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October 13, 2021

Shelly Boss
Project Manager, Prairie and Northern Region
Impact Assessment Agency of Canada

Subject: Natural Resources Canada's Response to Request for Review of Designation Request and Additional Information from the Requester for the Vivian Sand Project

Dear Ms. Boss,

On September 23, 2021, the Impact Assessment Agency of Canada (IAAC) requested that Natural Resources Canada (NRCan) review the letter requesting the designation of the proposed Vivian Sand Project (the Project) and the additional information/questions from the Requester in their Questions for CanWhite Virtual Open House for the Vivian Sand Extraction Project and Hydrogeological Report document.

NRCan reviewed Section 5 in the designation request letter, *Unrealistic Groundwater Model Simulations*, and Section 6 in the Questions for CanWhite Virtual Open House document, *Numerical Groundwater Model*, as they relate to NRCan's groundwater quantity expertise. NRCan found that from a groundwater quantity perspective, the Vivian Sand Extraction Project does not have the potential to cause significant adverse effects within federal jurisdiction or adverse direct or incidental effects as described in Section 2 of *Impact Assessment Act*. This advice is the same advice provided to IAAC on August 30, 2021 and more details are provided in Attachment 1.

With respect to acid rock drainage and metal leaching, the information in the designation request letter and the Questions for CanWhite Virtual Open House document does not change the advice NRCan provided to IAAC on August 30, 2021. NRCan finds that the sampling methods proposed by the Requester are not applicable as they are for sampling deep ocean sediments. NRCan recommends using the Mine Environment Neutral Drainage program as it provides thorough guidance on sampling mine materials, including shale, containing high concentrations of reactive pyrite and other sulphides, which is considered sufficiently robust for this program.

If you have any questions, please contact me via e-mail at anica.madzarevic@nrcan-rncan.gc.ca.

Sincerely,

<original signed by>
Anica Madzarevic
Impact Assessment Officer
Office of the Chief Scientist

ATTACHMENT 1: Natural Resources Canada Groundwater Quantity Comments to the Impact Assessment Agency of Canada on the Vivian Sand Project

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Topic

Potential for the Vivian Sand Extraction Project to cause significant adverse effects within federal jurisdiction or adverse direct or incidental effects as described in Section 2 of the *Impact Assessment Act (IAA)*, from a groundwater quantity perspective

Background and scope

The Impact Assessment Agency of Canada (IAAC) is seeking advice about the potential effects of the Vivian Sand Extraction Project. Specifically, the Agency is requesting that NRCan review the information provided by the proponent in its application to the province of Manitoba, with a view to answering the following question:

“From the perspective of the mandate and area(s) of expertise of your department or agency, does the Extraction Project have the potential to cause adverse effects within federal jurisdiction or adverse direct or incidental effects as described in Section 2 of *IAA*?”

Since Natural Resources Canada (NRCan) does not have any legislative or regulatory authority over this project, other questions from IAAC are not relevant.

Although the project proposal addresses groundwater quantity, groundwater quality, and bedrock geochemistry and waste management issues, this review only addresses the question with respect to the groundwater quantity issue. This review does not consider the issue of subsidence due to sand extraction, which is not addressed in the Environmental Application Proposal (EAP) or Hydrogeological and Geochemistry Assessment Report.

As such, this report is not a review of the application or project but rather considers if the proposal has the potential to produce effects on groundwater quantity that may have significant adverse effects within federal jurisdiction, namely on fish and fish habitat, aquatic species, migratory birds, or to Indigenous peoples of Canada, or on federal lands (or across provincial and national borders).

References

AECOM, 2021a. CanWhite Sands Corp., Vivian Sand Extraction Project, Environmental Application Proposal. 23 July 2021.

AECOM, 2021b. Appendix A, Hydrogeology Assessment Final Report. Vivian Sand Extraction Project – Hydrogeology and Geochemistry Assessment Report. July 2021.

Note that this reference is a component of the EAP (AECOM, 2021a) but referenced separately for ease of citation.

Proponent’s groundwater quantity assessment

The proponent has reviewed existing hydrogeological information and data, conducted field studies including a 72-hour pump test, and simulated groundwater drawdown using a calibrated groundwater flow model to assess potential impacts of sand and groundwater extraction on groundwater levels in the Red River Carbonate and Winnipeg Sandstone aquifers (AECOM, 2021b).

Attachment 1

Pump testing was used to assess the hydraulic properties of the Winnipeg Sandstone. Relatively small drawdown in the Red River Carbonate and high hydraulic gradients across the Winnipeg Shale were interpreted to indicate that the Winnipeg Shale is an effective hydraulic barrier between the two aquifers at the pump test location.

A conceptual hydrogeological understanding, based on previous literature and available data, was summarized and used in the development of a regional groundwater flow model extending from the Sandilands to the Red River. The model was developed to “conduct predictive simulations to estimate the effect groundwater and sand extraction will have on groundwater levels in the area during the first four years of operations.” The model was used in both steady state and transient modes. It was calibrated using both regional groundwater data and pumping test results.

Predictive simulations examined five potential scenarios to demonstrate the potential range of drawdown (groundwater level decreases due to pumping) in the Red River Carbonate and Winnipeg Sandstone aquifers resulting from proposed sand extraction activities. Even for scenarios where no groundwater is re-injected into the Winnipeg Sandstone aquifer (to simulate maximum drawdown), predicted drawdowns are less than 2 m at a distance of 2 km from the pumping. Drawdowns are lower when groundwater is re-injected as proposed. For comparison, natural fluctuations of groundwater levels in the Red River Carbonate and Winnipeg Sandstone aquifers are on the order of 1.5-2.5 m (AECOM, 2021b, Fig. 5-12 to 5-14). Transient simulations predict that groundwater levels recovery is rapid when pumping ceases each year. A sensitivity analysis was conducted to examine the impact of uncertainty in hydraulic conductivity and recharge on model results.

In the EAP (AECOM, 2021a, section 6.2.3), the potential risks to groundwater are assessed to be minor, seasonal in duration and reversible.

NRCan assessment for IAAC

The proponent’s hydrogeology assessment report was not intended to specifically respond to issues of federal jurisdiction. Instead, the report focuses on a groundwater quantity issue of concern to groundwater users, that of the extent and duration of drawdown in the two bedrock aquifers. Assessment of potential groundwater quantity effects on fisheries, aquatic species and Indigenous peoples are not explicitly examined but such an assessment is provided by NRCan based on the information available in these reports and professional judgement.

The description of the Aquatic Environment (AECOM, 2021a, section 4.3) states that “There are no natural lakes, rivers or streams within the Project Site” and that “Waterbodies that occur within the Project Site are described in Section 4.3.1 and consist of isolated small ponds associated with previous quarry operations which have a low likelihood of providing suitable fish habitat.” The distance from the Project Site to the Brokenhead River appears to be more than 3 km (Fig. 4-3). Similarly section 4.5 of the EAP states that “The closest First Nation reserve lands to the Project Site is the Brokenhead Ojibway Nation’s Na-Sha-Ke-Penais Indian Reserve (3 ha) surrounded by East St. Paul and located approximately 38 km northwest of the Project Site.” These statements suggest that the areas pertaining to issues of federal jurisdiction are not located in the immediate vicinity of the proposed Project Site.

A review of the hydrogeological assessment report (AECOM, 2021b) by NRCan with respect to groundwater quantity issues indicates that the study appears to have been based on a thorough review of existing hydrogeological information and data, appropriate field studies and testing, and industry-standard hydrogeological modelling. Although NRCan may question some minor details,

Attachment 1

NRCan is in general agreement with the analysis and findings of the report with respect to groundwater quantity.

The extent and duration of predicted drawdown are small when one considers the distance between the Project Site and the areas of federal jurisdiction. It is unlikely that pumping at such a distance could reduce surface water sufficiently to significantly influence fish or aquatic species in a stream/river with sufficient flow to support fish and aquatic species. In NRCan's opinion, potentially significant impacts to fisheries, aquatic species and Indigenous people due to drawdown are not anticipated and are highly unlikely with respect to groundwater quantity.

The hydrogeological assessment report (AECOM, 2021b) does not specifically consider whether water and sand withdrawal would deplete groundwater resources from the aquifers on a regional basis. The report lists licensed water wells (Table 6-A) with a total capacity of 5.4 million m³/year. For comparison, the production schedule (Appendix H), anticipates pumping approximately 660 000 m³ (540 US GPM for 224 days) of sand and groundwater annually. If half of that volume is groundwater that is re-injected (Appendix H), the net loss of groundwater volume (needed to replace the mined silica sand) would be about 330 000 m³/year. This annual volume is a small proportion of licenced groundwater use in the region and of similar magnitude to other users (Table 6-A). It is equivalent to the annual recharge in less than 2 square kilometres of the Sandilands (Table 6-D) or 0.1% of the estimated total recharge of 230 million m³/year in the groundwater model (Table 6-B). Therefore, it does not appear that the removal of silica sand would significantly reduce groundwater resources at a regional scale.

Adverse groundwater quantity effects due to the extraction of sand and groundwater can be readily mitigated using a variety of measures (e.g., EAP Table 6-4, hydrogeology assessment section 7-3). With appropriate monitoring, mitigation and management plans (EAP, section 8), adaptive management and mitigation measures can be enacted before any significant impacts due to groundwater or sand extraction occur.

Conclusion

In NRCan's opinion, from a groundwater quantity perspective, the Vivian Sand Extraction Project does not have the potential to cause significant adverse effects within federal jurisdiction or adverse direct or incidental effects as described in Section 2 of *IAA*.