water levels and simulated fluxes that equal the target, or observed, values. Foth used only groundwater elevations, not estimated or measured fluxes, and therefore the model is not unique.

Provide comment.

There is no map showing observation wells or residuals. It is not possible to assess spatial biases that could be apparent on the ground.

Please respond. Please provide a map that includes the water level monitoring points illustrating the residuals between the measured water levels and the calibrated model calculated water levels.

There is no transient calibration, so the storage coefficients were simply taken from textbook values.

Please respond.

CH boundaries provide an inflow of 35,590 m^3/d and an outflow of 12,432 m^3/d. The CH inflow is more than 30% of the total inflow to the model domain. This is flow that crosses the boundaries into layers 2

through 7. This is a very large flux to add to the domain at depth without justification based on observed data or even based on a conceptual flow model (CFM). The large majority of the flow is through boundary reach 1, which is the CH along the north edge of the project area (16,135 m3/d net inflow). In summary, CH boundaries provide up to 30% extra flow to the water balance of the domain, and the majority is from CH boundaries in layers 2 through 4 under the river on the north edge of the domain.

Provide a detailed response on how the calibrated model took into account the flow required to meet the constant head boundaries and how this impacts the model results. Include information on any data collected to verify this model.

RIVER boundaries, as used to simulate wetlands, can provide up to the full recharge rate, based on the conductance being set so that at a 1:1 gradient the flux would equal recharge. This presumes the conductivity through the bottom of the wetland is similar to the conductivity within the upper layer of the alluvial formation. At the wetland in Figure 8 [WL-2b], horizontal and vertical conductivity equals 1.49 and 0.2 m/d, respectively, which is similar to the K=1 m/d used to estimate conductance in the RIVER boundary package (as determined from the GWVistas model file). Setting conductivity equal to that in the surface soil layer ignores the sediment that would accumulate at the bottom of a wetland which would likely form a skin on the bottom of the wetland that would impede seepage into the groundwater.

Without the seepage from the wetland, drawdown would expand further and increase the amount of indirect impacts to the wetlands.

Provide a detailed response. Include information on how the hydraulic conductivities used in the River boundary package were determined to represent onsite wetlands. Provide additional detail on any relevant information collected from onsite wetlands that supports the model conductivities used.

The direct modeling of wetlands, whether in the valley or in the uplands, assumes that water in the wetlands can seep into the ground through the bottom of the wetland as easily as it can percolate into a river bed or onto unsaturated ground. This modeling ignores the fact that the bottom of wetlands would be full of fine sediments that would impede the flow through the bottom of the wetland. This flow impedance would occur regardless of the groundwater level beneath the wetland. Currently, the modeling allows water to flow unimpeded to the groundwater, which prevents the drawdown cone from spreading.

Please respond. Provide information on how the vertical connectivity value was determined for wetlands and wetland soils. Include information on determining the depth of the wetland soils and the drainage and retention of surface water hydrology (recharge). Provide any information on how onsite data support the calibrations of this model.

Appendix B

Fish Community Surveys

There is mention of red horse and suckers but no mention of bass or sturgeon.

Provide response.

Water Quality

The applicant has not taken into account the quality of the effluent allowed to discharge and the increased potential for, and increased risk to aquatic resources from mercury methylation.

Provide response.

Reclamation

And not separating the more reactive (high-sulfide) tailings will result in some of these tailings being left on the surface in perpetuity, rather than being backfilled into the mine pit, where they can be isolated from atmospheric oxygen by water.

Provide information on the long-term, post closure and post reclamation, storage of potentially reactive materials near wetlands and aquatic resources. Provide significant detail on how these materials will be managed to ensure that leachate generated from surface storage does not enter wetlands and groundwater systems, potentially impacting aquatic systems after mine reclamation.

Cut-off Wall

LEDPA: "A subsurface, low-permeability cut-off wall is proposed adjacent to the west pit perimeter to minimize groundwater inflow to the pit during mining (and to minimize outflow from the pit after backfilling at closure)."

Provide additional detail on the anticipated groundwater movement through the proposed cutoff wall post reclamation.

Invasive Species Management

Invasive species management plan only includes statements about what will be developed and not what is actually being proposed. Language stating there are no "high risk" species onsite, yet the page 3 of 7 provides a list of high risk species that exist onsite.

Provide response and clarification.

Freshwater Mussels

Lead levels at the outfall will exceed impact threshold for freshwater native mussels. See Mixing Zone Calculation: "A lead concentration of 10 µg/L is used because this is the threshold concentration above which adverse impacts to mussels may occur. Solution of Equation 1 will define the downstream location at which point lead concentrations adjacent to the bank will drop below 10 µg/L. The approximate annual mean discharge obtained from the U.S. Geological Survey (USGS) gaging station at White Rapids dam (see Attachment 1) is 2500 cfs. River depth, d, is set equal to 2.5 ft as an approximation of the average depth across the river. Actual river depth was surveyed by Environmental Resources Management (ERM) (2011) as ranging from zero ft at the banks to approximately 6 ft in the center of the channel. River width at the location of the outfall is approximately 334 ft (see outfall location figure in

permit application). Channel slope determined from USGS topographic maps is approximately 0.00038 ft/ft. The flow velocity of 2.994 ft/s is determined as the discharge (2500 cfs) divided by the river wetted area (334 ft x 2.5 ft).Iteratively solving Equation 1 gives X = 125 ft. Thus, the maximum downstream distance at which lead concentrations are expected to equal or exceed 10 µg/L for lead is 125 ft below the downstream edge of the riprap pad conveying discharge to the river. Between the outfall and this location, lead concentrations are projected to exceed 10 µg/L close to the river bank. Downstream of a point 125 ft below the outfall, lead concentrations will be less than 10 µg/L."

Which mussel species is used, in this statement, to determine that mussels are able to tolerate lead up to the 10 uq/L "threshold concentration above which adverse impacts to mussels may occur?" Specifically, what are the "adverse impacts" – mortality? Failure to reproduce? Are all of the Menominee River freshwater mussel species considered equally intolerant of lead? Will there be any biological monitoring of the mussels located 135 feet below the outfall, where presumably the lead concentrations will be less than 10µg/L? Will long terms sediment monitoring for toxic metals (lead, zinc, mercury, copper) take place in the outfall and along the mixing zone?

Provide response.

Floodplain

Floodplain analysis including the White Rapids Dam. The FERC regulated dam should have a Potential Failure Mode Analysis (PFMA) completed as part of the license requirement. This information should be used in the analysis of flood risk.

Wetland Monitoring and Adaptive Management

The Wetland Permit shows that most of the current wetland monitoring points the site are to be abandoned, as shown in Figure 1, Existing Monitoring Locations to Be Abandoned for Project Construction - Wetland Monitoring Plan. Twenty locations are to be abandoned. No surviving monitoring locations are shown. How will this sensitive area be monitored for water quality in the shallow and deep aquifers, as well as surface water which would apparently collect in the man-made wetland before passing through a culvert to outfall naturally to the Menominee River? Please clarify which, if any, wetland monitoring and compliance points will remain?

Provide response.

Describe the proposed monitoring for the wetlands located downstream of the proposed project site and adjacent to the Menominee River. Which wetland areas will be monitored for potential downstream impacts from mining activities and discharge? Provide information on baseline conditions of these wetlands that have been collected or information on when baseline studies will be conducted. What metric will be used to determine if there is an unanticipated or secondary impact to these wetland communities from proposed mining activities?

Provide response.

Have any studies been conducted as to what vibrations will be produced from mining activities or explosives and what impacts those vibrations will have on organisms within aquatic communities?

Please respond.

From the Proposed Wetland Monitoring and Adaptive Management Plan:

"Mitigation measures to compensate to the extent possible for identified wetland impacts". What are the mitigation measures for impacts off-site of the Project Area? I don't see any mention of this.

"The mitigation plan also identifies additional candidate sites for supplemental mitigation if needed as a result of unanticipated wetland impacts." This must be clearer.

Provide clarification to the above statements.

From the section 6, related to adaptive management: *"Also, adaptive management measures through augmentation..." This should be clearer.*

Provide response. Include further details on the adaptive management and potential augmentation plan.

From section 5: "Mitigation measures to compensate to the extent possible for identified wetland impacts". What are the mitigation measures for impacts off-site of the Project Area? I don't see any mention of this.

Provide response.

"In the event that unanticipated wetland impacts are identified by the proposed compliance monitoring protocol that cannot be avoided or adequately minimized..." Once again, what is adequately minimized? This must be clearer.

Provide a response that clearly defines "adequately minimized" as used in the above statement.

Paragraph 8: "The mitigation plan also identifies additional candidate sites for supplemental mitigation if needed as a result of unanticipated wetland impacts." What about adjoining property owners and impacts off-site of the Project Area? This must be clearer.

Provide response with further clarification of the above statement.

Cultural Resources

Burial sites and mounds sacred to the Menominee Tribe of Wisconsin are located within the footprint of the proposed mine.

Provide response.

The rights of the Menominee Tribe to preserve and have access to their ancestral sacred areas such as burial mounds that exist within the leased area should be respected.

Provide response.

A comprehensive cultural landscape including ancestral burial sites, ceremonial and village sites, cultural and other funerary objects are located within the footprint of the proposed site and will be impacted by this project if the wetland permit is approved.

Provide a response on how Aquila has accounted for the cultural importance of the project location and of specific cultural sites and objects within the project area. The Tribal Engagement Summary includes correspondence to the Menominee Tribe through 2011 regarding cultural resources on the project site. Has any further correspondence and communication with the Menominee Tribe occurred to address the Tribe's concerns with how cultural resources at the project site may be impacted by the proposed project activities?

It seems that Aquila has reduced the length of the cutoff wall and moved the wall and pit closer to the Menominee River and closer to known locations of cultural resources (23 meters-closer than the recommended buffer area described in the Phase 1 study).

Provide response.

Both archeological and oral tradition leaves this known location and history an undisputed Traditional Cultural Property. For this reason, there is concern with the site evaluation and predictive models concerning cultural properties. The reports provided as part of the wetland permit application are generally only reconnaissance level surveys that provide a basic overview. The proposed wetland fill associated with this project may endanger or even destroy sites that have not been adequately evaluated. This permit would allow for destruction and/ or disturbance of the sacred ancestral lands of the Menominee Nation.

Provide response on the studies that have been conducted at the project area and plans for future/ further evaluation of known and potential cultural resources within the project site.

Proximity to Shakey Lakes Natural Area

Shakey Lakes is the highest-quality occurrence of oak barrens in Michigan and one of the largest, least degraded barrens remaining in the upper Midwest. This conclusion is based on a comprehensive review of Midwestern Oak Savanna and on data of the Midwest Office of The Nature Conservancy. Adjacent state lands were recommended by former MNFI Lead Ecologist Dennis Albert for National Natural Landmark status.

These sites are recognized both for their ecological and cultural significance; both are recognized for their cultural importance by local Native American tribes and the original government survey notes from the mid-1800s document native presence, management, and/or occupation of portions of these sites. The Shakey Lakes Natural Area (savanna) is an ecologically unique and valuable place. It is classified as Oak-Pine Barrens community by the Michigan Natural Features Inventory (MNFI). With an "S2" ranking, this natural community is considered "imperiled" in Michigan due to restricted range, very few occurrences, and other factors making it vulnerable to extirpation in the state. The Shakey Lakes savanna has also been considered an oak barrens community, an S1 community that is "critically imperiled in the state" because of its extreme rarity or risk of extirpation.

Has any assessment been conducted on potential impacts to the quality, value and function of this designated State of Michigan Natural Area? The management goals for this area are described in MDNR's Compartment 109, 2008 Compartment Review. The managing goals for this State Natural Area are described as follows: "Restore Oak Pine Barrens natural community and associated intermittent wetlands including trees, shrubs, and herbaceous plants and wildlife indicative of this fire dependent ecosystem. Protect and enhance rare species populations. Assess the need for access sites, parking lots and signs etc. Maintain recreational and traditional use opportunities that are compatible with Oak Pine Barrens restoration (hunting, berry picking, photography, wildlife and scenery viewing). Procure the capacity and funding to carry out management goals and objectives. Seek legal level of protection via natural areas dedication."

Has any study or delineation been conducted on the intermittent wetlands within this Natural Area? The Foth drawdown contour map shows wetlands in this Natural Area to be within the 6 inch to 1 foot drawdown contour. Please provide discussion on how this area will be impacted by the proposed project. Specifically address any assessments that have been conducted on wetlands within the modeled cone of depression. Discussion should detail how the impacts to groundwater in this area may impact wetland communities and supporting buffer areas that are reliant on groundwater systems. Discussion should also be given to rare species populations that are reliant on wetland systems within this Natural Area and any surveys that have documented known populations of these rare species.

Life of Mine

Open pit mining is called "Phase 1" in all of the company's investor materials. "Phase 2" will require keeping the pit (as an access ramp) plus new tunneling, at least doubling the mine life and impacts. The plan for underground mining is "reasonable and foreseeable" as it has been repeatedly illustrated by the applicant. (Referenced and included with these comments were figures from TSX: AQA/ Investor Presentation, January 2018, available at: https://aquilaresources.com/wp-content/uploads/2018/01/AQA_Corporate-Presentation_TD_Conf.pdf)

Michigan Administrative Code R 281.922a states (4) "A permit applicant shall completely define the purpose for which the permit is sought, including all associated activities." In submitting the Wetland application, Aquila did NOT completely disclose or define their purpose and the scope of associate activities. First, the applicant is planning to extend the Aquila Back Forty project by 9 years – more than doubling their "7 year open pit mine" (as previously permitted under Part 632) is reasonable and foreseeable. This is readily apparent to some regulators and most concerned citizens.

For example, a fact sheet issued by the DNR in 2016 includes the following bullet point: "The size of the proposed Back Forty mine operation in Menominee County including state-owned and privately owned lands would total 580 acres. The total surface area of the proposed open mine would cover 83 acres. The total anticipated mine life would be 16 years, including seven years for the open pit phase and nine years for the underground phase." [Accessed at https://www.michigan.gov/documents/dnr/AquilaFactSheet_82516_533029_7.pdf]

The applicant has repeatedly, and we believe falsely, represented Back Forty mine project as a 7 year mine, but shows it as a 16 year project with estimate metal cash flows through Yr 16, and plans to submit an underground permit as soon as the facility is constructed: [reference to Aquila Investor

Presentation, January 2018, accessed at https://aquilaresources.com/wp-content/uploads/2018/01/AQA_Corporate-Presentation_TD_Conf.pdf]

Provide clarification on the proposed activities that relate to the purpose of the project. Provide a clear statement as to the reasonable and foreseeable duration of life of mine.

Economic Value

The pristine landscape and supreme hunting and fishing in our area lend itself to our premium tourism industry. Over time an open pit mine and the devastation it brings would have an adverse effect on tourism in our area.

The proposed project area has a rich outdoor heritage of hunting, fishing, trapping and other recreation rooted in the region's robust wildlife populations and diverse habitats. In fact, the hunting and fishing economy in the region exceeds that of many traditional "industry or development" based economies – emphasizing the importance of protecting vital fish and wildlife habitats.

Please respond. Include details on considerations in project development that was given to local and regional historic, cultural, scenic, ecological, or recreation value and on the public health or fish and wildlife.

Every major, well-paying industry in the Menominee-Marinette area is looking for workers and hiring, so that is not an issue. There is a lack of demonstrated need or benefit to the public in Lake Township, Menominee and Marinette Counties.

The project purpose outlined in Aquila's permit application states that there are six objectives to the activities, three of which relate to the public interest – creation of skilled jobs for a workforce in the region, economic development, and increasing domestic production of copper, zinc and gold.

Provide a response on how the proposed project will benefit the economic values of both public and private interests in the general area.