

SiMbA Project

Environment Act Proposal

Sio Silica Corporation

Project number: 60730241

August 18, 2025

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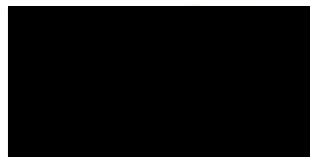
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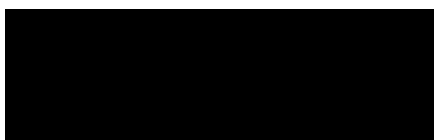
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Distribution List

# Hard Copies	PDF Required	Association / Company Name
	✓	Manitoba Environmental Approvals Branch
	✓	Sio Silica Corporation

Executive Summary

This report has been prepared in support of an Environment Act Licence application submitted by Sio Silica Corporation ('Sio') for consideration by Manitoba Environment and Climate Change (MECC) Environmental Approvals Branch for proposed high purity quartz sand extraction activities using a water well drilling rig and using standard industry practice water well drilling techniques. Extraction of the sand resource will be reviewed under *The Environment Act* by MECC as a "mine" which is a Class 2 development in section 3 of the Classes of Development Regulation under group 5 "Mining". This Environment Act Proposal (EAP) report contains the information described in the Manitoba Government "Information Bulletin – Environment Act Proposal Report Guidelines" (Manitoba Government 2023).

Sio has heard the questions and concerns raised by the public and the government Technical Advisory Committee (TAC) on their review of the EAP for the original Vivian Sand Extraction Project (AECOM 2021) and has considered the Manitoba Clean Environment Commission (CEC)'s recommendations (CEC 2023). In consideration of the concerns raised during the review of the originally proposed Vivian Sand Extraction Project, and in consideration of the CEC's recommendations (CEC 2023), Sio has substantially revised the originally proposed Vivian Sand Extraction Project. The substantially revised new sand extraction project, now named the SiMBA¹ Project (hereafter the "Project") is proposed to proceed using a stepwise phased approach that substantially reduces the sand volumes extracted from the sandstone aquifer for the initial years of Project operation. Using this approach while concurrently monitoring key aspects of concern regarding the environment (e.g., groundwater quality and quantity) for any changes not predicted to occur within the environmental assessment conclusions in this EAP report, Sio's new Project is expected to address concerns raised regarding the previously proposed Vivian Sand Extraction Project EAP (AECOM 2021).

Sio is applying for an Environment Act Licence for years 0 to 4 (five years) of initial sand extraction operations for the Project. Sio has heard the feedback from the public and the province on the previous EAP for the originally proposed Vivian Sand Extraction Project and is now submitting this EAP for review for a revised Project which describes a stepwise phased approach with substantially reduced extracted sand volumes for the first five years of the Project. Sio is still proposing to extract high purity quartz sand (hereafter "sand") from the Winnipeg Sandstone aquifer (approximately 61 m, or 200 ft below ground) within the Winnipeg Sandstone geological formation southwest of the hamlet of Vivian, Manitoba and approximately 35 km east of the City of Winnipeg from the Project Area. The proposed Project is being developed for the purpose of supplying high purity quartz sand for use in a variety of markets such as the renewable energy industry (e.g. solar panel production), quartz powders (fillers, medical, dental), silicon metals, high purity quartz process equipment, crucibles, telecommunications (e.g. fibre optics), smart glass, silicon carbides (e.g. electronics, cellphones, computer chips), silicon enhanced alloys (e.g. aluminum components for aerospace and automobile), low iron glass (architectural envelopes) and ceramics. No sand will be utilized in fracking² of any kind.

The Project will not be using an open pit quarry method due to the depth of the target sand deposit. Instead, water well drilling rigs will be used to drill extraction wells and install casings to the target sand deposit. The extraction wells will be between 10 inches (25.4 cm) and 8 inches (20.3 cm) in diameter, with a removable 16-inch (40.6) diameter casing at surface. Using compressed air, sand will be brought to the surface with groundwater from approximately 61 m (200 ft) below ground surface depending on the formation depth in

¹ SiMBA Project name interpretation: "Si" = Silica; "Mb" = Manitoba; A = Action Plan: regarding Canada's net zero 2050 emissions target "Action Plan 50"

² Hydraulic fracturing, or 'fracking' is a method used to extract natural gas and oil from deep rock formations (i.e., shale). A specific type of silica sand acts as a proppant to open fractures when added to fracking fluids injected into unconventional oil and gas wells during hydraulic fracturing.

the area. Extraction activities will occur April through November (and winter, weather dependant) each year of operation while well drilling activities may occur year-round.

Key activities and components of the Project will include:

- Establishment of temporary access trails to annual sand extraction areas to accommodate water well drilling rigs.
- Extraction well drilling and monitoring year-round.
- Sand extraction April to November (and winter, weather dependant) in a phased approach starting with approximately 23 wells in year 0; 68 wells in year 1; 132 wells in years 2 and 3; and 137 wells in year 4; in clusters of one to five wells.
- Maximum of up to seven extraction wells operating simultaneously at the Project site for five to seven days each.
- Separation of water from sand at the extraction site where excess water is returned to the sandstone aquifer via the sand producing well after filtration and UV treatment, or other approved treatment method, and sand enters the slurry transport loop.
- Pre-screening of sand and water slurry at the extraction site to remove material that is too large ('overs') with additional screening occurring at the proposed Processing Facility.
- Temporary contained storage at the well clusters of the overs material and well drill cuttings for disposal or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. Usage for well sealing activities will only be for approved cuttings and may include sandstone or carbonate (limestone).
- Construction of above-ground temporary slurry line (high density polyethylene piping) and associated pumping stations, to transport the pre-screened sand directly to the Processing Facility and transport recycled water from the Processing Facility back to the extraction sites for re-use.
- Dismantling and relocating the above-ground slurry and water return lines and pumping stations, as needed, to the subsequent annual sand extraction area.
- Treatment of groundwater separated from the sand and water slurry at the extraction site using a filtration and ultraviolet (UV) system, or other approved treatment system, before returning excess groundwater to the aquifer via extraction wells.
- Progressive decommissioning (sealing) of annual extraction wells and well cluster areas.
- Progressive annual rehabilitation of temporary drill rig access trails, equipment laydown areas, slurry line trails and return water line trails.

At no time will dry sand be left exposed at the Project site. Sand will be wet and will either be contained within the extraction well line or the slurry line. Material that is too large ('overs'), such as concretions (calcified sand), will be stored in appropriate containment prior to removal from site or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. Therefore, the risk of silica sand dust dispersal is eliminated.

The procedure for sand processing and water treatment at a future Processing Facility is described within a separate Environment Act Proposal that was granted an Environment Act Licence (No. 3367) in December 2021. Therefore, the Processing Facility and associated infrastructure components are not assessed within this Environment Act Proposal. Annual sand extraction activities will occur sequentially within blocks of mineral leased land parcel areas south, and west of the sand Processing Facility. Extraction activities will gradually progress further from the Processing Facility each year within blocks of land adjacent to previous year extraction activity land areas over the anticipated 25-year life of the Project.

Land area within which extraction wells will be established will occupy approximately 0.65 km² (one quarter section) during each annual extraction activity year. A phased approach will allow for the eventual extraction of up to 500,000 tonnes of sand annually. Sio has heard the feedback from the public and the province and

is proposing a substantial reduction in the total tonnage annually and within the previously applied for project area (AECOM 2021). The following phased approach is proposed:

Phase 1 - Year 0 – Maximum of 100,000 tonnes

Phase 2 – Year 1 – Maximum of 300,000 tonnes

Phase 3 – Year 2 to 4 – Maximum of 500,000 tonnes annually

Wells will be drilled in clusters consisting of up to five wells per cluster. Wells will be sequentially developed and progressively decommissioned and rehabilitated each year. Once drilled, these wells will be producing for five to seven days. All wells within a well cluster may not be operating at the same time. The objective is to keep the slurry supply continuously moving to the Processing Facility at an optimal and manageable rate. Therefore, the maximum number of wells operating simultaneously maybe spread across adjacent well clusters (e.g., two operating wells in one cluster and one in an adjacent well cluster). Up to seven wells may be operating at any given time at full capacity in Phase 3 from year 2 onwards. The operations will move in a pattern from one well cluster to the next, with wells being progressively sealed (i.e., decommissioned) sequentially over the April to November timeframe. Disturbed areas will be rehabilitated yearly.

The results of the environmental and socioeconomic effects assessment are summarized as follows:

Geology/Topography

Impacts on topography and geology have been assessed as being minor.

The geology and topography of the Project site will be affected by Project activities including:

- Clearing and levelling as needed at the sand extraction well locations;
- Clearing for temporary laydown areas in well cluster areas;
- Development of temporary access trails for drilling equipment access and temporary trails for slurry line and return water line and associated pumping stations; and
- Drilling of sand extraction wells.

Extraction of the sand resource will result in a permanent change to the underground geology in the form of horizontal arrays of rooms and pillars in the sandstone geological layer (between 52 m to 76 m), in the Carman Sand member of the Winnipeg Formation aquifer within the Project site.

Based on the results of preliminary exploratory drilling from 2017 to 2022 and recommendations provided in a geotechnical assessment, Sio will adhere to the following criteria for the Project commencing in Phase 1 with the first few wells utilized to confirm extraction conditions in a scaled scenario:

- Design the borehole arrangement and depth to limit the extraction disturbance geometry to the design extraction geometry presented in the geotechnical analysis report.
- Limit extraction to areas with competent limestone thicker than 15 m.
- Locate extraction group wells with at least 60 m edge to edge distance between their expected long-term cavity disturbance zone (approximately 70 m for short-term cavity disturbance zones).
- Complete a full-scale extraction test to confirm conditions with pre-extraction measurement and monitoring requirements listed in this report.
- Update the FLAC model (i.e. the computer modeling software used for specific geotechnical modeling) as more data becomes available for the extraction boreholes and surface settlement data.

- Measure the overburden, caprock, competent limestone, and sand thickness at each extraction location before the start of extraction. Apply the relevant extraction design based on the recommendations or the refined design as needed based upon full-scale extraction testing results.
- Develop a Trigger Action Response Plan (TARP) for extraction locations. This includes surface, caprock and piezometric monitoring and review during and after extraction.

Furthermore, based on the CEC hearings, Sio is proposing to add the following additional measures as a part of its stepwise approach:

- Advancement / logging of inclined boreholes and acoustic televiewer and optical televiewer (ATV/OTV) surveys prior to extraction activity in a new area to characterize sub-vertical discontinuities.
- Confirmation and monitoring of void space using sonar after extraction including long-term monitoring (after 1 year).
- Installation of subsidence monitoring network including underground extensometer anchored to the caprock top surface, and piezometers within the overburden and at the top of the caprock surface.
- Confirmation of competent limestone thickness and ongoing core sampling to confirm strength.

The following measures will be implemented to avoid or minimize Project adverse effects on geology and topography, including potential for underground and surface subsidence due to the sand and groundwater extraction activities:

- Where applicable, existing roads and trails and other previously disturbed areas will be utilized to minimize disturbance to the natural topography.
- The locations of annual extraction wells will be determined in consideration of the results of geotechnical modeling used to predict thresholds of extraction amounts to mitigate adverse effects related to the potential for underground and surface subsidence.
- Additional testing will be conducted to further assess and confirm the limestone and overburden thickness and structure as the Project progresses geographically.
- Progressive annual decommissioning of extraction wells will be done using a concrete cap, bentonite and permeable backfill in accordance with applicable guidance documents such as 'Constructing and Sealing Wells in Manitoba' (Province of Manitoba, 2018).
- Levelling and grading will occur during progressive annual decommissioning of extraction wells to return the landscape to elevations typical to the surrounding area.

A Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related complaints regarding geology/topography effects) and will describe how complaints are managed and addressed.

With the application of the above described mitigation measures, impacts on topography have been assessed as being minor because disturbed land will be leveled, graded and progressively rehabilitated.

Impacts to geology are assessed as being minor due to the abundance of remaining sand resource with approximately 0.0125% of sand removed in the first five years of the Project, and approximately 0.082% over the 25-year mine life of the known 15,252,000,000 tonnes of sand from resource estimate studies. The extracted sand will not be replaced; therefore, impacts to the geology will be irreversible/permanent.

Soils

The potential for soil erosion and associated adverse impacts to the surrounding environment are anticipated to be minor and restricted to the Project site due to the application of the following mitigation measures:

- An Erosion and Sediment Control Plan will be implemented for all phases of the Project.
- Access matting will be used to prevent excessive ground disturbance where needed (e.g., low, wet areas).
- During the progressive annual decommissioning activities, after Project components have been removed, the landscape will be leveled and graded, and disturbed areas will be revegetated as quickly as feasible to stabilize the soil and minimize soil erosion.

Groundwater

The effects of the Project on groundwater are assessed to be minor, seasonal in duration and reversible. This assessment is based on the results of an updated comprehensive hydrogeological and geochemical assessment that was undertaken involving field investigation, data analysis, numerical groundwater modelling and geochemical modelling.

The slurry loop system for transporting sand to the Processing Facility is designed to not require any additional water which allows for the majority of the water that comes from each extraction well to be returned to the aquifer within a short period of time. Therefore, very little groundwater from the aquifer will be permanently withdrawn.

Consistent with the results of field testing, water levels were simulated to recover relatively rapidly, with approximately 80% recovery approximately two days following the end of production at each well cluster. Water levels in the Winnipeg Sandstone and Red River Carbonate aquifers are anticipated to return to near static water groundwater levels within approximately 60 days after production ceases each year.

Based on groundwater model simulations, most of the wells within the Project Area are not likely to be affected by operations because they fall outside the estimated 0.5 m drawdown cone. However, several licensed wells fall between the estimated 0.5 m and 5 m drawdown cones and pumps installed a short distance below the water table may experience diminished well yield during operations. Appropriate mitigations may include conducting a survey in advance of operations to determine the location, depth, use and configuration of each well, lowering of pumps in advance of sand extraction or providing treated makeup water during periods of time when drawdown impacts may occur.

A Water Management Plan will be developed and a Groundwater Monitoring and Impact Mitigation Plan will be implemented to monitor groundwater extraction / injection and water levels within the aquifer surrounding the Project Area and mitigate any impacts to surrounding wells.

Overall, material impacts to groundwater quality within the Project Area are unlikely because both the Red River Carbonate and Winnipeg Sandstone host fresh and relatively dilute groundwater. Based on the results of geochemical assessment and modelling, the activities associated with Project operations and post-closure phases of the Project were determined to have no material impact on groundwater quality. In many cases, the impact was simulated to be positive due to reduction of concentrations of iron and manganese when oxygen is introduced into the aquifer which in turn favor the co-precipitation of metals / metalloids.

The following measures are expected to mitigate groundwater withdrawal effects and potential for groundwater contamination:

- Process water will be recycled in a loop system for reuse, which reduces the quantity of water required from groundwater.
- When each well is drilled, a casing will be installed and grouted in place to isolate the Red River Carbonate and Winnipeg Sandstone aquifers from one another to mitigate vertical mixing of the aquifers.

- Extraction wells will be progressively (sequentially) established and sealed (decommissioned) during the ongoing sand and groundwater extraction activities in accordance with applicable guidance documents such as 'Constructing and Sealing Wells in Manitoba' (Province of Manitoba, 2018) and Environment Act Licence requirements.
- Geochemical modelling has indicated that reinjection of groundwater (which will be UV-treated) back to the sandstone aquifer will not adversely affect groundwater quality in either the Winnipeg Sandstone or Red River Carbonate aquifers.
- A Waste Characterization and Management Plan, Water Management Plan, Trigger Action Response Plan, Groundwater Monitoring and Impact Mitigation Plan and Progressive Well Abandonment Plan will be developed and implemented to protect groundwater quality and guide responses to any potential impacts to groundwater quantity and quality. Measures will be developed to avoid and/or mitigate any well interference issues as required by *The Water Rights Act* of Manitoba.
- A Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related groundwater complaints) and will describe how complaints are managed and addressed.
- Groundwater quality will be maintained in accordance with requirements in an Environment Act Licence.

With the application of the above mitigation measures and utilization of groundwater at sustainable rates as determined by ongoing hydrogeological testing and monitoring, impacts to groundwater are anticipated to be minor, seasonal in duration and reversible. Considering there will not be a continuous and unsustainable drawdown on the regional groundwater aquifer for Project processes and that the majority of the water that comes from the extraction well will be returned to the aquifer within a short period of time, effects on groundwater quantity in the regional aquifer can be managed by adhering to a Water Management Plan and by implementing a Groundwater Monitoring and Impact Mitigation Plan. The aquifer will also continue to be recharged through natural groundwater recharge processes (i.e. rain and snow melt) and lateral groundwater flow. Effects on groundwater quality will be minor and, in some cases, positive. Risks to groundwater quality will be mitigated through application of a Waste Characterization and Management Plan, Progressive Well Abandonment Plan, Trigger Action Response Plan, and Groundwater Monitoring and Impact Mitigation Plan.

Air Quality

The impact of the Project on air quality is assessed as minor to negligible.

Project activities are expected to have a minor to negligible effect on air quality due to dust generated by movement of drill rigs and other mobile equipment, and due to exhaust emissions including nitrogen dioxide (NO₂), carbon monoxide (CO) and sulfur dioxide (SO₂).

At no time will dry sand be left exposed at the Project site. Sand will be wet and will either be contained within the extraction well lines or the slurry lines, or material that is too large ('overs'), such as concretions (calcified sand), will be stored in appropriate containment prior to removal from site or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. Therefore, the risk of silica sand dust dispersal is eliminated.

Measures that will be applied to minimize potential Project effects to air quality include the following:

- Idling of motorized equipment will be minimized to the extent feasible;
- Water will be applied on gravel roads to control dust, as required; and
- Equipment and vehicles will be properly maintained.

Additionally, a Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related air quality complaints) and will describe how complaints are managed and addressed.

With the application of the above measures, impacts on air quality are expected minor to negligible, and sufficiently mitigated.

Climate/Greenhouse Gases (GHGs)

The impact of the Project on GHG contributions to the atmosphere is assessed as negligible.

Overall, the Project is estimated to generate 3,853 tons (0.003853 Mt) of CO₂e annually with the application of the above mitigation measures, which is 0.0183% of the reported Manitoba emissions in 2023 which were 21 Mt CO₂e (ECCC, 2025), about 0.0006% of the reported 694 Mt CO₂e from Canada in 2023 (ECCC, 2025).

Noise

The impact of the Project on noise levels at nearest points of reception (e.g. nearest residences) is assessed as minor to moderate with intermittent duration and short-term frequency.

Example noise sources associated with Project activities will include mobilization of extraction well drilling equipment, drilling of wells and operation of pump stations.

The following measures will be implemented to reduce noise generated from Project activities:

- Vegetation clearing will be minimized to the extent feasible.
- Project activities will setback a minimum of 100 m from nearest residences.
- Mobile equipment and vehicles will be kept well maintained and will be fitted with mufflers, and other noise mitigation equipment as required.
- Unnecessary idling and revving of engines will be avoided.
- A Noise Mitigation Plan will be prepared that will describe additional noise mitigation measures to be applied (e.g. portable noise barriers) as required.

Additionally, a Complaint Handling Plan will be developed prior to Project construction that will describe the procedure for handling complaints that are brought to the attention of Sio (e.g., Project related noise complaints) and will describe how complaints are managed and addressed.

In consideration of the above measures to minimize noise levels due to Project activities, it is anticipated that potential noise levels at the nearest residences will be adequately attenuated. Noise disturbances to wildlife are expected to be moderate in the vicinity of Project activities but are not expected to measurably affect wildlife populations within the Interlake Plain Ecoregion within which the Project is located.

Surface Water

The impacts on surface water are assessed as negligible.

Due to the absence of natural waterbodies such as wetlands in the Project site and immediately adjacent local area that may be potentially affected due to a temporary drawdown effect from sand extraction activities, Project operations are not expected to affect surface water quantity.

Project operations do not involve the use of, or discharge of, any surface water of any kind. Drainage ditching will be constructed along Project access trails and at disturbed areas, as required, to assist in directing runoff flow from rain and snow and maintaining natural drainage pathways through low areas.

Portable toilets will be located at active well cluster sites which will be regularly pumped out by a licensed local contractor for proper disposal to prevent potential contamination of local waterbodies with potentially harmful substances. An Erosion and Sediment Control Plan will be implemented for all phases of the Project. Therefore, Project activities are not expected to impact surface water quality.

Fish and Fish Habitat

Project related impacts on fish and fish habitat are not anticipated due to the lack of fish habitat within the Project Site and application of an Erosion and Sediment Control Plan.

Vegetation

The overall Project impacts to vegetation are assessed as minor within the Project site and negligible within the local area.

The total amount of naturally vegetated area requiring clearing for annual Project operations will vary considering the variable amounts of natural vegetation present within each annual block of Project development lands within the Project site (which consists of 39% “agriculture lands” and 11% “developed land”). No land cover considered uncommon for the regional area was observed in the Project site during terrestrial reconnaissance of the Project site. The probability of occurrence of the three vegetation species at risk that may occur at the Project site range from negligible (Gattinger's agalinis), to low (rough agalinis), to low/moderate (Western silvery aster).

The annual footprint area requiring clearing to accommodate Project components will be minor and temporary, with disturbed areas allowed to revegetate naturally and will be augmented using an approved native seed mixture and native plantings if required. Considering progressive closure, rehabilitation and revegetation of extraction activity areas will be done each year, it is expected that most natural vegetation will be very well established after approximately four years, with reestablishment of trees and shrubs expecting to be evident within five to 10 years following closure.

A Revegetation Monitoring Program will be implemented to determine the success of the revegetation program and determine if follow-up reseeding or replanting is required.

Wildlife

Project impacts on the regional wildlife populations are assessed as negligible.

The types of naturally vegetated land cover (wildlife habitat) that will be cleared (i.e., forest and meadow) are not uncommon within the regional area. The amount of naturally vegetated area that will need to be cleared for the Project during each year of operation is minor considering approximately 50% of the Project site is previously disturbed landcover due to human development such as agriculture roads and aggregate quarries. Project components will be located on previously disturbed land to the extent feasible.

Minimizing vegetation clearing to the extent feasible will limit adverse effects to wildlife habitat and will assist in mitigating noise from Project activities. Noise will also be minimized by the measures summarized above (Noise). Wildlife species present in the vicinity of the Project are anticipated to be accustomed (habituated) to some level of noise due to the presence of existing developments (e.g. agriculture activities, residential areas, roads and aggregate quarries).

Vegetation clearing will take place outside of the spring and summer months to the maximum extent feasible to avoid disturbance to breeding birds and other spring breeding wildlife species. Vegetation clearing will not take place during the breeding bird season (April 14 – August 24).

The minor increase in vehicle traffic in the regional area as a result of Project construction and operation activities is anticipated to result in a minor increase in the risk of vehicle collisions with wildlife given the relatively small spatial scale of the Project site and overall minor increase in regional area traffic.

In summary, the Project is not anticipated to have a measurable effect on wildlife populations, including Species at Risk, within the Interlake Plain Ecoregion.

Labour Force and Employment

Employment opportunities associated with the Project will be a positive, long-term benefit for the regional area within a reasonable commute time to the Project site.

Approximately 30 to 40 staff and third-party contractors will be employed for Project activities such as annual site clearing, extraction well drilling, extraction activities and relocation and assembly of temporary Project components. The need for local suppliers and other business to support Project activities is likely to provide an additional 90 to 110 indirect employment opportunities.

Infrastructure and Services

The Project is expected to have minor impacts on regional emergency services because an Environmental Emergency Response Contingency Plan will be available on-site during all Project phases that will clearly outline appropriate emergency response protocols. Standard mitigation measures to avoid accidents and malfunctions will also be applied.

Land and Resource Use

Project activities will occur on Sio mining claims sequentially from year 0 (2026) to year 4 (2030) which will result in temporary use of a very limited portion of the Project site land each year of the Project. Land use for Project activities will occur in accordance with municipal and provincial approvals and legislative requirements.

Use of the land for other purposes will not be available in the locations of annual Project activities. However, due to the progressive annual reclamation of extraction sites and other Project-related disturbed areas, parcels of land used for Project activities during any given year of Project operation will be available for other uses the following year or once the activities are complete. Sand extraction activities occur over weeks in one area rather than months, with individual wells over days. Therefore, the Project is anticipated to result in an overall minor temporary adverse impact to land use within the Project site.

Human Health

The measures that will be applied to minimize adverse effects on air quality and noise (as summarized above) are expected to adequately mitigate adverse effects on human health both on and off the Project site.

All Sio employees will abide by the standards, procedures and training required under *The Workplace Safety and Health Act* of Manitoba as well as with Sio's internal Health and Safety Program and Environmental Emergency Response Contingency Plan. Employee Orientation and Safety training will be mandated for all new hires in addition to required yearly safety reviews for existing staff. All required personal protective equipment (PPE) will be provided to employees. Where required, visitor orientation and PPE will be provided when visitors enter employee only areas. Therefore, the risk of adverse impacts on human health is determined to be negligible.

Indigenous and Treaty Rights

The Project is not expected to adversely impact the exercise of Indigenous or Treaty rights because:

- The Project site consists of private land with private surface rights that do not have public access unless by permission;
- No fish or fish habitat will be affected by the Project;
- The residual environmental impact of the Project on vegetation beyond the Project site is assessed to be negligible; and
- The residual environmental impact of the Project on regional wildlife populations is assessed to be negligible.

Heritage Resources

Results of an on-site archaeological investigation found the Project site to have substantial previous disturbances and concluded that there were no heritage concerns regarding development of the Project at the Project site. If heritage resources are discovered within the Project site, work will be stopped, Historic Resources Branch will be advised, and the discovered historic resources will be recorded by an archaeologist and adequately protected as required. The heritage resources protection practices outlined in the Heritage Resource Protection Plan for the Facility Project will also be used for this Project (AECOM 2020)

With the application of the above described mitigation measure and given the opinion of a qualified archaeologist indicating no heritage concerns regarding development of the Project at the Project site, the impacts on heritage resources are assessed as minor.

Traffic

The increase in regional area traffic will not be substantial because the sand will be transported to the sand Processing Facility by slurry line rather than by haul truck which will limit traffic associated with the Project staff and contractors during the Project construction and operation. Project staff will be limited to approximately 30 to 40 personnel during Project operations with staff arrivals and departures being staggered daily to accommodate the 24 hours, seven days/week (24/7) operation schedule. Traffic will travel within the Project site along the PR 302 (Ostenfield Road) for up to 5 km to the intersection with PTH 15. Additionally, Project traffic for operation years 3 and 4 will travel along Centre Line municipal road 57N for up to 1.5 km west of from PR 302. Therefore, the overall annual increased use of regional roads will be minor.

Aesthetics

The impact of the Project on the aesthetics of the Local Project Area is anticipated to be minor because land disturbances and Project components will be temporary within a very limited area in the Project site during each year of operation. Most of the Project site will remain in the current condition, and vegetation clearing to accommodate the Project footprint will be minimized to the extent feasible. Annual well cluster sites and wells will be progressively closed / sealed each year, and disturbed areas will be rehabilitated throughout each year of Project operation. Setback distances where no activity will occur (e.g. from residences) will be maintained.

Public and Indigenous Engagement

Sio has had, and will continue to have, discussions with residents, businesses, local stakeholders, all levels of government and local Indigenous communities in the Project area. The opportunity for public review of the proposed Project, including the hydrogeological impact assessment study report, will occur during the

public review period for this Environment Act Proposal, during which time Sio will hold a public meeting to provide Project information and respond to public comments and questions on the proposed Project.

Follow-up Plans and Overall Assessment

The Project follow-up plans and monitoring programs that will be implemented include, but are not necessarily limited to, the following:

- Waste Characterization and Management Plan
- Water Management Plan
- Progressive Well Abandonment Plan
- Groundwater Monitoring and Impact Mitigation Plan
- Erosion and Sediment Control Plan
- Environmental Emergency Response Contingency Plan
- Revegetation Monitoring Program
- Heritage Resources Protection Plan
- Noise Mitigation Plan
- Complaint Handling Plan
- Wildlife Monitoring and Impact Mitigation Plan
- Trigger Action Response Plan (to monitor groundwater and ground surface settlement)
- Closure Plan.

Complete follow-up plans will be developed and submitted to the Environmental Approvals Branch based on requirements as stipulated in an Environment Act Licence for the Project, which is common practice regarding the timing of follow-up plans for developments in Manitoba.

It is recommended that mitigation measures, follow-up plans, and monitoring programs described in this report be implemented to avoid or minimize potential environmental effects and/or identify any unanticipated adverse effects early so that appropriate adaptive management action can be undertaken.

Summary

In summary, based on the proposed Project description and with the application of the proposed mitigation measures and follow-up plans outlined in this Environment Act Proposal, adverse residual environmental impacts resulting from the Project are expected to be sufficiently mitigated. The success of the Project is anticipated to be a substantial benefit to the local and regional area communities in terms of training, employment, and potential business opportunities related to the services that will be required for the Project and the tax revenue that will be realized with the proposed Project being in the RM of Springfield.

List of Abbreviations

CEC	Manitoba Clean Environment Commission
CO	Carbon Monoxide
CO₂	Carbon Dioxide
CO₂e	'Carbon Dioxide equivalent' – amount of CO ₂ that would have equivalent global warming impact as the effect of different greenhouse gases
COSEWIC	Committee on the Status of Endangered Wildlife in Canada.
EAB	Environmental Approvals Branch
EAP	Environment Act Proposal
EC	Environmental Component
ELC	Ecological Land Classification
EPM	East of the Prime Meridian
ESEA	<i>The Endangered Species and Ecosystems Act</i> of Manitoba
GHG	Greenhouse Gas(es)
gpm	U.S. gallons per minute (metric L/min units also provided throughout)
ha	Hectares
hp	Horsepower
HRB	Historic Resources Branch
HRIA	Heritage Resources Impact Assessment.
km	Kilometre
kVA	Kilo-volt-ampere; tells you how much power the overall system is using
kW	Kilowatt
L	Litre
L/min	Litres per minute
m	Metre
m³	Cubic metres
MAAQC	Manitoba Ambient Air Quality Criteria
masl	Metres above sea level
MECC	Manitoba Environment and Climate Change
N₂O	Nitrous Oxide
NO₂	Nitrogen Dioxide
PM	Particulate matter
PR	Provincial Road
PTH	Provincial Trunk Highway
RCMP	Royal Canadian Mounted Police
RM	Rural Municipality
RoW	Right-of-Way
SARA	The federal <i>Species at Risk Act</i>
SC	Social Component
TARP	Trigger Action Response Plan
UV	Ultraviolet

Terms / Glossary

Abandonment/Sealing	The act of filling a well or a test hole with a material or a mixture of materials in a manner that is sufficient to prevent the vertical movement of water or other substances within the well or test hole.
Aesthetics	Subjective principles concerned with the perception of beauty, such as the visual appeal of the natural landscape.
Aquifer	An underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (such as sand).
Compressor	For the purpose of this Project, a diesel-powered mechanical device that increases air pressure by reducing its volume.
Drill cuttings	Broken bits of solid material brought to surface from the borehole while drilling a well.
Extraction site	The location of the well area and extraction equipment.
Extraction well	A borehole drilled into the ground like a groundwater well, but for the extraction of minerals. For this Project, both sand and groundwater will be extracted as a slurry through extraction wells.
Hydrogeology	The area of geology that studies the distribution and movement of groundwater in the soil and rocks of the earth's crust (commonly in aquifers).
Monitoring Well	A water well that is used for the purpose of collecting groundwater information such as groundwater level, quality and other parameters as needed.
Overs	Material larger than 20 mesh (841µm) such as larger hard compacted sand material (concretions) or other small rocks.
Processing Facility	This is referring to the Vivian Sand Facility Project (Environment Act Licence No. 3367), which will process the sand extracted by this proposed sand extraction Project.
Project Site	Includes the Project footprint, which is the area that will encompass the land on which Project components are located, and immediate surrounding area that will be directly affected by the Project. For the purpose of this environmental assessment, the Project footprint has been determined for the operation years 2026 to 2030.
Sealed	Refers to the decommissioning of sand extraction wells in accordance with <i>The Groundwater and Water Well Act</i> .
Slurry	For this Project, a semi-liquid mixture of silica sand and recycled water. The proportion of sand and water within the slurry will vary during the extraction process at each extraction well.
Slurry line	Fully enclosed, temporary 14-inch (35.6 cm) line to transport sand and water slurry from extraction site to sand Processing Facility site. Line is made from HDPE (high-density polyethylene).
Trigger Action Response Plan	Plan to monitor groundwater and short-term and long-term ground surface settlement and underground settlement.
UV	Ultraviolet (UV) water treatment systems use UV rays to destroy 99.99% of harmful microorganisms without adding chemicals and are commonly used in municipal water treatment facilities.
Viewscape	The visible landscape.
Well Construction	Refers to any work in relation to the drilling, installing, modifying or repairing of a well or test hole.
Well Cluster	For this Project, an area 50 m to 60 m in diameter where a cluster of five sand extraction wells are located approximately 18 m apart. The distance between each well cluster is a minimum of 60 m.

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Appendices

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Appendix B	Hydrogeological Assessment Report - Updated
Appendix C	Geotechnical Analysis Report
Appendix D	Traffic Impact Study (Draft)
Appendix E	Soil Characteristics in the Project Site Area
Appendix F	Species of Conservation Concern in the Interlake Plain Ecoregion
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1. General Project Information

1.1 Background

On July 23, 2021, AECOM submitted an application for an Environment Act Licence to Manitoba Environmental Approvals Branch (EAB) on behalf of Sio Silica Corporation (Sio) for the Vivian Sand Extraction Project (Manitoba Public Registry [file #6119.00](#)). Question and comments from the Manitoba Technical Advisory Committee (TAC) and public during the review period for the Environment Act Proposal (EAP) for the Vivian Sand Extraction Project were available in the public registry on November 15, 2021. That same day, Sio received a letter from the then Minister of Conservation and Climate advising that a Manitoba Clean Environment Commission (CEC) hearing would be held regarding the Vivian Sand Extraction Project. Prior to the commencement of the CEC hearing, and to address the Manitoba TAC and public review questions and comments on the Vivian Sand Extraction Project, AECOM submitted responses to TAC and public questions and comments on the EAP, which were uploaded by the EAB to the public registry in December 2021 and January 2022.

The CEC public hearing for the Vivian Sand Extraction Project was held over 12 days, from February 27 to March 15, 2023, in Steinbach, Anola and Beausejour (CEC 2023). A CEC report on the hearing, including conclusions and recommendations was completed on June 22, 2023 (CEC 2023). The CEC report advised that “...*significant conditions be required for the project to proceed.*” (CEC 2023). The CEC’s conditions were provided with eight recommendations regarding the originally proposed Vivian Sand Extraction Project (CEC 2023).

CEC Recommendations	The SiMBA Project Includes
#1 - Government Legal Opinion	N/A
#2 - Stepwise Approach	
#3 - Community & Indigenous Participation	
#4 - Monitoring & Environmental Management Plans	
#5 - Water Treatment Testing	
#6 - Engineering Standards & Limits	
#7 - Risk Assessments	
#8 - Cumulative Effects Assessment	N/A

Sio has heard the questions and concerns raised by the public and the TAC on their review of the EAP for the original Vivian Sand Extraction Project (AECOM 2021) and has considered the CEC’s recommendations (CEC 2023). In consideration of the concerns raised

during the review of the originally proposed Vivian Sand Extraction Project, and in consideration of the CEC’s recommendations (CEC 2023), Sio has substantially revised the originally proposed Vivian Sand Extraction Project. The substantially revised new sand extraction project, now named the SiMBA³ Project (hereafter the “Project”) is proposed to proceed using a stepwise phased approach that substantially reduces the sand volumes extracted from the sandstone aquifer for the initial years of Project operation. Using this approach while concurrently monitoring key aspects of concern regarding the environment (e.g., groundwater quality and quantity) for any changes not predicted to occur within the environmental assessment conclusions in this EAP report, Sio’s new Project is expected to address concerns raised regarding the previously proposed Vivian Sand Extraction Project EAP (AECOM 2021). A concordance table that summarizes Sio’s responses to the CEC’s recommendations (CEC 2023) is provided in **Appendix A**.

³ SiMBA Project name interpretation: “Si” = Silica; “Mb” = Manitoba; A = Action Plan: regarding Canada’s net zero 2050 emissions target “Action Plan 50”

1.2 Project Overview

Sio is applying for an Environment Act Licence for years 0 to 4 (five years) of initial sand extraction operations for a revised new sand extraction Project. Sio has heard the feedback from the public and the province on the previous EAP for the originally proposed Vivian Sand Extraction Project and is now submitting this EAP for review for a revised Project which describes a stepwise phased approach with substantially reduced extracted sand volumes for the first five years of the Project. Sio is still proposing to extract high purity quartz sand (hereafter “sand”) from the Winnipeg Sandstone aquifer (approximately 61 m, or 200 ft below ground) within the Winnipeg Sandstone geological formation southwest of the hamlet of Vivian, Manitoba and approximately 35 km east of the City of Winnipeg from the Project Area. The proposed Project is being developed for the purpose of supplying high purity quartz sand for use in a variety of markets such as the renewable energy industry (e.g. solar panel production), quartz powders (fillers, medical, dental), silicon metals, high purity quartz process equipment, crucibles, telecommunications (e.g. fibre optics), smart glass, silicon carbides (e.g. electronics, cellphones, computer chips), silicon enhanced alloys (e.g. aluminum components for aerospace and automobile), low iron glass (architectural envelopes) and ceramics. No sand will be utilized in fracking⁴ of any kind.

The Project will not be using an open pit quarry method due to the depth of the target sand deposit. Instead, water well drilling rigs will be used to drill extraction wells and install casings to the target sand deposit. The extraction wells will be between 10 inches (25.4 cm) and 8 inches (20.3 cm) in diameter, with a removable 16-inch (40.6) diameter casing at surface. Using compressed air, sand will be brought to the surface with groundwater from approximately 61 m (200 ft) below ground surface depending on the formation depth in the area. Extraction activities will occur April through November (and winter, weather dependant) each year of operation while well drilling activities may occur year-round.

The water portion of the sand and groundwater slurry that is brought to surface through extraction wells will be separated from the sand at the extraction site. This groundwater is then returned to the aquifer via the sand producing well after being filtered and treated with ultraviolet light (UV) or other approved method of treatment. UV treatment is a treatment technique commonly used in municipal water treatment facilities locally and globally. The sand then enters a movable slurry transport system via a small-diameter 14-inch (35.6 cm) slurry line to transport the sand slurry to Sio's Processing Facility to be constructed south of the hamlet of Vivian. This slurry transport system is part of a recycled water loop using the same water to move sand from the extraction site to the Processing Facility. A one-time water draw at the beginning of the initial extraction year is needed to prime the sand slurry transport system. After that, the initial one-time water draw remains in the slurry transport loop system while the sand enters and exists the loop system. The water component of the slurry will consist of recycled water that will remain in the system constantly flowing in a loop from the extraction sites to the Processing Facility. During the winter months, the water in the system is stored on site in tankage to eliminate the need to draw additional water at the start of each extraction season (April). Therefore, a minimal amount of groundwater is used by sand extraction activities each year of operation.

The slurry line will be relocated as the water well drilling rigs relocate between sequential extraction sites. Upon arrival to the Processing Facility, the sand and water are separated, with water first passing through a water treatment process before returning into the loop system for re-use. The procedure for sand processing and water treatment at a future Processing Facility is described within a separate Environment Act Proposal that was granted an Environment Act Licence (No. 3367) in December 2021. Therefore, the Processing Facility and associated infrastructure components are not assessed within this Environment Act Proposal.

⁴ Hydraulic fracturing, or ‘fracking’ is a method used to extract natural gas and oil from deep rock formations (i.e., shale). A specific type of silica sand acts as a proppant to open fractures when added to fracking fluids injected into unconventional oil and gas wells during hydraulic fracturing.

A thorough and complete hydrogeological study was conducted on the potential impacts of the extraction activities on the aquifer in 2021/2022. The results of these most recent hydrogeological studies are provided in an updated Hydrogeology and Geochemistry Assessment Report provided in **Appendix B** which is based on a new reduced sand extraction volume for this Project and includes additional information that was provided at the 2023 CEC hearings for the original Vivian Sand Extraction Project.

Progressive annual closure and rehabilitation of each extraction year area will be done once sand extraction is completed at each group of well cluster areas which will minimize the annual above-ground Project footprint. Annual sand extraction activities will occur sequentially within blocks of mineral leased land parcel areas south, and west of the sand Processing Facility. Extraction activities will gradually progress further from the Processing Facility each year within blocks of land adjacent to previous year extraction activity land areas over the anticipated 25-year life of the Project.

Sio is currently applying for an Environment Act Licence for extraction activities up to and including years 0 to 4 because advancements in extraction methods and operations are expected to increase efficiency and reduce overall footprint after these initial years of sand extraction. A Notice(s) of Alteration for future potential extraction years will be submitted to the EAB for review and approval, which will describe and assess future potential Project operations based on the initial years 0 to 4 operations. Therefore, the scope of this Environment Act Proposal is limited to the proposed activities and Project spatial extent up to and including years 0 to 4.

Key activities and components of the Project will include:

- Establishment of temporary access trails to annual sand extraction areas to accommodate water well drilling rigs.
- Extraction well drilling and monitoring year-round.
- Sand extraction April to November (and winter, weather dependant) in a phased approach starting with approximately 23 wells in year 0; 68 wells in year 1; 132 wells in years 2 and 3; and 137 wells in year 4; in clusters of one to five wells.
- Maximum of up to seven extraction wells operating simultaneously at the Project Site for five to seven days each.
- Separation of water from sand at the extraction site where excess water is returned to the sandstone aquifer via the sand producing well after filtration and UV treatment, or other approved treatment method, and sand enters the slurry transport loop.
- Pre-screening of sand and water slurry at the extraction site to remove material that is too large ('overs')⁵ with additional screening occurring at the proposed Processing Facility.
- Temporary contained storage at the well clusters of the overs material and well drill cuttings for disposal or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. Usage for well sealing activities will only be for approved cuttings and may include sandstone or carbonate (limestone).
- Construction of above-ground temporary slurry line (high density polyethylene piping) and associated pumping stations, to transport the pre-screened sand directly to the Processing Facility and transport recycled water from the Processing Facility back to the extraction sites for re-use.
- Dismantling and relocating the above-ground slurry and water return lines and pumping stations, as needed, to the subsequent annual sand extraction area.
- Treatment of groundwater separated from the sand and water slurry at the extraction site using a filtration and UV system, or other approved treatment system, before returning excess groundwater to the aquifer via extraction wells.
- Progressive decommissioning (sealing) of annual extraction wells and well cluster areas.

⁵ Overs are material larger than 20 mesh (841µm) such as larger hard compacted sand material (concretions) or other small rocks.

- Progressive annual rehabilitation of temporary drill rig access trails, equipment laydown areas, slurry line trails and return water line trails.

At no time will dry sand be left exposed at the Project site. Sand will be wet and will either be contained within the extraction well line or the slurry line. Material that is too large ('overs'), such as concretions (calcified sand), will be stored in appropriate containment prior to removal from site or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. Therefore, the risk of silica sand dust dispersal is eliminated.

Land area within which extraction wells will be established will occupy approximately 0.65 km² (one quarter section) during each annual extraction activity year. A phased approach will allow for the eventual extraction of up to 500,000 tonnes of sand annually. Sio has heard the feedback from the public and the province and is proposing a substantial reduction in the total tonnage annually and within the previously applied for project area (AECOM 2021). The following phased approach is proposed:

Phase 1 - Year 0 – Maximum of 100,000 tonnes

Phase 2 – Year 1 – Maximum of 300,000 tonnes

Phase 3 – Year 2 to 4 – Maximum of 500,000 tonnes annually

Wells will be drilled in clusters consisting of up to five wells per cluster. Wells will be sequentially developed and progressively decommissioned and rehabilitated each year. Once drilled, these wells will be producing for five to seven days. All wells within a well cluster may not be operating at the same time. The objective is to keep the slurry supply continuously moving to the Processing Facility at an optimal and manageable rate. Therefore, the maximum number of wells operating simultaneously maybe spread across adjacent well clusters (e.g., two operating wells in one cluster and one in an adjacent well cluster). Up to seven wells may be operating at any given time at full capacity in Phase 3 from year 2 onwards. The operations will move in a pattern from one well cluster to the next, with wells being progressively sealed (i.e., decommissioned) sequentially over the April to November timeframe. Disturbed areas will be rehabilitated yearly.

A summary of the key changes from the originally proposed Vivian Sand Extraction Project (original project; AECOM 2021) and the currently proposed revised Project (new Project) is provided in **Table 1-1**.

Table 1-1: Key Changes: Original vs. New Project

Original Project*	New Project
Size of Project:	
1,360,000 tonnes of sand extracted per year	Reduced by approximately 63% to 500,000 tonnes per year maximum (starting with up to 100,000 tonnes per year)
Maximum 467 extraction wells per year	Reduced by approximately 64% to a maximum 167 well per year, with only 25 wells in first year
Seven wells per cluster	Reduced to one to five wells per cluster
1.2 km² footprint per year for extraction areas	Reduced by approximately 46% to 0.65 km² footprint per year for extraction areas - Substantially smaller Project Site for Years 0 to 4 and substantially smaller future life of Project area
Project Site area = 649 ha	Reduced Project Site area by approximately 45% to 358 ha
Life of Project area = 8,235 ha	Reduced Life of Project area by approximately 66% to 2,764 ha
Phased (Staged) Approach:	
Not proposed	Phased approach: - Phase 1 (Year 0): Max. 100,000 tonnes sand / year - Phase 2 (Year 1): Max. 300,000 tonnes sand / year - Phase 3 (Years 2 to 4): Max. 500,000 tonnes sand / year
Groundwater Treatment before Groundwater Returned to Aquifer:	
Ultraviolet (UV) treatment	Additional safeguards: - UV treatment plus filtering - Testing of groundwater treatment process to confirm compliance with provisions in an Environment Act Licence
Follow-up Plans:	
- Waste Characterization and Management Plan - Water Management Plan - Progressive Well Abandonment Plan - Groundwater Monitoring and Impact Mitigation Plan - Erosion and Sediment Control Plan - Environmental Emergency Response Plan - Revegetation Monitoring Program - Heritage Resources Protection Plan - Noise Mitigation Plan - Closure Plan	Same as original Project, plus the following additional Follow-up Plans: - Complaint Handling Plan - Wildlife Monitoring and Impact Mitigation Plan - Trigger Action Response Plans (to monitor groundwater and short-term and long-term ground surface settlement and underground settlement) - Methods for geotechnical data collection revised to address CEC recommendations (Appendix A)

* Vivian Sand Extraction Project EAP (AECOM 2021)

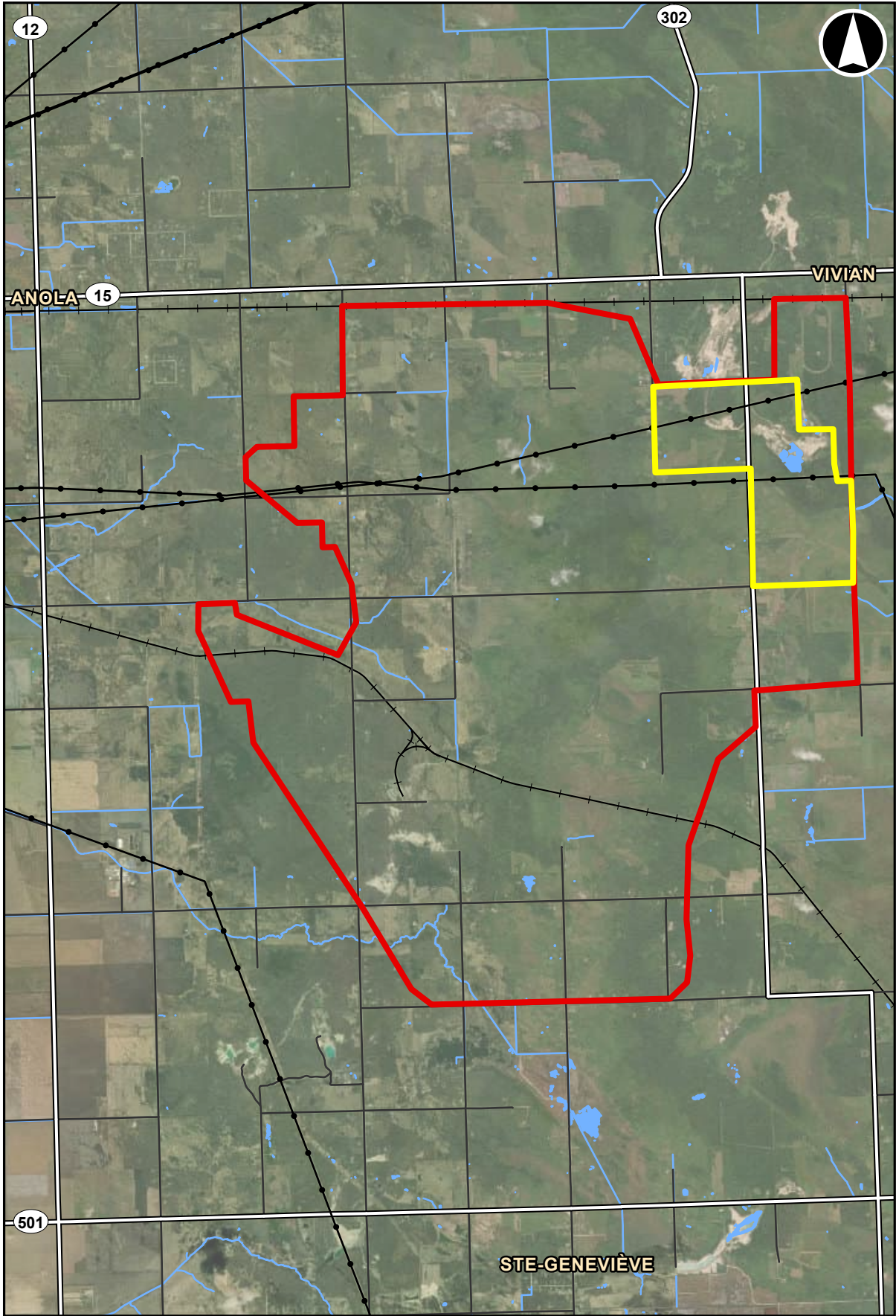
As indicated in **Table 1-1**, the land area required for the new Project is smaller than the original project. A comparison of the spatial area of the original project vs. the new Project is shown in **Figure 1-1**.

Sio's changes from the original project to this new Project, summarized in **Table 1-1**, are intended to not only address questions and concerns raised during the CEC hearing for the original project (**Section 1.1**), but also to address the reasons for denying the issuance of an Environment Act Licence expressed by the Minister of Environment and Climate Change in a February 16, 2024 letter to Sio. This new Project, being

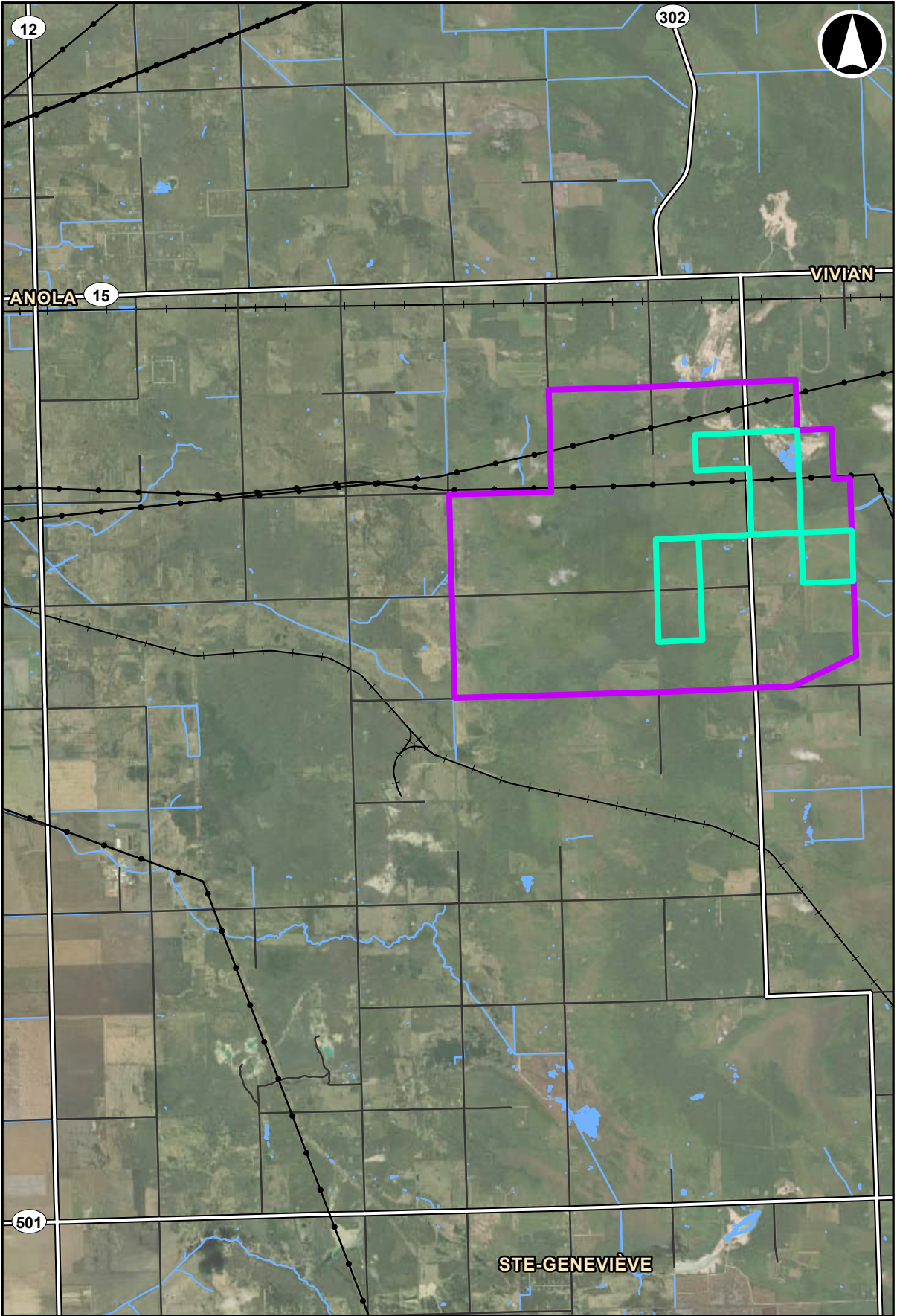
revised from the original project based on the outcome of the CEC hearing, and with appropriate mitigation measures, monitoring and follow-up plans as described in this Environment Act Proposal, is proposed to address the then Minister's previous key concerns regarding:

- Ensuring that the environment is protected and maintained in such a manner as to sustain a high quality of life for this and future generations
- Ensuring that drinking water can be protected now and for future generations

Details regarding Project activities and components are provided in **Section 2** (Project Description).



ORIGINAL PROJECT AREA



NEW PROJECT AREA

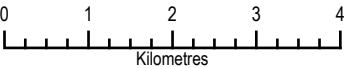


- Legend**
- Original Project Site Area
 - Original Life of Project Area
 - New Project Site Area
 - New Life of Project Area

- General Features**
- Highway
 - Road
 - Railway
 - Transmission Line
 - Watercourse
 - Waterbody

SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL

COMPARISON: ORIGINAL VS. NEW PROJECT AREAS



Datum: NAD 1983 UTM Zone 14N

April 2025 PN#: 60730241 1:90,000
*when printed 11"x17"

Figure 1-1

AECOM

Data Sources: MLI, NRCan - Canvec
Earthstar Geographics, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

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MAP LOCATION: \\NA\AECOM\NET\COMMON\PROJECTS\ENVIRONMENT ACT PROPOSAL\FIG_1_1_SIO_SILICA\EXTRACT\EA\APRXX_FIGURE_1MAP_FIG1_1_EAP_PROJECTLINEACOMPARI

1.3 Proponent Contact Information

Table 1-2: Proponent Contact Information

Name of Proponent	Sio Silica Corporation
Address of Proponent	Suite 1800, 201 Portage Ave. Winnipeg, MB R3C 0B9
Principal Contact Person for the EAP	Feisal Somji Chief Executive Officer info@siosilica.com Ph: 1-888-436-5238

1.4 Company Profile

Sio Silica Corporation (Sio) is a private Alberta company registered to carry on business in Manitoba. Sio (formerly known as CanWhite Sands Corp.) is the legal owner of mineral claims in and around the RM of Springfield. The mineral deposits covered by these claims contain a high purity quartz sand resource (SiO₂ [Silica Dioxide]) which is unique to Manitoba, Canada, and North America. The purity of the raw sand resource, averaging 99.85%, is within international standards for high purity quartz sand use. This positions southeastern Manitoba as a viable supplier of high purity quartz sand utilized in green and renewable energy businesses as well as electronics, specialty/medical glass, and other industries supplied by high purity quartz.

Sio aims to be the lowest cost supplier of high purity quartz sand using environmentally sustainable methods while providing benefits to the local community. Sio proposes to develop this Manitoba-based Project using local resources and services to deliver the sand product by rail to markets in Canada, the United States and internationally.

- Corporation ID: 2019935051
- Business Number: 75100 0324 RC0001
- Incorporation Date: 09/15/2016

1.5 Project Location and Land Tenure

The Project will be located on private land covered under private surface rights within the Rural Municipality (RM) of Springfield as illustrated in **Figure 1-2**, within Sio mineral claims (**Figure 1-3**) and land parcels as listed in **Table 1-3**. Lands will have an agreement for surface and mineral rights access within other land parcels that will encompass Project activities and operations where they are not already under Sio's surface right and/or mineral claims. Mineral rights permit use and occupation of the land for the purpose of prospecting, exploring, developing, mining or production of minerals on, in, or under the land. Land agreements will be issued in advance of any work occurring on private property.

Where an existing road crossing or property crossing not owned or under agreement with Sio is required for the slurry line system or temporary access trails, a separate application / agreement will be filed / issued in advance of operations.

Table 1-3: Project Mining Claims and Legal Land Description Information

Mining Claim Name*	Disposition Number	Legal Land Description	Area (ha) Extraction Years 0 to 4
Bru 81	SV12664	NW Sec-18 Twp-010 Rge-08 E1	56.27
Bru 82	SV12665	SW Sec-19 Twp-010 Rge-08 E1	57.42
Bru 83	SV12666	NW Sec-20 Twp-010 Rge-08 E1	63.01
Bru 84	SV12667	SE Sec-20 Twp-010 Rge-08 E1	0.01
Bru 92	SV12675	SW Sec-29 Twp-010 Rge-08 E1	69.26
Bru 93	SV12676	SE Sec-30 Twp-010 Rge-08 E1	45.63

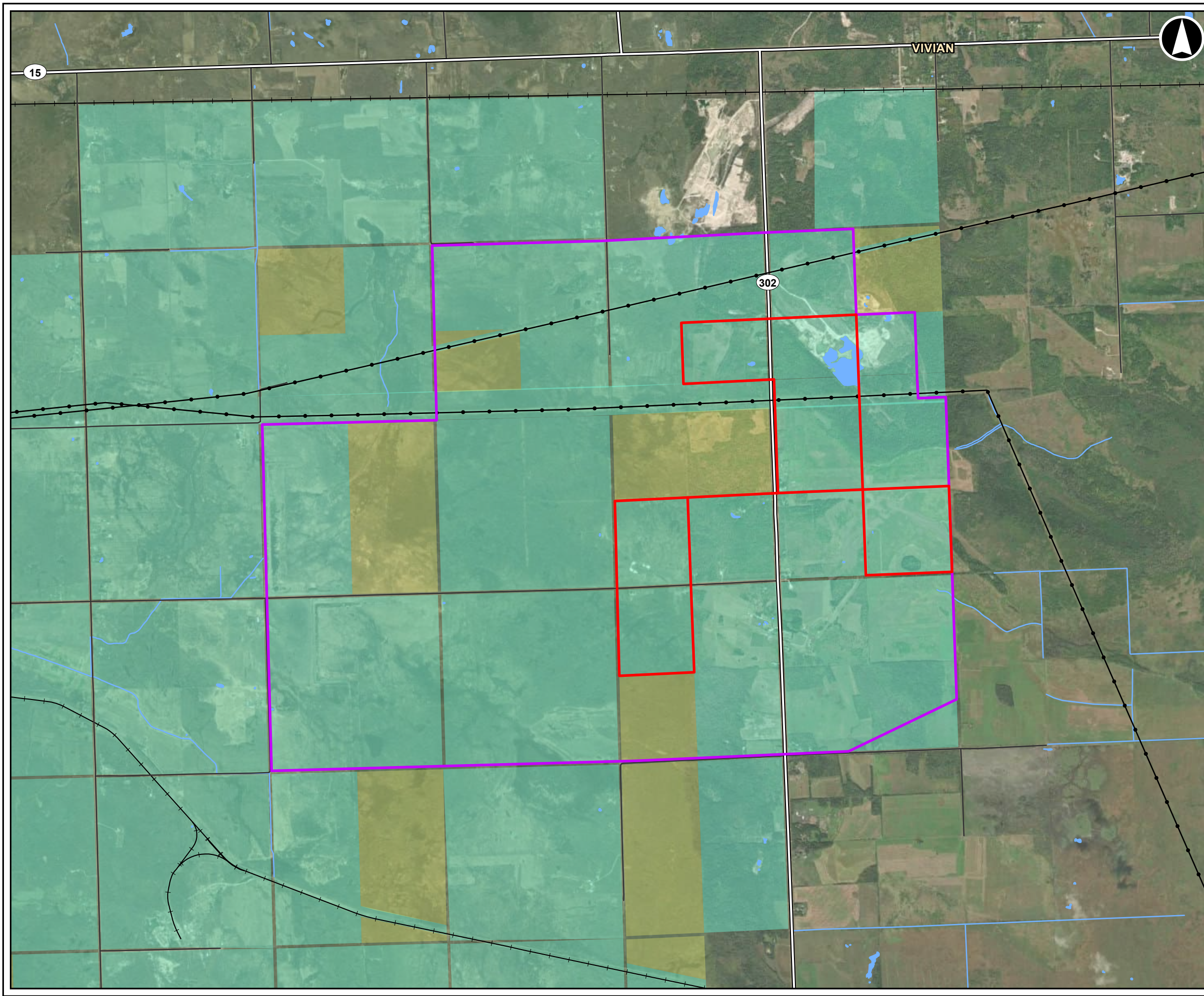
*See **Figure 1-3** for locations of mineral rights.

1.5.1 Setbacks

The location of the Project components will be setback at least 15 m from the centre of a Manitoba Hydro Right-of-Way (RoW) or easement. Unless otherwise indicated in a landowner agreement, statutory requirement or licence requirement as applicable, Project components will also have the following minimum setbacks:

- 100 m from a dwelling and the dwelling's drinking water well.
- 100 m from a hamlet.
- 50 m from a private property line.
- 100 m from any Manitoba Hydro utilities.

The location of extraction drill holes will also be sited to protect existing water wells and waterbodies, as discussed in **Section 6** (Environmental Assessment and Mitigation Measures).



Legend

- Project Site Boundary
- 25 Year Life of Project Area

Land Ownership

- Crown Land
- Private Land

General Features

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

**PROJECT SITE LOCATION
AND LAND OWNERSHIP**

0 0.5 1 1.5 2
Kilometres

Datum: NAD 1983 UTM Zone 14N

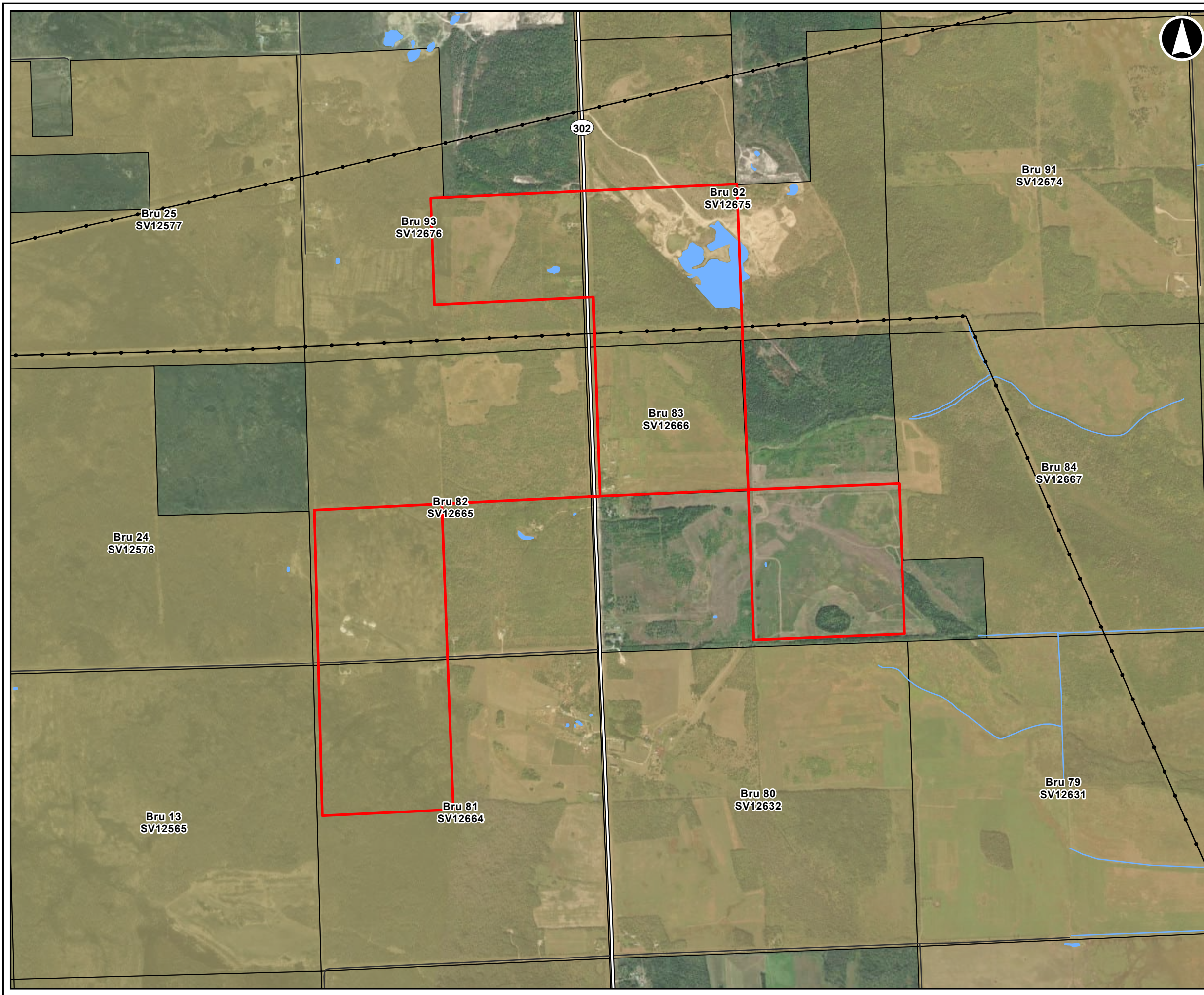
May, 2024	PN#: 60730241	1:35,000 * when printed 11"x17"
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Figure 1-2

AECOM

Data Sources: MLI, NRCan - Canvec
Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Maxar

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Legend

- Project Site Boundary
- Mining Claims

General Features

- Highway
- Road
- Railway
- Transmission Line
- Watercourse
- Waterbody

**SIO SILICA CORPORATION
ENVIRONMENT ACT PROPOSAL**

**PROJECT SITE AREA
MINERAL RIGHTS**

0 200 400 600 800
Metres

Datum: NAD 1983 UTM Zone 14N

May, 2024	PN#: 60730241	1:20,000 * when printed 11"x17"
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Figure 1-3

AECOM

Data Sources: MLI, Manitoba Mining and Quarrying, NRCan - Carvec
Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Maxar

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1.6 Previous Exploration

Sio's previous sand deposit exploration activities occurred from 2017 to 2023 in southern Manitoba east of Winnipeg within an approximate 30 km west to east width area extending from approximately 30 km south of Steinbach, north to PTH 15 near Anola. The target underground quartz sand deposit known geologically as the Carmen Sand Member spans a wide area in Manitoba and was the focus of Sio's exploration activities due to the high purity quartz sand within this deposit.

These early exploration activities were conducted under mining claim permits, borehole licences, reinjection permits and landowner agreements for private land access to determine the full extent of the quartz sand deposit purity. Exploration included determination of the most productive deposit areas that were also within proximity to a suitable location for a sand Processing Facility with access to railway and other existing infrastructure such as roads and available electrical power line options.

To minimize environmental impacts and costs associated with trucking extracted sand to a sand Processing Facility, Sio selected an alternative solution whereby the extracted sand resource and water would be transported via slurry line directly to a sand Processing Facility that is planned to be constructed and operated by Sio in accordance with Environment Act Licence No. 3367. The processed sand product is then proposed to be transported from the Processing Facility by direct loading to railcar for transportation of the product to markets in Canada, the United States and internationally. Therefore, locating the Project primarily within the RM of Springfield was determined to be the most feasible location for the Project.

1.7 Project Planning

Based on recommendations within the CEC report on the previously proposed Vivian Sand Extraction Project (CEC 2023), Sio's Project planning will include:

- Submission of Environmental Management Plans to the EAB for review prior to operations (e.g., groundwater monitoring and impact mitigation plan, complaint handling plan, emergency response plan). Information on Project environment-related plans is provided in **Section 7**.
- Demonstration of sequential installation, operation and decommissioning of extraction wells.
- Operation of water treatment equipment by certified and trained individuals as per the Water and Wastewater Facility Operators Regulation (77/2003) under *The Environment Act*.
- Conducting geotechnical, hydrogeological and geochemistry assessments/installations for monitoring and sampling in accordance with an Environment Act Licence for the Project. Geotechnical investigations are proposed to include:
 - Angled bore-hole testing to verify presence of vertical fractures
 - Acoustic Televiewer/Optical Televiewer (ATV/OTV) surveys
 - Coring to confirm overburden, and competent caprock thickness
 - Side scan sonar to confirm cavity development and long-term cavity shape
- A phased approach to initial Project development as described in **Section 1.7.1**.

1.7.1 Phased Approach

From the CEC report on the previously proposed Vivian Sand Extraction Project regarding water quality (CEC 2023), the CEC advised that *"If this project is to proceed safely and with confidence that there will be no significant adverse effect, it must be treated as a prototype, operating in a limited capacity as something less than a fully licensed development and something more than a program of test wells."* Recommendation # 2iii of the CEC report advised that *"The proponent must carry out full-scale well-cluster extraction tests in order to provide information on the potential effects of extracting the planned 21,000 tonnes of sand from a single cluster. This should be completed from several clusters in different parts of the project area."* (CEC 2023).

To address the above CEC recommendation, Sio will initiate the first year of operations (Phase 1) at a location that allows for a reduced number of wells in a cluster, with no more than one or two wells per cluster. Sio will start sand extraction activities using a stepwise phased approach that includes initiating a limited number of well clusters with a small number of wells. During the initial phase of Project operations, Project design assumptions and geotechnical and geological modeling (**Appendix C**) will be confirmed by monitoring. The number of well clusters and wells will gradually be increased if monitoring data and associated reporting results verify that this can be done without risk of significant adverse effects during the initial Phase 1 small-scale operations. Based on on-going monitoring results, minor adjustments to the Project design may be done during the initial phase of operations (e.g., number of wells and spacing of wells within each well cluster and spacing of each well cluster). Should monitoring results yield requirements for Project operation parameter changes, Sio will advise the EAB of Project operation changes in accordance with provisions in an Environment Act Licence for the Project.

As indicated in **Section 1.2**, the following phased approach is proposed for the extraction of sand:

Phase 1 - Year 0 – Maximum of 100,000 tonnes

Phase 2 – Year 1 – Maximum of 300,000 tonnes

Phase 3 – Year 2 to 4 – Maximum of 500,000 tonnes annually

Descriptions of the Project stages of this phased approach are provided in **Section 1.7.2**.

1.7.2 Project Stages

Sio is planning to initiate clearing to accommodate temporary access trails for extraction well drill rigs, well cluster areas and temporary trails for slurry lines and water return lines for the first year of extraction activities in Q1 2026⁶ and begin initial Project operations (sand slurry extraction) in Q2 2026 upon the issuance of regulatory permits and approvals required for Project construction and operation. Details of planned Project stages, activities and scheduling are provided in the Project Description (**Section 2**).

Project stages include the following:

- Planning and Permitting stage
 - Current stage of the proposed Project
- Construction stage (during each sequential extraction year)
 - Includes clearing for and establishment of:
 - Temporary drilling rig access trails and temporary trails for slurry line and return water line
 - Well cluster (sized based on the allowable span as determined by the latest geotechnical analyses data; see Table 9 in **Appendix C**) which includes equipment laydown areas within each annual mineral leased extraction area block
 - Drilling of extraction wells (one to five within each well cluster)
 - Construction/placement of slurry lines, water return lines and associated pumping stations
- Operation stage
 - Extraction of quartz sand and groundwater to surface using compressed air and water well development methods
 - Separation of the water and sand at surface at the extraction site
 - Return of this groundwater to the well (also known as 'reinjection') following a filtration and UV light treatment, or other approved treatment method

⁶ **Note:** QX = year quarter (e.g. Q3 = July through September timeframe)

- Pumping of sand to the sand Processing Facility via slurry lines which contain separate recycled water from the Processing Facility to move sand through the slurry lines.
- Return of treated slurry line water from the Processing Facility to the extraction site for reuse to bring sand to the facility in a loop system.
- Decommissioning and Closure (annual)
 - Annual progressive (sequential) closure and decommissioning (sealing) of extraction wells
 - Progressive annual rehabilitation of well cluster areas, temporary drill rig access trails, slurry line and return water line trails and associated pumping station locations as needed.

The annual Project operation activity will occur 24 hours per day, 7 days per week April through November (and winter, weather dependant). Extraction well drilling will occur year-round.

1.8 Regulatory Framework

1.8.1 The Environment Act

This Project will be reviewed by MECC under *The Environment Act* as a “mine” which is a Class 2 development in section 3 of the Classes of Development Regulation under group 5 “Mining”. The Environment Act Licence application for this Project, and scope of this current EAP document, is for extraction years up to and including year 0 to 4 (i.e., five years of operation). Notices of Alteration will be submitted to the Environmental Approvals Branch for each subsequent four-year block of future proposed extraction activities for the 25-year life of the Project. The application information and review process for Notices of Alteration of an Environment Act Licence for the Project will be as required under Section 14 of *The Environment Act*.

Processing of the extracted sand resource will occur at a Processing Facility which was licenced by the province in 2021 (Environment Act Licence No. 3367) under *The Environment Act* as a Class 2 development (a “manufacturing and industrial plant”) under the Classes of Development Regulation.

Sio submitted an Environment Act Licence application for the Processing Facility separately and in advance of this extraction Project because:

- The Processing Facility consists of a permanent building and related infrastructure similar to other manufacturing operations located in urban or semi-urban settings.
- By contrast, Sio anticipates that special license conditions will have to be contemplated for extraction which will involve changing of extraction sites on a relatively frequent basis, which is not typical for Environment Act Licences and which will not be relevant to the Processing Facility.
- In the future, the Processing Facility could be operated on a commercial basis to process and transfer sand that is not mined by the same owner provided that the sand is of the same nature and quality as the resource to which Sio has rights.
- Construction of the Processing Facility will take time to achieve, whereas extraction involves portable drills and other portable components which will move frequently and for which no permanent structures are required to be constructed.
- A re-zoning application and Development Agreement with the Rural Municipality of Springfield for the Facility Project were also required, and needed to occur sequentially, the timing of which was not linked to the sand extraction Project and could therefore occur separately from the Project.

1.8.2 The Mines and Minerals Act

Sand extraction activities are proposed to occur within mining claims issued to Sio under provisions of *The Mines and Minerals Act* and under borehole licences issued under Part 3 of the Drilling Regulation. The current mining claims that are included within the Project Site where Project activities will occur (**Figure 1-3**) are being converted to mineral leases for production extraction of sand.

A draft Closure Plan has been developed and submitted to Manitoba Mining, Oil and Gas Branch and Manitoba Environment and Climate (MECC) for this Project in accordance with the Manitoba Mine Closure Regulation 67/99 General Closure Plan Guidelines (**Section 7.13**).

1.8.3 Other Approvals

In addition to seeking licensing under *The Environment Act*, Sio will apply to Manitoba for:

- Water rights license(s) for the extraction of groundwater as described in **Section 2.6** (Water Use).
- Injection permit(s) for return of water to the sandstone aquifer.
- Burning permits to dispose of woody debris will be sought, as required, in accordance with Section 19(1) of *The Wildfires Act*.

Sio is in discussions with Manitoba Hydro, other local stakeholders and Manitoba Infrastructure to coordinate the development of Project temporary extraction equipment access trail intersections to existing municipality roads and PR 302, and to develop sand and groundwater slurry line and water return line crossings over and/or under existing municipality roads and PR 302.

No federal permits or approvals are expected to be required for the Project.

1.9 Project Funding

Development of the Project will be funded entirely by Sio and will be owned and operated by Sio.

1.10 Project Schedule

The proposed Project schedule is provided in **Table 1-4**.

Table 1-4: Proposed Scheduling

Project Stages and Activity	Proposed Schedule (subject to the results of Regulatory review)
Construction	
Progressive, sequential extraction site preparation.	Q1 2026 for initial Phase 1 production extraction year, then April through November (and winter, weather dependant) for each extraction year thereafter (i.e., Phases 2 and 3). Activities will occur 24 hours per day, seven days/week (24/7).
Clearing vegetation to accommodate temporary drill rig access trails; well clusters; slurry line and water return line trails and placement of pumping stations.	Necessary vegetation clearing each year will occur during winter months to the extent feasible and will be done outside of the breeding bird season (April 14 – August 24).
Placement/construction of slurry line and groundwater return line.	Year-round (24/7).
Drilling of extraction wells for Phase 1 and for each subsequent extraction years after (i.e., Phases 2 and 3)	
Operation	
Pumping of sand and water slurry via slurry lines to the sand Processing Facility and return of water from the Processing Facility to the aquifer at the extraction sites.	Q2/Q3/Q4 2026 for initial Phase 1 production extraction year, then April through November (and winter, weather dependant) for each extraction year thereafter (i.e., Phases 2 and 3). Activities will occur 24/7.
Decommissioning and Closure	Annual sequential (progressive) decommissioning of well clusters/capping of extraction wells, decommissioning of slurry line, water return line and pumping stations, rehabilitation of disturbed extraction sites and other temporarily disturbed areas (access trails, slurry line placement areas, well clusters, pumping station areas).

Note: QX = year quarter (e.g. Q4 = October through December timeframe)

As indicated in **Section 1.2**, the following phased approach is proposed for the extraction of sand:

Phase 1 - Year 0 – Maximum of 100,000 tonnes

Phase 2 – Year 1 – Maximum of 300,000 tonnes

Phase 3 – Year 2 to 4 – Maximum of 500,000 tonnes annually

2. Project Description

Sio has heard the feedback from the public and the province on its original Vivian Sand Extraction Project EAP and is now submitting this new revised EAP for review. This Project has been revised to proceed using a stepwise phased approach, and with substantially reduced sand volumes extracted during the first four years of the Project. Sio is still proposing to extract high purity quartz sand and groundwater in a slurry using water well drilling rigs and a standard water well airlift extraction method on private land overlaying the sandstone geological formation southwest of the hamlet of Vivian, Manitoba, and approximately 35 km east of the City of Winnipeg from the border of the Sio mining claims. Sand extraction activities will occur 24/7 from April through November (and winter, weather dependant) while extraction well drilling will occur year-round.

The water portion of the sand and groundwater slurry that will be brought to surface through extraction wells will be separated from the sand at the extraction site. This groundwater is then returned to the aquifer via the sand producing well after being filtered and treated with UV light, or other approved treatment method. UV treatment is a technique commonly used in municipal water treatment facilities. The sand, then enters a movable slurry transport system via a small-diameter 14-inch (35.6 cm) slurry line to transport the sand slurry to a sand Processing Facility located south of the hamlet of Vivian. This slurry transport system is part of a recycled water loop using the same water to move sand from the extraction site to the Processing Facility. A one-time water draw at the beginning of the initial extraction year is needed to prime the sand slurry transport system. After that, the initial one-time water draw remains in the slurry transport loop system while the sand enters and exists the loop system. The water component of the slurry will consist of recycled water that will remain in the system constantly flowing in a loop from the extraction sites to the proposed Processing Facility. In the winter months, the water in the system is stored on site in tankage to eliminate the need to draw additional water at the start of each extraction season (April). Therefore, a minimal amount of groundwater is used by sand extraction activities each year of operation. The sand Processing Facility is already licenced under *The Environment Act* (Environment Act Licence No. 3367).

The amount of sand within the target geological formation, i.e. the Carman Sand Member, within Sio's mining claims for this Project is much more than can be economically extracted. Sio is planning to target less than 0.0125% of that sand resource for extraction over the first five years of the Project, and approximately 0.082% over the 25-year mine life of the known 15,252,000,000 tonnes of in-place sand resource as defined by a resource estimate conducted by (Stantec 2024a,b).

Section 2.1 provides additional information for the Project components and activities.

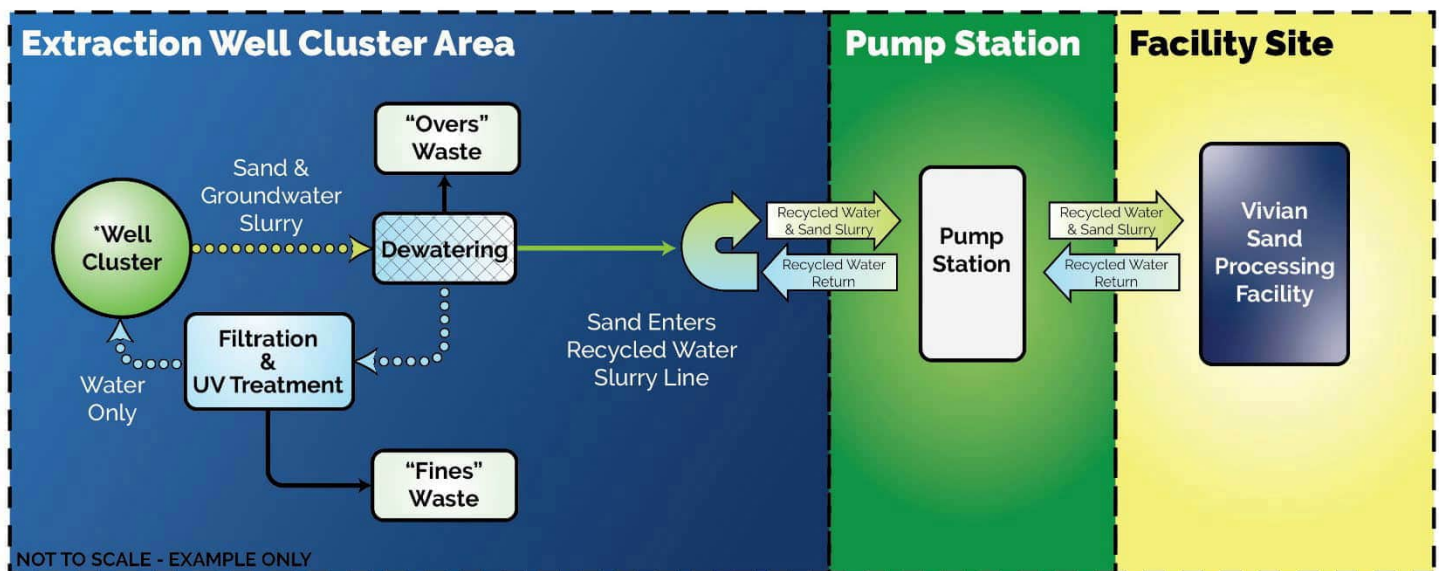
2.1 Components and Activities

The proposed Project will consist of the following key activities and components proposed to be permitted under an Environment Act Licence:

- Establishment of temporary access trails to annual sand extraction areas to accommodate water well drilling rigs.
- Extraction well drilling and monitoring year-round.
- Sand extraction from April to November (and winter, weather dependant) in a phased approach starting with approximately 23 wells in year 0; 68 wells in year 1; 132 wells in years 2 and 3; and 137 wells in year 4; in clusters of one to five wells.
- Separation of water from sand at the extraction site where excess water is returned to the sandstone aquifer via the sand producing well after filtration and UV treatment, or other approved treatment method, and sand enters the slurry transport loop.

- Pre-screening of sand and water slurry at the extraction site to remove material that is too large ('overs'), such as concretions (calcified sand), with additional screening occurring at the Processing Facility⁷.
- Temporary contained storage at the well clusters of the overs material and well drill cuttings for disposal at a licenced facility or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. Usage for well sealing activities will only be for approved cuttings and may include sandstone or limestone.
- Construction of above-ground temporary slurry line and associated pumping stations, to transport the pre-screened sand directly to the Processing Facility and transport recycled water from the Processing Facility back to the extraction sites for re-use.
- Dismantling and relocating the above-ground slurry and water return lines and pumping stations to the subsequent annual sand extraction area.
- Treatment of groundwater separated from the sand and water slurry at the extraction site using filtration and a UV system, or other approved treatment method before returning excess groundwater to the aquifer via extraction wells.
- Progressive decommissioning (well sealing) of annual extraction wells and well cluster areas.
- Progressive annual rehabilitation of temporary drill rig access trails; equipment laydown areas; slurry line trails and return water line trails.

Figure 2-1 is a general illustration of the sand extraction circuit process.



¹1-5 wells in each cluster

²"overs" & "fines" waste is stored in appropriate containment until it is removed for disposal

Figure 2-1: Sand Extraction Circuit Process

⁷ The sand Processing Facility was granted Environment Act Licence No. 3367 in December 2021 by the Environmental Approvals Branch as a separate Environment Act Licence.

The land parcels where sequential sand extraction activities will occur by year for the first four years of the Project are illustrated in **Figure 1-3**. The first four years of sand extraction activities are expected to result in improvements and efficiencies to the sand extraction method. Therefore, the site layout and ancillary infrastructure for the subsequent four-year blocks of sand extraction areas (after the first four years of Project operation) up to the 25 -year life of the Project (**Figure 1-2**) will be submitted to MECC as Notices of Alteration to an Environment Act Licence for the Project.

Clearing of natural vegetation to accommodate the establishment of sand extraction well cluster sites, temporary access trails, temporary trails for slurry lines and water return lines and area for pumping stations will occur outside of the peak breeding bird season for the Project area (i.e. April 25 – August 15) to avoid contravening the federal *Migratory Birds Convention Act, 1994*. This vegetation clearing activity restriction will also reduce adverse effects to wildlife young during this sensitive seasonal time period. Mitigation measures to avoid or minimize adverse effects to wildlife are fully described in **Section 6** (Environmental Assessment and Mitigation Measures). Project activities will occur on previously disturbed areas to the maximum extent feasible to minimize Project effects on vegetation and associated wildlife.

Progressive annual decommissioning of extraction wells and ancillary components (e.g. temporary access trails; slurry line), and progressive annual rehabilitation of disturbed areas, will be done in accordance with a Closure Plan (**Section 7.13**).

2.2 Sand Extraction Process

The Project will be developed as a sequential extraction well drilling operation with progressive annual closure / sealing of extraction wells and progressive annual rehabilitation of temporarily disturbed areas. Temporarily disturbed areas include areas to accommodate the extraction wells, drilling rig access trails, equipment laydown areas (within well cluster areas) and trails to accommodate the slurry lines and water return lines.

Operations will start out with lower numbers of wells (up to 25 extraction wells during Phase 1) with the number of extraction wells gradually increasing over the first few years of operations. Sio anticipates extracting sand as a sand and water slurry from up to 167 extraction wells per year by Phase 3 at an approximate depth of 61 m (200 ft) in the Winnipeg Sandstone geological formation. Not all extraction wells during each year of operations will be operating simultaneously (i.e. at the same time). As indicated in **Section 1.2**, a maximum of seven extraction wells will be operating simultaneously for five to seven days each. The sand and water slurry will be transported directly to an adjacent sand Processing Facility via above-ground slurry lines that may be diverted underground at road crossings, as required. Pumping stations will be installed as necessary along the slurry line and water return line trails to facilitate transport of the sand and water slurry to the sand Processing Facility and water return from the sand Processing Facility. This method of sand extraction will minimize above-ground disturbance and eliminate the need for sand transportation truck traffic as well as dust related to trucking or open pit digging. Additional details regarding the sand extraction method, how the slurry is transported to the sand Processing Facility and how excess water is returned to the aquifer at the extraction site are provided below in **Section 2.2.1**.

2.2.1 Extraction Method

Sand will be extracted from the Winnipeg Sandstone aquifer using an airlift extraction method which uses a compressor to circulate air into the bottom of the installed production pipe within each extraction well to extract the sand which is then placed in a slurry line for transportation directly to a sand Processing Facility. The extraction method sequence of activities is described as follows:

- 1) Drilling of extraction wells will occur year-round. Clusters of one to five extraction wells will be drilled (**Section 2.2.2**) in advance of extraction activities occurring using a water well drilling rig, and using standard industry practice water well drilling techniques. A maximum of seven extraction wells are expected to be operating simultaneously at full capacity operations from year 2 onwards (i.e. at the

same time). These seven active extraction wells may be spread across adjacent well clusters. The number of wells in each cluster will be based on the allowable span as determined by a geotechnical analysis report for this Project as provided in **Appendix C**. The geotechnical analysis report (**Appendix C**) was developed for conservative maximum allowable spans of the extraction areas and spacing required according to the thickness of the limestone caprock and overburden.

- a) When each well is drilled, a casing will be installed and grouted in place to isolate between the various formation layers to mitigate vertical mixing of the different aquifers present. For additional details explaining how the extraction wells will be installed, refer to Section 2 of the Hydrogeological Assessment Report provided in **Appendix B**.
 - b) Wells will be drilled into the sandstone over one to two days. Once a well is drilled and the casing is in place with cement as per *The Groundwater and Water Well Act* requirements, wells are securely capped until sand extraction activities begin.
- 2) Sand extraction activities will occur 24/7 from April through November (and winter, weather dependant). Up to seven extraction wells will be operating simultaneously with active wells in the same cluster or adjacent clusters.
- a) A production pipe will be installed in the extraction well with an air line installed inside the production pipe for air to circulate and facilitate movement of sand and water to the surface. This activity is a standard water well drilling and production method. The compressor is a dry screw compressor, which is oilless, and therefore no oil is expected in the air. The compressor will be equipped with a standard intake filter which is designed to remove 99% of 5 micron or larger contaminants and 95% of 3 micron or larger contaminants.
 - b) The sand and groundwater slurry brought to surface will pass through vibrating screens installed over a sump at the extraction site which will capture overs such as concretions (calcified sand) which are commonly encountered.
 - c) The sand and groundwater slurry will then move to a dewatering station at the extraction site where the sand will be separated from the groundwater.
 - d) This groundwater will then be returned to the aquifer via the sand producing extraction well after being filtered and treated with UV light, which is a water treatment technique commonly used in municipal water treatment facilities.
 - e) The construction method of the extraction well and surface water handling will prevent water that is returned to the sandstone from contacting any potential source of contamination.
 - f) The water that is returned to the sandstone aquifer comes from the sandstone aquifer and returns to the same place after filtration and UV treatment as described above.
 - g) The sand will then enter a movable slurry transport system via a slurry line that will transport the sand slurry to the sand Processing Facility located south of the hamlet of Vivian.
 - h) This slurry transport system will contain recycled water from the Processing Facility that is traveling in a continuous loop. The sand enters the loop at the extraction site, travels in the slurry line to the Processing Facility and is removed from the slurry line for washing and drying. The Vivian Sand Facility Project Environment Act Proposal (AECOM 2020), available in the Manitoba Public Registry⁸, describes how the sand is processed once it arrives at the facility.
 - i) Once the water no longer contains sand and has been through the treatment process (as outlined in the Facility Environment Act Proposal), the water returns to the extraction site via a dedicated water return line. This water then feeds back into the sand slurry line to move more sand back to the facility in a continuous loop process.
 - j) Each well will operate for five to seven days before the well is capped and equipment is moved to the next well.

⁸ The EAP for the Vivian Sand Facility Project (AECOM 2020) is accessible at:
<https://www.gov.mb.ca/sd/eal/registries/6057canwhite/index.html>

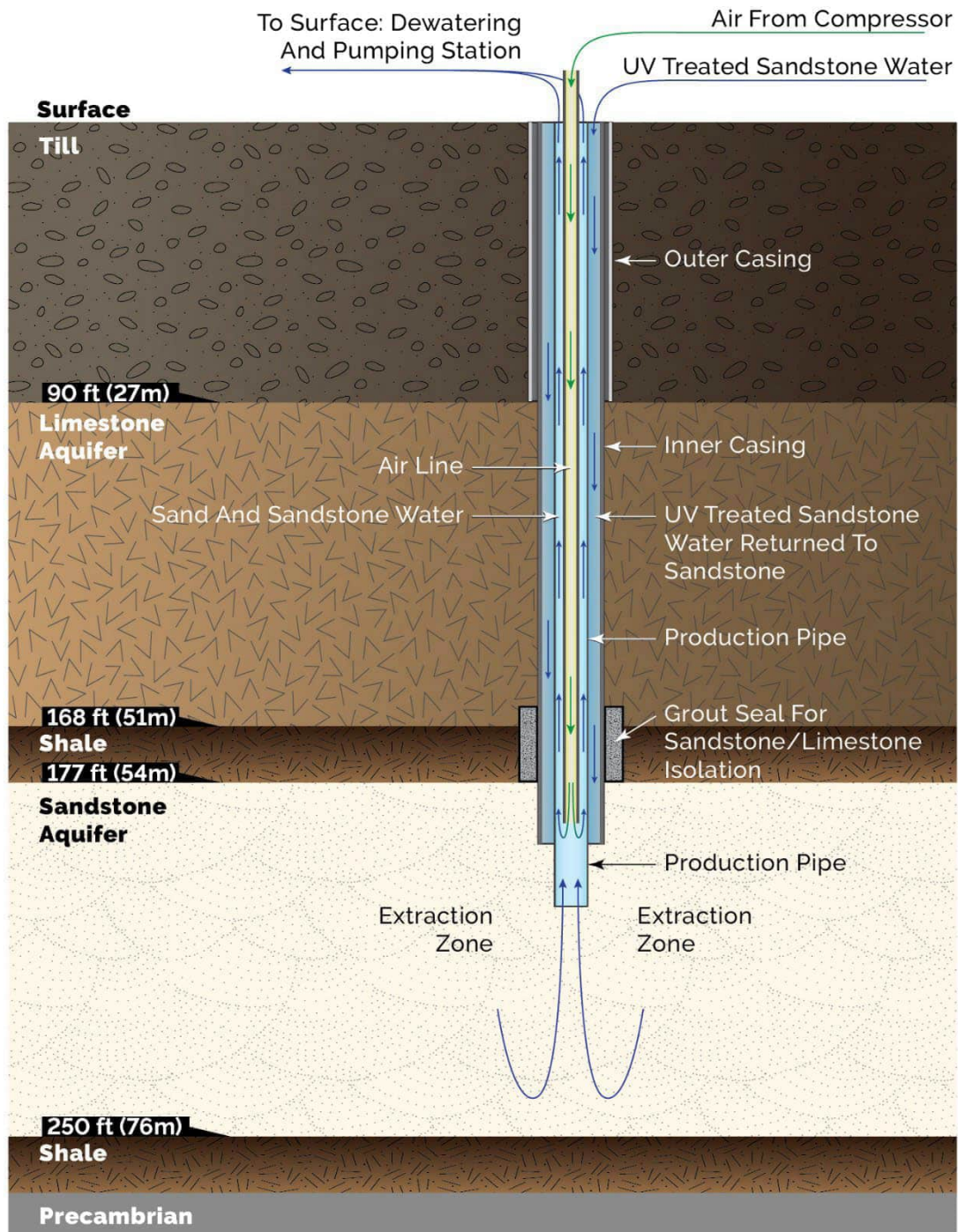
- k) Water well rigs that are the typical size used to install domestic water wells will be used to install the sand extraction wells.
- l) When a well is no longer producing sand, the production piping will be removed, the slurry line connection will be disconnected, and the well will be capped. All equipment will then be moved to the next well in the cluster and re-connected.
- m) While this is occurring, the other wells (up to seven) will continue to operate so that the slurry loop system continues to supply sand to the facility for processing.
- n) Once the production piping is removed from the extraction well, the well will be sealed as per *The Groundwater and Water Well Act* requirements to prevent movement of water vertically between the aquifers.

The slurry loop system for transporting sand to the Processing Facility is designed to not require any additional water. **This allows for the majority of the water that comes from the extraction well to be returned to the aquifer within a short period of time. Therefore, very little extraction of groundwater from the aquifer is required.**

Approximately 15% moisture content will remain with the sand as it enters the slurry loop system because the dewatering system at the extraction site will not remove 100% of the water from the extracted sand. Therefore, a small amount of water (approximately 8 to 25 US gpm [approximately 30 to 95 L/min]) will stay with the sand. For comparison, a garden hose uses approximately 12 to 13 gpm (approximately 45 to 49 L/min) of water, and a typical fire hose uses 200 or more gpm (757 or more L/min). The sand will remain wet as it enters the slurry loop system. The other 85% of the remaining removed water will be re-injected after a filtration and UV treatment or other approved treatment method.

It should be noted that for the start-up of the extraction process each spring, a one-time water draw at the beginning of the initial extraction year is needed to prime the sand slurry transport system. After that, the initial one-time water draw remains in the slurry transport loop system while the sand enters the loop system at the extraction site and exits the loop system at the Processing Facility. In the winter months, the water in the system is stored on site in tankage to eliminate the need to draw additional water at the start of each extraction season (April). Therefore, a minimal amount of groundwater is used by sand extraction activities each year of operation.

A schematic illustrating the extraction method is shown in **Figure 2-2**.



Example Only

Figure 2-2: Sand Well Extraction Method

2.2.2 Layout of Sand Extraction Sites

During each year of sand extraction operations, extraction wells will be clustered in groups of five wells sized based on the allowable span as determined by Table 9 in the Stantec Geotechnical Analysis Report, January 2022 (**Appendix C**). Based on the feedback during the CEC, a new phased approach is proposed (**Section 1.7.1**) starting with approximately 25 wells in year 0, 75 wells in year 1, 167 wells in years 2- 4 in clusters of one to five wells which will be sequentially developed and progressively decommissioned and rehabilitated each year.

A conceptual diagram illustrating an example of how the extraction wells within each well cluster may be configured is shown in **Figure 2-3**.

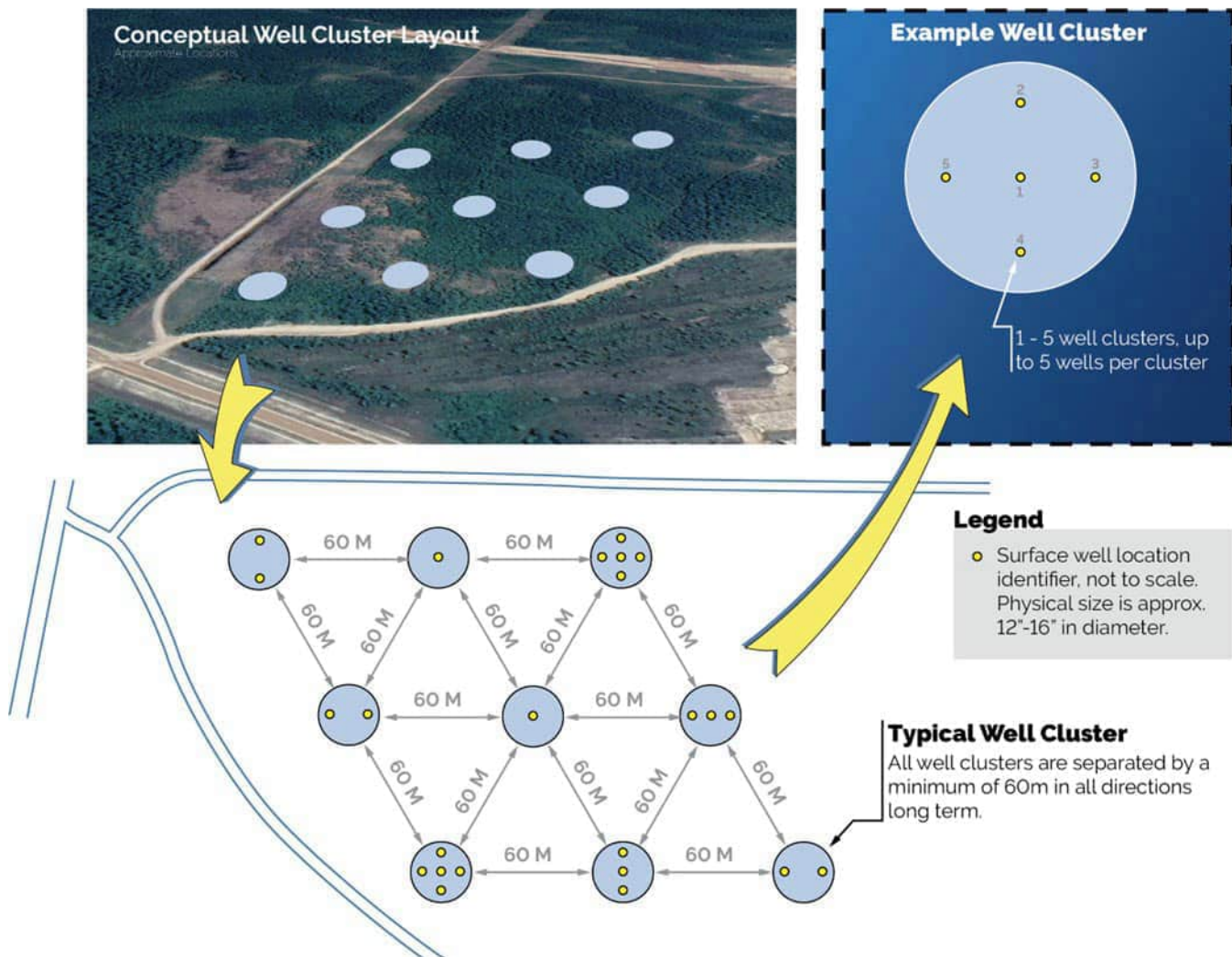


Figure 2-3: Conceptual Extraction Well and Well Cluster Layout

2.2.3 Sand Slurry Pre-Screening and Overs/Fines Temporary Stockpiling

As the groundwater and sand is brought to surface the sand and groundwater will pass through vibrating screens installed over a sump (or tank) to capture overs such as concretions (calcified sand) which are commonly encountered. The vibrating screens will allow the sand grains and water to pass through, but no material larger than 20 mesh (841µm) such as larger hard compacted sand material (concretions) or other small rocks.

These 'overs' that are captured will be temporarily stockpiled in a covered containment bin approximately 14 cubic yard (10.7 m³) in size⁹ on site prior to disposal at a licenced facility or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. One containment bin will be on-site at each active extraction location. Approximately one bin per day will be required to remove and dispose of overs from the Project site.



Photograph 2-1: Example of covered temporary containment bin type for storage of overs

2.2.4 Sand Slurry Conveyance to Processing Facility

The sand and water brought to the surface from each extraction well is separated from the water at each extraction site. The water is then filtered, and UV treated before being immediately returned to the extraction well and to the sandstone aquifer the groundwater was originally extracted from (**Figure 2-1**). The sand enters the main slurry loop system with the recycled water (**Figure 2-1**). The slurry loop system is a temporary line made of high-density polyethylene (HDPE) piping fused together to create one continuous line that is 35.6 cm (14-inches) in diameter which transports sand to the Processing Facility site.

During the first year of extraction activities, the well clusters will be closer to the Processing Facility than subsequent years of operations. Therefore, during the first year of operations, one pumping station will be needed to move the sand slurry to the Processing Facility. When the slurry line increases in length during subsequent years of operations, additional pumping stations (up to four) will need to be added along the length of slurry line. The footprint area for the pumping stations along the slurry line is small (approximately 63 m²).

The water in the slurry line is recycled through the system from the Processing Facility to the extraction site and back. Fines are removed from the water at the Processing Facility using a food grade biodegradable flocculant (anionic polyacrylamide) as described in the Processing Facility EAP (AECOM 2020). The polyacrylamide product recommended for the Processing Facility is Potable Water Grade and can be used for drinking water or food waste thickening environments.

⁹ Dimensions of containment bin will be approximately 3.7 m (12 ft) long by 2.4 m (8 ft) wide by 1.2 m (4 ft) high. **Photograph 2-1** showing an example containment bin is from: <https://fusionwest.ca/products-fusion-west/roll-off-containers/>

There has been some concern from some members of the public that there could be residual polyacrylamides in the water used for slurry transport. It is important to note that polyacrylamides have been used for industrial water clarification, potable water purification, and solids thickening for decades. It is one of the most studied family of chemicals because of its place in people's lives.

Residual acrylamide monomer is not present in finished polyacrylamide product at levels to be considered toxic and have not been shown to accumulate to toxic levels in the Project slurry line system.

The slurry loop will typically operate at approximately 15% sand and 85% water. The ratio of sand and water in the slurry loop is expected to vary from approximately 15% sand and 85% water to 35% sand and 65% water. This ratio of sand and water in the slurry loop system allows the system to be started from a complete stop by the pumping station(s), as required, and also minimizes the potential for the slurry system to clog and potentially break as a result. This also removes the need to potentially drain or remove sand or cut the line.

Slurry lines will be constantly monitored with sensors that can detect leaks. Slurry lines will also be visually inspected daily. Prior to the mobile slurry lines being moved between extraction well sites, the slurry line segments are emptied via periodic access points in the slurry line to eliminate any spills or leaks of water onto the ground.

During the winter months, the water in the system will be stored on site in tankage to eliminate the need to draw additional water at the start of each extraction season (April).

The sand Processing Facility and associated infrastructure was reviewed by MECC as a separate project and was issued Environment Act Licence (No. 3367) in 2021.

2.2.5 Groundwater Treatment and Return to the Aquifer

The sand and water brought to the surface from each extraction well is separated from the water at each extraction site. The water is then filtered and UV treated before being immediately returned to the extraction well and to the sandstone aquifer the groundwater was originally extracted from (**Figure 2-1**). The UV treatment is conducted as a precaution and not because the water is expected to be contaminated in any way. The filtration and UV treatment will occur at the extraction site to reduce water movement requirements and risk of contamination. The groundwater is not exposed to the atmosphere after the UV treatment to prevent any potential for contamination (e.g. bacteria). The UV treatment is a technique commonly used in municipal water treatment facilities, including the City of Winnipeg.

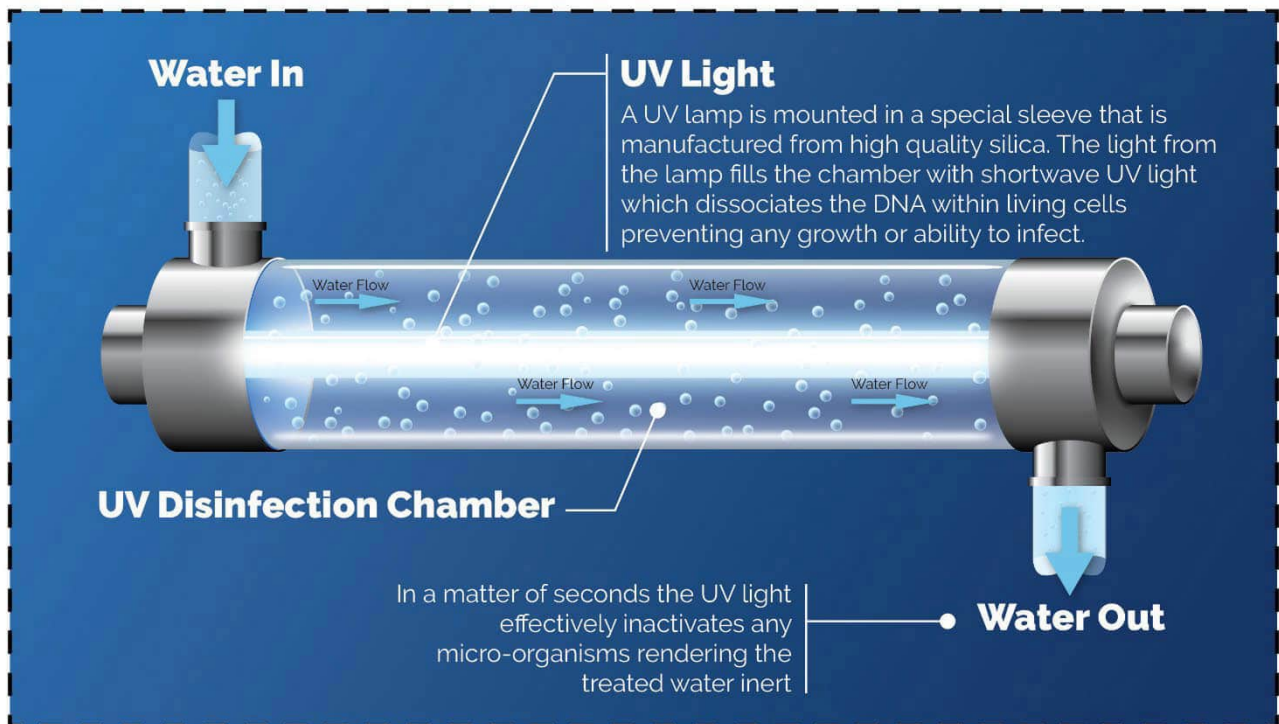
Filtration of the water following sand removal is being added as a part of the process because it will increase the efficiency of the UV process and reduce maintenance on the UV system. When the sand comes to surface and separates from the water, it leaves behind kaolinite (clay) in the water as fine particles making the water less clear. Filtering out these particles will allow the UV treatment to be more effective. The kaolinite clay is naturally occurring, and is a common ingredient used in the development of products such as ceramics, paints, cosmetics and pharmaceuticals. The clay will be captured, stored in appropriate containment and removed from the site. During early Project phases, the clay will be disposed of at a licenced facility. During later Project phases, the clay may be transported to alternative markets (e.g., for production of ceramics, cosmetics, or paints).

UV treatment uses ultraviolet light that is invisible to the human eye as a safe and environmentally friendly method to disinfect water. UV treatment only requires a few seconds of UV light exposure and does not require any chemicals or long contact time with the water. UV light acts very rapidly by rendering any bacteria, viruses or protozoa that may be present inert when they are exposed to the UV light making these organisms, if present, incapable of growing or infecting the water. The process adds nothing to the water but UV light, has no impact on chemical composition or dissolved oxygen content, and does not create disinfection by-products (Trojan Technologies EBook, 2020).

The UV treatment resembles that of fluorescent lamps. The groundwater flows past a series of UV lamps that expose the water to UV light and renders bacteria and other microorganisms inactive (**Figure 2-4**). The UV lamps contain ionized gas mixtures that when electrified illuminate the lamp. To protect the lamps and not compromise the light emitted from the lamps, a fused quartz sleeve is used. This is because quartz is transparent to UV light. After the water flows past the UV lamps, the groundwater remains contained within the extraction process piping to avoid the potential for contamination from the atmosphere before being immediately returned underground to the aquifer. The groundwater treatment process will be tested to confirm compliance with an Environment Act Licence.

The UV treatment system will be regularly tested for effectiveness and will be equipped with automatic shutdowns in case of any treatment deviation.

Water Treatment



Concept Only

Figure 2-4: UV Water Treatment

The water contained within the line returns between the grouted in place casing (that goes to the sandstone) and the production piping. This removes the risk of the UV treated water entering either the limestone or shale layers above the sandstone aquifer and has no other place to flow to except the sandstone aquifer.

This process resembles that of a typical geothermal loop system as water is returned to the aquifer.

2.2.6 Progressive Annual Closure and Rehabilitation of Extraction Wells

After sand extraction is complete at a well, the extraction piping is removed. The well is then sealed in accordance with *The Groundwater and Water Well Act* using a mechanical plug with grout and layers mimicking that of the formation using materials such as pea gravel, native material and/or bentonite on top to prevent any vertical movement between aquifers.

Progressive decommissioning (well sealing) of annual extraction wells and well cluster areas will occur each extraction year in addition to progressive annual rehabilitation of temporary drilling rig access trails; equipment laydown areas; slurry line trails and return water line trails. Disturbed areas will be allowed to revegetate naturally and will be augmented using an approved native seed mixture and native plantings if required. Details of the progressive annual closure and rehabilitation of the extraction wells will be provided in a Closure Plan in accordance with the Manitoba Mine Closure Regulation 67/99 General Closure Plan Guidelines (**Section 1.8.2** and **Section 7.13**), and in accordance with a Progressive Well Abandonment Plan (**Section 7.3**).

2.3 Waste Management

2.3.1 Wastewater

There will be no discharge of wastewater during the sand extraction process. Wastewater associated with the sand Processing Facility was described and assessed in a separate Environment Act Licence application. Sandstone groundwater in the sand slurry from the extraction process is separated from the sand and returned to the sandstone aquifer after filtration and UV treatment, or other approved treatment method, as described in **Section 2.2.5**. The slurry loop system uses a continuous loop of recycled water. Therefore, there is no wastewater in the extraction process.

Portable toilets will be located at active well cluster sites which will be regularly pumped out by a licensed local contractor.

2.3.2 Solid Waste and Hazardous Materials

Domestic and commercial waste will be removed from the Project Site by a licensed local contractor and disposed of at a licensed landfill. A portable toilet rented through a licenced commercial company will be provided at well cluster sites that are actively under development to accommodate work crews as needed. Recyclable materials will be collected in designated recycling containers and transported to a recycling facility.

Hazardous materials such as fuel, oils and lubricants will be transported, handled, stored and disposed of in accordance with applicable federal, provincial and municipal regulations and requirements. Diesel fuel, oil, lubricant, chemical and hazardous wastes storage areas will be maintained and monitored in accordance with applicable legislation and associated regulations and guidelines, including *The Dangerous Goods Handling and Transportation Act* of Manitoba and applicable regulations.

Sand slurry brought to surface at the extraction wells will be pre-screened to remove 'overs' such as concretions (calcified sand) which will be temporarily stockpiled in a containment bin on site before disposal at a licenced facility or for use in annual progressive closure and decommissioning (i.e. sealing) of extraction wells. (**Section 2.2.3**). Drill cuttings will be managed as described in **Section 2.3.3**.

2.3.3 Drill Cuttings

When the extraction wells are drilled, they generate drill cuttings from the Quaternary Sediments, (till), Red River Carbonate (limestone), Red River Shale and Winnipeg Sandstone. These cuttings will be captured separately and contained during drilling. As containment fills up, these cuttings will be disposed of in accordance with applicable regulations.

It is the intention of Sio to keep drill cuttings separate, so that limestone and till cuttings can be used in the well sealing process in the corresponding sections of the well. Drill cuttings used in the well sealing process will not have metal leaching or acid rock drainage (ML/ARD) potential.

Refer to the hydrogeology study provided in **Appendix B** for further details on the geochemistry and ML/ARD data.

Further details regarding drill cuttings and extraction waste handling and testing will be provided in a Waste Characterization and Management Plan (**Section 7.1**).

2.4 Ancillary Components

Sections 2.4.1 to 2.4.6 describe components of the Project other than the extraction wells which are described in **Section 2.2.1**. **Figure 2-5** illustrates the conceptual general layout of the mobile slurry and water lines, and temporary access trails to the sand extraction areas.



Figure 2-5: General layout of Mobile Slurry and Water Lines and Temporary Access Trails

2.4.1 Temporary Drill Rig Access Trails

Temporary access trails to accommodate extraction well drill rigs will be established within previously disturbed areas (e.g. existing trails) to the extent feasible. Temporary access trails will be approximately four meters wide and up to approximately eight meters in wide at turning points to accommodate required drill rig turning areas.

As indicated in **Section 1.8.3**, Sio will coordinate with Manitoba Hydro, other local stakeholders and Manitoba Infrastructure, as required, regarding approvals for the development of Project temporary extraction equipment access trail intersections to existing municipality roads and PR 302.

2.4.2 Slurry Lines and Water Return Lines

Slurry lines constructed of 15 cm (6-inch) and 35.6 cm (14-inch) HDPE piping will be used to directly transport the sand and water slurry to the sand Processing Facility¹⁰. The slurry lines will be pressurized using pump stations with pressure comparable to typical agricultural hog manure potable fertilizer distribution lines. The trails to accommodate the slurry lines will be approximately two meters wide. The slurry lines will be positioned at ground level. At road and/or trail crossings, the slurry lines will go temporarily below the road and trails using existing culverts where possible. If required, slurry lines may be elevated over crossings and will be determined on a case-by-case basis. Each well will feed with a 15 cm (6-inch) slurry line into the main slurry line to the Processing Facility. Each cluster will have a dedicated 35.6 cm (14-inch) slurry line, with a total of two slurry lines feeding to the Processing Facility upon full operations. The slurry lines may vary from 500 m long to 3.5 km long at the greatest sand transport distance (length) in year 4.

Slurry lines are fused for sectional length and flanged together through the length of the system which allows for easy access for inspection and maintenance, and substantially reduces the risk of a leak. Constant flow, pressure and visual monitoring will occur 24/7 while slurry lines are in use for leak detection.

Water return lines will be used to transport water from the Processing Facility back to the extraction wells to pick up more sand. These water-only lines will follow the same route as the slurry lines and all the same protocols exist (e.g. controls for prevention of leaks /spills).

Specific access points will be built into the line periodically and close to major wear areas such as corners to allow access to the slurry line or water return lines as required. The specific section of the line will be closed off with valves, and water / sand in the line will be removed prior to the line being opened. To do this, access points will be equipped with vacuum truck connections to void the line of material. Material removed from this section of line will be returned into the system with the water at the dewatering and pumping station.

During the winter months and prior to start up of the slurry line each season, a full inspection for wear of seals and connections will be conducted. Slurry lines will be replaced based on a maintenance schedule or if early wear is detected during inspections.

The slurry lines will be positioned adjacent to, and in parallel with, the water return lines. The following general line routing criteria will be used:

- Using previously cleared / disturbed areas, where available, to minimize clearing requirements;
- Following existing linear right-of-ways (RoWs), such as municipal road RoWs, and access roads, where possible; and
- Avoiding water crossings (e.g. drainage channels) to the extent feasible.

¹⁰ The sand Processing Facility was granted Environment Act Licence No. 3367 in December 2021 by the Environmental Approvals Branch.

Due to the characteristics of the Project area topography (**Section 4.1.2**), rock outcrops are not expected to be encountered or will be minor in area extent if encountered. Therefore, rock blasting to accommodate slurry line routes will not be required as slurry line routes will avoid such barriers if encountered.

As indicated in **Section 2.4.1**, Sio will coordinate with Manitoba Hydro, other local stakeholders and Manitoba Infrastructure, as required, regarding approvals for the development of slurry line and water return line crossings over and/or under existing municipality roads and PR 302.

2.4.3 Dewatering at Extraction Sites

As described in **Section 2.2.4**, the sand and water brought to the surface from each extraction well is separated from the water at each extraction site. The sand is separated from the water by a mobile dewatering screen at the extraction site where the groundwater is then sent for filtration and UV treatment. At the same time, the sand from the dewatering screen enters the main slurry loop system with the recycled water from the sand Processing Facility (**Figure 2-1**). The dewatering equipment will be powered by an onsite diesel generator, which will be buffered by sound barriers for noise suppression if required.

2.4.4 Pumping Stations

Pumping stations will be used to move the sand slurry to the Processing Facility and recycled water back to the extraction sites to collect more sand. As described in **Section 2.2.4**, during the first year of extraction activities, the well clusters will be closer to the Processing Facility than subsequent years of operations. Therefore, during the first year of operations, one pumping station will be needed to move the sand slurry to the Processing Facility. When the slurry line increases in length during subsequent years of operations, additional pumping stations (up to four) will need to be added along the length of slurry line. The footprint area for the pumping stations along the slurry line is small (approximately 63 m²).

The pumping station will be dismantled and relocated as needed to optimal locations to facilitate movement of the sand and recycled water slurry through the slurry lines to the sand Processing Facility. This movement is anticipated to be once per year.

The pumping station will be powered by an onsite diesel generator, which will be buffered by sound barriers for noise suppression if required. It is Sio's intention to electrify equipment where possible in the future.

2.4.5 Fuel Storage / Propane Tanks

Diesel fuel will be stored at the Project Site in a central location for fuelling of the sand extraction rigs and other mobile equipment in accordance with regulatory requirements for the transportation, storage and handling of hazardous materials.

No propane tanks are required.

2.4.6 Real-time Extraction Control Office

During extraction operations, a small mobile office unit will move around with the extraction equipment. This office will act as the control centre for all field operations, where the monitoring software, controls and communications will be housed. Personnel will monitor operations such as production, slurry density, monitoring well data, and flow rates from the mobile control office when not directly inspecting or operating equipment. The dewatering and pumping station will also be monitored from this mobile office unit.

2.5 Employees

There will be no worker camp on-site due to the proximity of the Project Site to the City of Winnipeg. Skilled workers will be required for the establishment of the well cluster sites, associated slurry lines and pumping stations, will be required for the decommissioning and re-establishment of new extraction wells, slurry line

routes and water return line routes as the sand extraction process progressively advances with each operation year.

The number of employees required within a given year of operations during the on-going sand extraction process will be approximately 30 to 40 staff and third-party contractors (with 50% to 60% of those roles being seasonal). Additionally, it is expected that approximately 90 to 110 indirect jobs for specialty activities, supplies, and services will be generated. The following positions will be required for staff or third-party suppliers:

- Drill Rig Operators
- Helpers/laborers
- Heavy Equipment operators
- Truck Drivers
- Drilling manager
- Extraction manager
- Millwright
- Welder
- Rig Electrician
- Rig mechanic
- Environment, Safety and Health, Quality control Professional
- Fleet Manager
- Consumables Supervisor
- Geologists
- Hydrogeologist/geochemist
- Engineering
- Certified water treatment operators

2.6 Water Use

Both sand and groundwater will be extracted from the wells. The extracted groundwater portion of the sand and water slurry will be separated from the sand at the extraction site, filtered and treated with UV (or other approved treatment method) then returned to the sandstone aquifer immediately after.

A separate loop of recycled water from the Processing Facility will move the sand to the Processing Facility. The treatment of this separate loop system water was outlined in the sand Processing Facility Environment Act Licence application which received a separate Environment Act Licence (No. 3367) in 2021 and is therefore not a component of this sand extraction Project.

The slurry loop system needs approximately 265,500 gal to operate, which is approximately 1,003 m³ of water. This is a gradual one-time groundwater draw volume to fill the system the first time when the system is commissioned. During the winter months, the water in the system will be drained into storage tanks located at the Processing Facility site for re-use the following year. As indicated in **Section 2.2.1**, the slurry loop system for transporting sand to the Processing Facility is designed to not require any additional water which allows for the majority of the water that comes from the extraction well to be returned to the aquifer within a short period of time. Therefore, very little extraction of groundwater from the aquifer is required.

Hydrogeological testing has been completed in 2020/2021 to determine sufficient and sustainable temporary groundwater extraction volumes for the sand extraction processes while preserving the integrity of the aquifer (**Appendix B**). Sio will operate the sand extraction activities in accordance with mitigation

measures and monitoring recommended in the hydrogeological report for this Project (**Appendix B**) and as described in a Groundwater Monitoring and Mitigation Plan (**Section 7.4**).

2.7 Power Use

Generally, power for all the extraction equipment will either be supplied by a generator on site or the equipment will have its own power generation, such as the water well drill rigs or light plant. A diesel generator will be used to power the slurry pumps, vibrating screens, UV system, filtration system and other support functions such as the Real-time Extraction Control Office at the extraction site (**Section 2.4.6**). It is Sio's intention to electrify equipment where possible in the future.

2.8 Equipment Use

Table 2-1 presents the heavy equipment use expected during Project construction and operation phases which are ongoing during the sequential progressive annual sand extraction activities.

Table 2-1: Project Heavy Equipment Use

Equipment	Units*
Construction Phase (Site Set-up and Well Drilling)	
Excavator	1
4 x 4 pick-up truck	1
Water Well Drill rigs	2
Water Truck	2
Grouting System	2
Operation Phase (Extraction)	
HDPE Piping Welding machine	1
Extraction Rigs	7
4 x 4 pick-up trucks	2
Compressor - Diesel	2
Excavator	2
Light Plant	8
Flat Deck Truck	2
Zoom boom/Telescopic handler	2
Welding Truck	1
Mechanical Service Truck	1
Vac Truck	1
Collection Sump with Scalping screen	4
Slurry Pumps (varying sizes depending on location)	8
Water pumps	10
Diesel Generator	2
Cyclone	7
Dewatering Screen	7
Real-time Extraction Control Office	1
Compartment Collection Sump	2
Decommissioning (Well Sealing and Site Clean-up / Rehabilitation)	
Water Well Drilling Rig	1
Picker Truck	1
Excavator	1
4 x 4 pick-up truck	1

* Not all operating simultaneously during any given phase.

2.9 Traffic

The traffic associated with the construction, operation and decommissioning phases of the Project will vary throughout the year as the construction and decommissioning will be occurring progressively through the calendar year. However, the operation phase will occur within the designated extraction year land areas from April through November during the life of the Project. Therefore, the number of drill rig(s), pick-up trucks and other vehicles and machinery as described in **Section 2.8** will be reduced in the winter months compared to the warmer months throughout the Project life. Most of the equipment and vehicles will not be back and forth on the local roads, as the equipment will stay in and around the extraction site area. The sand and water slurry will be transported to the sand Processing Facility by slurry line. Therefore, traffic related to all Project phases will only be associated with the drilling of wells, decommissioning/well sealing and site preparation and rehabilitation.

Most employees will be traveling to the Processing Facility first, to collect a maintenance vehicle or a water well rig, then will travel to the extraction site for their shift. Employees driving company vehicles located at the Processing Facility, will park their personal vehicles at the facility in a designated employee parking area. Some services such as mechanic or fuel will provide deliveries to the extraction sites. Traffic impact will be minimal with 15-20 employees arriving twice per day for their shift in addition to occasional parts and services deliveries. Most Project-related traffic will travel on PTH 15 and then south on PR 302, or municipality roads heading south from PTH 15, to access the specific annual extraction sites within the Project Site.

A comprehensive draft traffic impact study (**Appendix D**) was conducted by Stantec in fall 2023 encompassing traffic from both the planned Processing Facility and the proposed sand extraction activities and has been submitted to Manitoba Transportation and Infrastructure for review. A summary of the results of the traffic impact study is provided in **Section 6.7**.