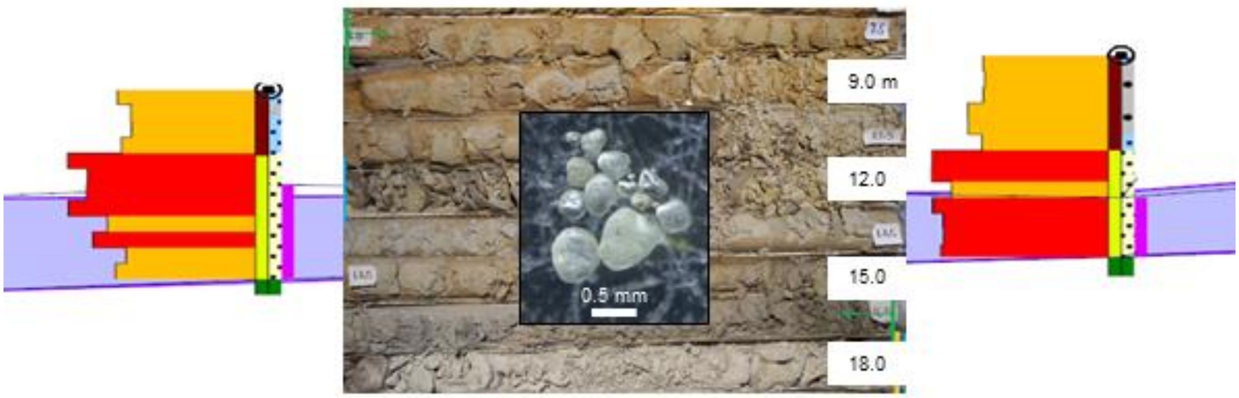
NI 43-101 TECHNICAL REPORT,

INFERRED RESOURCE ESTIMATE ON CANADIAN PREMIUM SAND INC.'S WANIPIGOW SILICA SAND GLASS PROJECT IN MANITOBA, CANADA



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1 Summary

1.1 Issuer and Purpose

This technical report and silica sand glass resource estimate has been commissioned by, and completed for, Canadian Premium Sand Inc. (CPS, or the Company), a publicly traded company with its corporate headquarters in Calgary, AB, Canada. CPS owns 100% interest in the Wanipigow silica sand deposit in southeastern Manitoba, Canada.

The silica sand deposit is hosted within a mature, well-rounded and quartzose sand-dominated portion of the Ordovician Winnipeg Formation of the Western Canada Sedimentary Basin. The deposit was previously defined as a 'proppant' or 'frac sand' resource and reserve as part of a Preliminary Feasibility Study effectively dated March 19, 2020.

Presently, the purpose of this technical report is to disclose CPS's current stage of exploration and development at the Wanipigow Property in which CPS proposes to assess and develop a high-grade (high silica, low iron) portion of the Wanipigow silica sand deposit for use in the glass manufacturing industry. Accordingly, the intent of this Technical Report is to:

1. Provide an assessment of a spatial and stratigraphic portion of the Wanipigow silica sand deposit with respect to its glass sand potential.

2. Prepare a glass sand resource estimate in accordance with the Canadian Securities Administration's National Instrument 43-101 and the Canadian Institute of Mining and Metallurgy *Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines*, dated November 29th, 2019, and *Definition Standards for Mineral Resources and Mineral Reserves*, amended and adopted May 10th, 2014.

3. Make recommendations for future exploration work programs and test work.

This technical report will replace and supersede all previous reports and is defined as the Company's current technical report. The Effective Date of the technical report is 14 October 2021.

While the emphasis in this report is on the definition of a sand resource intended for glass manufacturing, the 2020-defined frac sand resource/reserve, which pertains to 'hydraulic fracturing in the energy industry', is still material to CPS. Hence a summary of the frac sand resource, reserve, and economics is reiterated in this report, which represents CPS's current Technical Report.

1.2 Authors and Qualified Professional Site Inspection

This Technical Report was prepared by APEX Geoscience Ltd. (APEX) authors Roy Eccles, M.Sc. P. Geol. and Rachelle Hough, B.Sc. P. Geo. with Mr. Eccles accepting responsibility for the overall publication of the technical report. Mr. Eccles and Ms. Hough are Qualified Persons as defined by National Instrument 43-101 and have been involved in mineral exploration, and mineral resource modelling and estimations for greenfield and brownfield silica sand deposits and operations in western Canada and northeastern United States.

The authors conducted a Qualified Persons site inspection on March 4-6, 2019. No material change has occurred at the Property since the site visit. The authors validated select 2018 drill sites, participated in active backhoe trenching program, and viewed archived drill core samples to verify the Ordovician Winnipeg Formation, Black Island Member silica sand, which defines the silica sand mineralization.

1.3 Property Location and Description

The Wanipigow Glass Sand Project is located approximately 160 km northeast of the City of Winnipeg, Manitoba, within the jurisdictional boundaries of the Incorporated Community of Seymourville and is adjacent to the Hollow Water First Nation's reserve lands. Additionally, a portion of the Property occurs within the jurisdictional boundaries of the Community of Manigotagan. The Project is also located approximately 67 km north of the Town of Powerview-Pine Falls.

The Wanipigow Property consists of 41 contiguous Quarry Leases that grant CPS the exclusive right to mine quarry minerals on the Property. The area encompasses 2,147.87 hectares (5,307.50 acres). CPS owns 100% of the legal interests in all 41 Quarry Leases, and its interests are fully registered. The main glass sand mineral resource area reported in this Technical Report occurs within a smaller subset of 6 contiguous Quarry Leases within the Wanipigow Property.

The Property can be accessed by Provincial paved and all-weather gravel roads, and therefore, exploration can be conducted year-round. Modifying factors pending, CPS proposes to develop the sand for glass manufacturing by 1) open pit mining, 2) physical processing on a site within the Wanipigow Property to beneficiate the sand to lower levels of iron, and 3) transport the processed sand to an off-Property facility for glass manufacturing. There is no rail line access to the Property and CPS is exploring the option of barging the processed sand product to a glass manufacturing facility location. With respect to the location of the proposed on-site physical processing plant and glass manufacturing facility – no formal location has been announced by CPS.

1.4 Royalties and Economic Participation Agreements

CPS has entered into Economic Participation Agreements with Hollow Water First Nation and the Incorporated Community of Seymourville. CPS has also entered into various contractual agreements relating to the acquisition of title of 18 quarry leases that included advance and future royalty payments.

These Royalty and Economic Participation Agreements commit the Company to quarterly payments once production commences, totaling $3.30 per tonne silica sand sold as fracture proppant, $2.80 per tonne of silica sand sold and $0.50 per tonne of construction aggregates sold. There is a further royalty payment of $1.00 per tonne of silica sand sold as fracture proppant, $0.50 per tonne of silica sand sold and $0.50 per tonne for construction aggregates sold relating to tonnes mined and sold specifically related to the quarry leases acquired from Gossan Resources Limited.

1.5 Environmental Act Licence

The Project requires a licence issued by Manitoba, pursuant to *The Environment Act* (C.C.S.M. c. E125), which applies across all phases of the project, from the earliest build phases to decommissioning.

On May 16, 2019, the Company was issued the necessary environmental licence for the Wanipigow Frac Sand Project: Environment Act Licence No. 3285 (EA Licence), subject to commercially reasonable terms and conditions. A copy of Licence No. 3285 can be found at https://www.gov.mb.ca/sd/eal/registries/5991wanipigow/index.html.

The EA Licence contains a set of general terms and conditions that are intended to provide implementation guidance and to ensure the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation, and leisure for present and future Manitobans.

1.6 Conditional Use Order

As the Project substantially falls within the jurisdictional boundaries of The Incorporated Community of Seymourville, the Company was required to apply to the Incorporated Community of Seymourville, to utilize lands that are zoned "natural areas", under applicable Zoning and Development Plan By-laws, for the purpose of harvesting silica sand and other ancillary commercial purposes. The Company made the required Conditional Use Application, and a hearing on its application was held on May 3, 2019.

On May 9, 2019, the Incorporated Community of Seymourville issued a Conditional Use Order that approves the conditional use of lands within its jurisdictional boundaries for a silica sand extraction operation, including accessory uses, building and structures.

If any future glass mine and/or manufacturing facility plans constitute a change in the original mode of sand transportation or location of a plant facility at a new location, CPS will be required to submit:

- A notice of alteration to the issued Environmental Act Licence.
- An amended Conditional Use Order application.

1.7 Community Consultation

Potential operations associated with the Wanipigow Glass Sand Project are anticipated to be a substantial benefit to the Local and Regional Project Area communities in terms of training, employment, and potential business opportunities related to the services that will be required for the Project.

CPS has conducted its own extensive public engagement that has resulted in letters of support for the Project from local communities, including the Incorporated Communities of Seymourville, the Community of Manigotagan, the Northern Affairs Settlement of Aghaming and Hollow Water First Nation. CPS now has Participation Agreements in place with Hollow Water First Nation and the Incorporated Community of Seymourville.

1.8 Property-Related Risks and Uncertainties

The business of exploration for, and development of, silica sand involves a high degree of risk and there can be no assurance that the current program will result in profitable operations. The Company's continued existence is dependent upon the preservation of its interest in the underlying properties, the discovery of economically recoverable resources/reserves, the achievement of profitable operations, and the ability of the Company to raise additional financing, if necessary, or alternatively upon the Company's ability to dispose of its interests on an advantageous basis.

1.9 History

The Ordovician Winnipeg Formation contains the largest known deposits of high-quality silica sand in Manitoba. Silica sand was reportedly first discovered in Manitoba in 1859, prior to being formerly documented in 1900. The Wanipigow Property area – and immediate Property area – has undergone numerous exploration programs conducted by the Government of Manitoba and by Industry.

The first claims for silica sand were staked on Black Island, which is located approximately 5 km west of the Wanipigow Property, in 1910 and the silica sand production occurred on and off between 1929 and 2003 for use as feedstock to manufacture glass, fibreglass, foundry sand and silica sand for hydraulic fracturing in the oil and gas industry.

The authors have been unable to verify the historical information in the previous text, which includes the assessment of sand that is situated off of the Wanipigow Property, and therefore, the reader should be aware that this information is not necessarily indicative of the mineralization within the Wanipigow Property.

With respect to previous frac sand resource/reserve estimates at the Wanipigow Property, as conducted by CPS, the 2020 Preliminary Feasibility Study and Wanipigow frac sand resource/reserve estimations as they pertain to proppant, or frac sand, remains a materially current resource/reserve to CPS.

1.10 Canadian Premium Sand Inc. Exploration Programs

In 2018, CPS completed a 93-drillhole program to test and delineate the Wanipigow Silica Sand Project. A total of 1,573.7 m of drilling was completed. All drillholes were drilled vertically using a sonic drill to obtain core from surface collar through the entire targeted Winnipeg Formation and terminated in Precambrian Basement. The drilling pattern was orientated in a grid pattern and spaced 400 m apart. Infill drilling was periodically conducted at a drillhole spacing of 150 to 200 m. The drill program sampling achieved a 94% core recovery rate.

Based on drill logs, lithological observations and grain size particle distributions, the current study subdivides the Winnipeg Formation into four distinguishable subunits that include from stratigraphic base to top: Lower Black Island; Black Shale; Upper Black Island; and veneer of Pleistocene surficial material. A total of 761 samples were collected during the 2018 drill program. Most of the samples were collected in 1.5 m increments. All 761 samples were analyzed for particle grain size distributions that are reported in a series mesh-size. These data were used to create a gradation database that was utilized in the resource estimations presented in this Technical Report. Additionally, over 675 sample fractions were selected for proppant characterization test work, including: Krumbein shape factor (roundness and sphericity), crush resistance tests, acid solubility and turbidity.

During 2021, CPS collected a series of 18 composite samples of Lower Black Island sand using the archival material from 6 of the drillholes drilled by the Company in 2018. Ten of the 18 samples were collected from within the Company's current area of interest, defined as the 'main glass sand resource area'. The >125 um and <710 um size fraction (20-120 mesh) were analyzed for whole-rock analysis by ICP Total Digestion, SiO_2 by ICP whole rock assay, and trace-elements by ICP-MS Total Digestion.

The Lower Black Island sand samples collected in the main glass sand resource area have silica values of between 96.1 and 98.9 wt. % SiO_2 with an average 98.0 wt. % SiO_2. Iron values range considerably from 0.032 to 0.247 wt. % Fe_2O_3 with an average 0.117 wt. % Fe_2O_3. The silica and iron values are generally too low and too high, respectively, for specialty glass or Grade A-E glass, but is sufficient for coloured container and insulating fibre optical glass (Grades F-G). The aluminum content is also high for glass specifications with an average of 0.72 wt. % Al_2O_3. Titanium and chromium have low average values of 0.04 wt. % TiO_2 and 5 ppm Cr. Manganese and sodium are generally below the minimum limit of detection. Base-metal minerals fluctuations are like the pattern observed for iron and include Ni (1.4-9.3 ppm Ni), Co (0.3-4.6 ppm Co), Cu (1.7-16.6 ppm Cu), and Cr (3.0-9.0 ppm Cr).

Consequently, CPS initiated QEMSCAN analytical work to define the mineralogy of iron-bearing minerals and beneficiation test work to advance the sand to higher levels of silica and lower levels of iron and other detrimental elements. The beneficiation test work included both physical (e.g., screening, gravitation- and magnetic-separation) and chemical (e.g., acid attrition, hot acid leach, calcination) tests.

1.11 Beneficiation Test Studies and Reasonable Prospects

CPS's initial (2018-2019) silica sand characterization test work focused on proppant quality, which showed the Lower and Upper Black Island Member silica sand generally satisfy the recommendations set forth in International Standards ISO 13503-2:2006/Amd.1:2009E for use in hydraulic fracturing operations. This test work showed the Wanipigow silica sand is sufficiently hard for frac sand and is commonly composed of clear, high-silica grains.

Additional 2021 glass-specific beneficiation test work of the Wanipigow Lower Black Island sand was commissioned by CPS to 1) IGR Institut für Glas- und Rohstofftechnologie GmbH (IGR) in Göttingen, Germany, 2) IHC Robbins (IHC) in Yatala, Australia, 3) Saskatchewan Research Council (SRC) in Saskatoon, Canada, and 4) cm.project.ing GmbH (CMP) in Jülich, Germany and Industrial Mineral international (I.M.I.) in Aachen, Germany.

Beneficiation test work conducted by SRC, IGR, IHC, CMP and I.M.I., showed that physical separation methods, including sieving, bumping table, and magnetic separation test work on the 0.125 mm and 0.71 mm fraction (120-mesh to 20-mesh), can increase the Wanipigow Lower Black Island sand silica content to 99.3% to 99.6% SiO_2 and reduce the iron content to 0.0130 wt. %, or 130 ppm Fe_2O_3. Chemical beneficiation – on top of physical separation methods – resulted in 0.0295% (295 ppm) and 0.0167% (167 ppm) Fe_2O_3 by Acid Attrition and Hot Acid Leach methods, respectively. Aluminum in the beneficiation tests yielded between 0.090% and 0.313% Al_2O_3.

Melting test work resulted in no remarkable differences between the Wanipigow Lower Black Island sand and a typical, comparative soda-lime flint glass batch. Shading of the molten glass, and seeds and cords in the glass, were only very weakly pronounced in the Wanipigow Lower Black Island glass test product, which is typical within sand soda -lime melt batches. No relics of un-melted grains were observed.

Mechanical beneficiation test work performed by CMP and I.M.I. showed that the Wanipigow Lower Black Island sand can be reduced to 0.010% Fe_2O_3 with 99.5% SiO_2 through the simulation of a continuous mechanical beneficiation processes that include enhanced attrition and desliming, grain size classification (120-mesh to 20-mesh), density separation, and multi-magnetic separations. The Al_2O_3 content was reduced by attrition with consecutive washing and desliming and TiO_2 was reduced throughout the continuous beneficiation steps. The K_2O, Na_2O, MgO, CaO and BaO contents are well below critical values for quality glass.

CMP and I.M.I. further concluded that chemical treatment of the Wanipigow sand yielded a maximum silica content of 99.7% SiO_2 using phosphoric (0.5M; 2.5M) and oxalic acids (0.3M). The iron content was reduced to 0.006% (60 ppm) Fe_2O_3 with an extraction efficiency of 40% in the oxalic (0.1M; 0.3M), sulfuric (0.5M; 2.5M), phosphoric (0.5M; 2.5M), hydrochloric (2.5M) and hydrofluoric acids (0.5M) test. Potassium and aluminum were reduced to below 0.01% K_2O and to 0.03% Al_2O_3. The content of calcium was reduced to below 0.01% CaO, except the test with the oxalic and hydrofluoric acids. Hence, the oxalic, sulfuric, and phosphoric acid at the concentration of 0.5M could be selected for the further leaching experiments that involve further study of leaching temperature, acid concentration, mixing rate, and the liquid-to-solid ratio.

Based on the silica, iron, and other elemental contents of the mechanically and chemically treated sand in these beneficiation tests – and depending on market and manufacturing conditions – the Wanipigow LBI sand can be used to manufacture standard glass products such as flat glass, coloured container glass, and insulating fibers.

In addition, the initial mineral processing test work conducted by CMP and I.M.I., which included enhanced attrition scrubbing and desliming followed by grain size classification (35-120 mesh fraction), density separation, and magnetic separations (x2) – has shown the Wanipigow LBI sand can be mechanically-treated to yield an iron content of 0.010% Fe_2O_3 (100 ppm Fe_2O_3) with further chemical treatment yielding 0.006% to 0.007% Fe_2O_3 (60 ppm to 70 ppm Fe_2O_3). Hence, the initial trials conducted by CMP showed that the Lower Black Island Formation sand from the Wanipigow Glass Sand Resource Area satisfies the general specification for use in specialty glasses such as solar glass manufacturing.

Accordingly, and with respect to reporting a resource estimate that abides by NI 43-101, it is the opinion of the QP that the Wanipigow LBI sand within the glass sand resource area demonstrates reasonable prospects of potential extraction.

With respect to limitations, the author reiterates that there is no current standard, or industry-wide specifications, for the quality of silica sand with respect to glass manufacturing (see Section 8.3). Hence, the quality of the raw sand feed is dependent on several factors that can include, for example, 1) market conditions, 2) buyer need, and 3) chemical composition of materials other than silica sand that are used in the batch glass manufacturing process.

With respect to the latter point, a theoretical furnace batch calculation conducted by CMP used a 60% portion of the mechanically treated Wanipigow Lower Black Island sand from within the glass sand resource area (i.e., 0.010% Fe_2O_3 or 100 ppm Fe_2O_3), together with aragonite. This combination resulted in a theoretically calculated glass composition with 0.0098% Fe_2O_3 (98 ppm Fe_2O_3). CMP concluded that the mechanical treatment of the Wanipigow Lower Black Island Formation silica sand from within the glass sand resource area will fulfil the specifications required to manufacture specialty solar glass products based on a sand glass feed iron market value of ≤0.012% Fe_2O_3 (120 ppm Fe_2O_3). CMP noted that the batch calculation result is preliminary and additional test sets are required on a bulk sand sample (e.g., 500 kg) with the actual raw materials.

1.12 Mineral Resource Estimation

The Wanipigow glass sand resource estimate is fully contained within the Lower Black Island sand sub-member that occurs within 6 contiguous Quarry Leases on the east part of the 41-lease Wanipigow Property. The clipped main glass sand resource surface area is 3.49 km^2 or 862-acres. Additional regions within the Wanipigow Property that comprise distinct, clean, high silica Lower Black Island sand were assessed as a future exploration target.

The 3-D geological model utilized information from 93 vertical drillholes to define the geological units and 744 gradation analyses that form the 'assay' file used to calculate the Wanipigow glass sand resource estimate. The 3-D geological model in the main glass sand resource area is defined by 5 out of 93 vertical drillholes. The 5 drillholes include CPS18-018, CPS18-019, CPS18-024, CPS18-025, and CPS18-071.

A total of 230 samples out of the 744-gradation analyses were collected within the Lower Black Island sand sub-member, including 48 Lower Black Island samples in the main glass sand resource area. Downhole sample length analysis shows that the drillhole samples range from 0.4 m to 2.2 m with a dominant sample length of 1.5 m. In the 3-D geological model, the thickness of the Lower Black Island unit varies from 9.1 m to 15.85 m and averaged 7.9 m.

The resource is calculated using a block model with a size of 20 by 20 m in the horizontal directions and 2 m in the vertical direction. The block model was used to calculate the Wanipigow glass sand resource estimate of the different percentages of silica sand retained on the various screen sizes. Ordinary Kriging (OK) was used to estimate the size fraction values at each parent block that lies within the Lower Black Island wireframe.

A nominal *in-situ* sand bulk density of 1.878 g/cm^3 was applied to the Lower Black Island sand unit. The density is based on 36 representative loose bulk Lower Black Island density samples collected during the 2018 drill program. The loose bulk densities were converted to an *in-situ* bulk density by using a bulking factor of 30%.

The Wanipigow glass sand resource estimate has been classified by the QP in accordance with guidelines established by the CIM "Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines" dated November 29th, 2019, and the CIM "Definition Standards for Mineral Resources and Mineral Reserves" amended and adopted May 10th, 2014. The QP has a satisfactory level of confidence in, and understanding of, the geology and controls of the Lower Black Island geo-unit, but a lower level of confidence in the applicability of the sand unit – on a consistent basis – for higher quality levels of glass manufacturing. Based on these criteria, the resource estimate for the Lower Black Island geo-unit in the main glass sand resource area is classified as an Inferred Resource.

The resource estimation of the individual Lower Black Island size fractions was completed and reported using a lower cutoff of mesh-sizes that are greater than or equal to 35-mesh (<500 µm) and less than or equal to 120-mesh (<125 µm). I.e., the +35 and -120 mesh size fractions are discarded from the estimation process.

Mineral resources are not mineral reserves and do not have demonstrated economic viability. This Inferred Wanipigow Glass Sand Resource Estimate, which evaluates the Lower Black Island Formation within the main glass sand resource area, predicts a global (total) estimate of 7.25 million tonnes of silica sand (Table 1.1).

Table 1.1 The Wanipigow Glass Silica Sand Inferred Resource Estimate reported for the Lower Black Island sandstone geo-unit as a total (global) volume and tonnage.

	Volume (m^3)	Metric tonnes
Inferred Resource	**3,861,000**	**7,250,000**

Note 1: Mineral resources are not mineral reserves and do not have demonstrated economic viability. The estimate of mineral resources may be materially affected by geology, environment, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.
Note 2: The weights are reported in metric tonnes (1,000 kg or 2,204.6 lbs).
Note 3: The 'Total' (global) volume and weights are estimated on a global basis and represent the main Inferred Wanipigow Glass Sand Resource Estimate.
Note 4: The Wanipigow estimation of the individual sieve size fractions was completed and reported using a lower cutoff of mesh-sizes that are greater than or equal to 35-mesh and less than or equal to 120-mesh fraction.
Note 5: *In-situ* compacted bulk densities used include: Overburden: 1.897 g/cm^3; Upper Black Island: 1.911 g/cm^3; Lower Black Island: 1.878 g/cm^3. Bulk densities are utilized to convert volume (cubic metres) to tonnage.

With respect to unequivocal waste rock, the overburden overlying the Lower Black Island main glass resource area has an estimated volume of 6,180,900 m^3 for a total weight of 11.73 million metric tonnes. The density of the overburden was taken from compacted *in-situ* material bulk density tests on 13 samples that average 1.897 g/cm^3. There is no Upper Black Island waste product overlying the Lower Black Island geo unit in the main glass sand resource area.

1.13 Future Exploration Target

In addition to the main glass sand resource area, a future exploration target was evaluated at the Wanipigow Property by depicting those clean sand Lower Black Island drill intersections in other parts of the Wanipigow Property. The exploration target was calculated in the same way the Wanipigow Glass Sand Inferred Resource Estimate was and by applying a plus or minus percentage of 10% to define an exploration target of between 19.06 million tonnes and 23.30 million tonnes.

The potential quantity of the exploration target is conceptual in nature. There has been insufficient exploration to define a mineral resource and it is uncertain if further test work and/or marketing research will result in the exploration target being delineated as a mineral resource.

1.14 Reiteration of Proppant, or Frac Sand, Resources and Reserves

The resources, reserves, and economics stemming from a March 19, 2020, Preliminary Feasibility Study are reiterated as the proppant, or frac sand, information is still material to CPS.

1.15 Concluding Qualified Persons Statement and Recommendations

It is concluded that the geological, geochemical, beneficiation test work, and resource estimation work completed in this Technical Report shows that the Wanipigow Glass Sand Project is a project of merit. The QP's consider that the scientific and technical information support proceeding with additional data collection, studies to define modifying factors, and engineering work toward advancing the resource classification of the project and/or Preliminary Economic Assessment. However, the decision to proceed with additional studies and/or trial mining operations on an industrial mineral project is at the discretion of CPS.

The authors advise that CPS consider the following work recommendations at the Wanipigow Glass Sand Project with the objectives to:

1. Improve the confidence of the current resource area and expand/reclassify the resource and/or exploration target levels through infill and exploratory drilling and additional geochemical and beneficiation test work.

2. Conduct mine planning to assess modifying factors such as detailed mine design, product distribution, marketing studies, groundwater monitoring, environmental management planning, permitting, and social and local community engagement.

The author's perception is that the work objectives are complementary to one another, and therefore, a unified work approach is recommended. The collective estimated cost of the work recommendations, including a 10% contingency, is CDN$1,100,000 (Table 1.2).

Table 1.2 Future recommendations for the Wanipigow Glass Sand Project.

Objective	Item	Description	Cost Estimate (CDN$)
Improve the confidence of the current resource area and expand/reclassify the resource level(s)	Infill drilling within the current resource area	Approximate 250 m sonic and auger drill programs to improve geology/resource certainty and to better delineate waste material	$115,000
	Exploratory drilling on future targets for exploration	Approximate 350 m sonic and auger drill programs to better the potential of the exploration target area(s)	$165,000
	Geochemical test work	Ongoing geochemical assaying to further evaluate Winnipeg Formation sand quality. Conduct an orientation survey using a handheld XRF analyzer.	$55,000
	Beneficiation test work	Ongoing beneficiation test work to improve the quality of the LBI sand to higher levels of glass manufacturing	$40,000
Mine-planning design with an assessment of modifying factors	Detailed mine planning	Detailed mine design/plan; dewatering plan; productivity analysis; and operating costs estimates	$250,000
	Product distribution	Study of product storage, transport, and distribution.	
	Marketing studies	Market analyses including an assessment of market size, product demand, market concentration, and market volume.	
	Groundwater monitoring	Ongoing hydrogeological studies and pump tests to assess groundwater conditions	$150,000
	Environmental-planning and continued community consultation	Development of a Closure Plan, environmental plans, permitting, and continued social and local community engagement	$225,000
		Subtotal	**$1,000,000**
		10% Contingency	**$100,000**
		Total	**$1,100,000**

2 Introduction

2.1 Issuer and Purpose

This technical report and silica sand glass resource estimate has been commissioned by, and completed for, Canadian Premium Sand Inc. (CPS, or the Company), a publicly traded company with its corporate headquarters in Calgary, AB, Canada. CPS’s flagship project is the Wanipigow silica sand deposit in southeastern Manitoba, Canada (Figure 2.1).

The silica sand deposit is hosted within a mature, well-rounded and quartzose sand-dominated portion of the Ordovician Winnipeg Formation of the Western Canada Sedimentary Basin. The deposit was previously defined as a ‘proppant’ or ‘frac sand’ resource and reserve as part of a Preliminary Feasibility Study effectively dated March 19, 2020 (Eccles et al., 2020).

Presently, the purpose of this Technical Report is to disclose CPS’s current stage of development at the Wanipigow Property in which CPS proposes to assess and develop a high-grade (high silica, low iron) portion of the Wanipigow silica sand deposit within the Winnipeg Formation’s Lower Black Island sub-member for use in the glass manufacturing industry. Accordingly, the intent of this Technical Report is to:

1. Provide an assessment of a spatially and stratigraphically constrained portion of the Wanipigow silica sand deposit with respect to its glass sand potential.

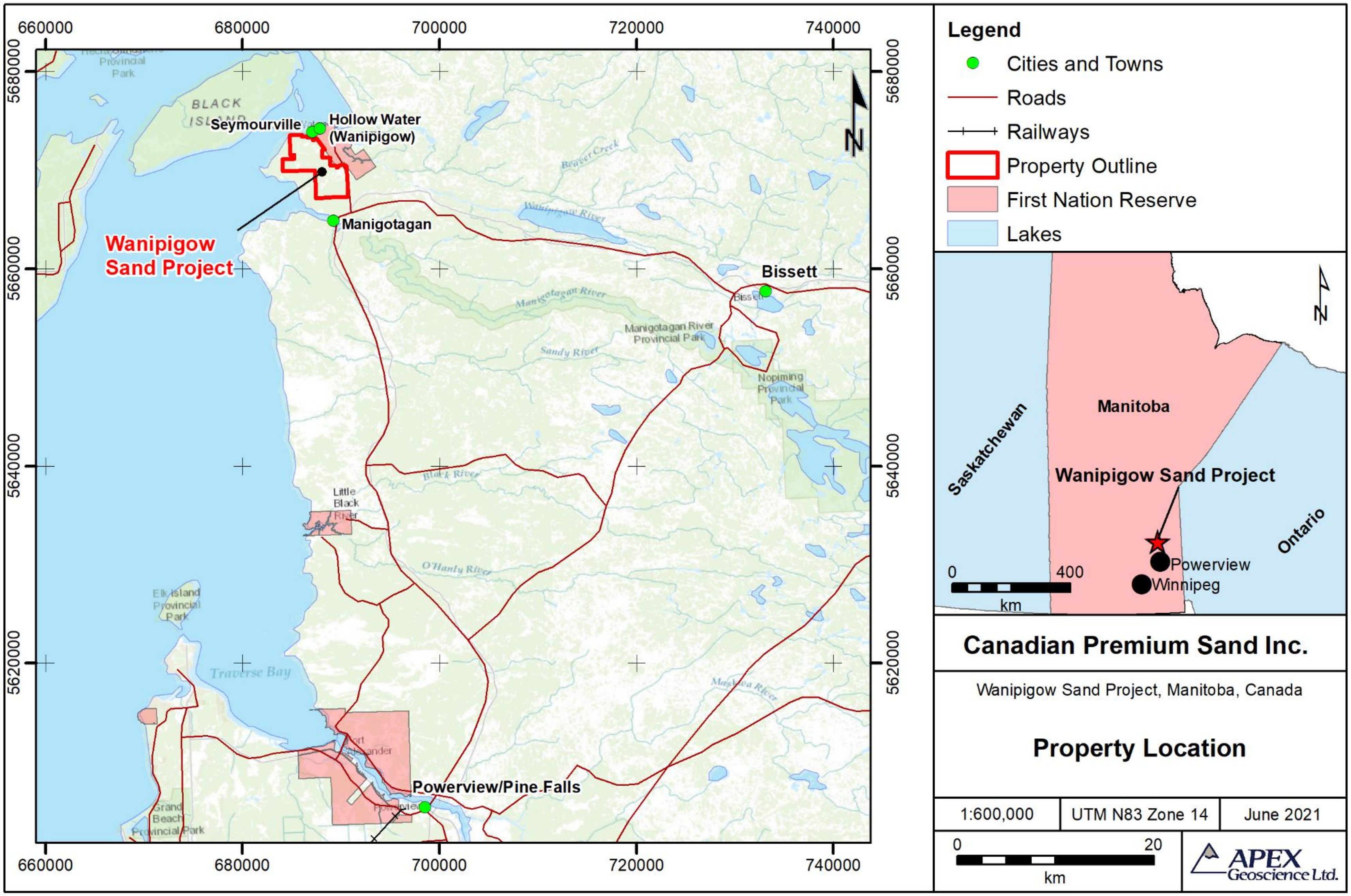
2. Prepare a glass sand resource estimate in accordance with the Canadian Securities Administration’s National Instrument 43-101 and the Canadian Institute of Mining and Metallurgy *Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines*, dated November 29th, 2019, and *Definition Standards for Mineral Resources and Mineral Reserves*, amended and adopted May 10th, 2014.

3. Make recommendations for future exploration work programs and test work.

This technical report has an Effective Date of 14 October 2021 and will replace and supersede all previous CPS technical reports. Frac sand resource and reserve estimations as part of a Preliminary Feasibility Study effectively dated March 19, 2020 are summarized in this report, but the main emphasis is on the Wanipigow Silica Sand Glass Project and its respective maiden resource estimation.

The frac sand resource/reserve, which pertains to hydraulic fracturing in the energy industry, is still material to CPS. The 2020 frac sand resource and reserve estimations, and associated economics, from the Preliminary Feasibility Study are reiterated in this, the current CPS Technical Report.

Figure 2.1. General location of Canadian Premium Sand Inc.'s Wanipigow Glass Sand Project in southeastern Manitoba.



2.2 Authors and Site Inspection

This Technical Report was prepared by APEX Geoscience Ltd. (APEX) authors Roy Eccles, M.Sc. P. Geol. and Rachelle Hough, B.Sc. P. Geo. with Mr. Eccles accepting responsibility for the overall publication of the technical report. Mr. Eccles and Ms. Hough are Qualified Persons as defined by National Instrument 43-101. Mr. Eccles is a Professional Geologist with the Association of Professional Engineers and Geoscientists of Alberta (APEGA), has worked as a geologist for more than 30 years since his graduation from university and has been involved in mineral exploration, and mineral resource modelling and estimations for greenfield and brownfield silica sand deposits and operations in western Canada and northeastern United States.

Mr. Eccles and Ms. Hough conducted a site inspection on March 4-6, 2019. The project team visited select 2018 drill sites, participated in an active backhoe trenching expedition in conjunction with the site visit, and reviewed archived drill samples. This enabled Mr. Eccles to verify the Winnipeg Formation, Black Island Member silica sand and the general drill pattern and rationale behind CPS's 2018 exploration program.

Ms. Hough P. Geo. was on site for CPS's 2018 Wanipigow Glass Sand Project drill program (September 27 to December 12, 2018) and can confirm that material change occurred on the Wanipigow Glass Sand Project during September to December 2018 in the form of a 93-hole drill program. Ms. Hough coordinated core logging, core sampling and data acquisition associated with the drill program and can therefore verify that all aspects of the 2018 exploration program were properly and independently surveyed, measured, and recorded. Ms. Hough is a Professional Geologist with APEGA and has over 13 years of experience including grass roots to advanced stage drilling on numerous silica sand projects in western Canada.

The resource estimation statistical analysis and three-dimensional modeling was prepared by Mr. Warren Black P. Geo. (under the direct supervision of Mr. Eccles). Mr. Black is APEX' geostatistical specialist and created the three-dimensional model, and conducted statistical analysis, block modelling and the resource estimations. Mr. Eccles has reviewed all resource geological modelling and estimation work and accepts responsibility of the mineral resource presented in Section 14 of this Technical Report.

2.3 Sources of Information

This Report is a compilation of publicly available information, and information obtained from CPS's 2018 drill program at the Wanipigow Glass Sand Project. References in this Technical Report are made to publicly available reports that were written prior to implementation of NI 43-101, including government geological publications and journal manuscripts available through the Government of Manitoba (GoM) or publishing houses. Government reports and journal articles include those that depict the Winnipeg Formation bedrock stratigraphy and its proppant potential (e.g., Vigrass, 1971; McCabe, 1978; Spiece, 1980; Pearson, 1984; Watson, 1985; Bezys and Conley, 1998; Bamburak, 1996;

Bailes and Percival, 2000; Dott, 2003; Kreis, 2004; Matile and Keller, 2004; Dorador et al., 2014; Konstantinou et al., 2014; Lapenskie, 2016).

Miscellaneous industry Assessment File Reports and Company news releases were used to corroborate the stratigraphy and the Property’s silica sand potential, and to reference historical mineral exploration work in the general Wanipigow Glass Sand Project area (e.g., Chornoby, 2003; Pedersen, 2007; Cooke, 2008; Cooke, 2010; Canadian Premium Sand Inc., 2013, 2017, 2018a-d, 2020; Havilah Mining Corporation, 2018).

Other professionally prepared reports cited in this Technical Report that pertain directly to CPS’s Wanipigow Glass Sand Project include a 2014 NI 43-101 Resource Estimate Technical Report by Puritch et al. (2014) and an Environment Act Proposal prepared by Gifford and Samoiloff (2018). These reports were prepared by professional engineers (P.Eng.) or biologists (P. Biol.) on behalf of CPS and are used for geological and exploration background, and environmental assessment information, in the current report.

The sand gradation and proppant analytical work were conducted by Turnkey Processing Solutions LLC (TPS) in Ottawa, IL, Stim-Lab Inc. (Stim-Lab) in Duncan, OK and Lonquist Frac Sand Services (Lonquist) in Edmonton, AB. The analytical work was reviewed and approved by certified Professional Engineers that cite recognized ASTM specifications pursuant to ISO 13503-2 for laboratory preparation, analysis, and reporting.

Glass sand chemical and QEMSCAN analysis and beneficiation test studies were conducted by laboratories with experience in mineral sands metallurgical test work and include 1) the Institut für Glas- und Rohstofftechnologie (IGR) in Göttingen, Germany, 2) IHC Robbins (IHC) in Yatala, Australia, 3) Saskatchewan Research Council (SRC) in Saskatoon, SK, and 4) cm.project.ing GmbH (CMP) in Jülich, Germany and Industrial Mineral international (I.M.I.) in Aachen, Germany. IGR is accredited to DIN EN ISO / IEC 17025: 2018. IHC is accredited to ISO 45001 and ISO 9001 Quality Management System. The SRC is accredited in accordance with ISO/IEC 17025:2017. CMP is an independent, international holistic glass plant engineering company commissioned by CPS to develop a Front-End Engineering and Design (FEED) study.

All reference citation documentation is presented in Section 27, References. The senior author of this Technical Report has reviewed all government and miscellaneous reports. Government reports, journal papers and professional technical or environmental reports were prepared by a person, or persons, holding post-secondary geology or related degrees. Geochemical and metallurgical information was prepared by independent and accredited laboratories. Based on review of these documents and/or information, the senior author has deemed that these reports and information, to the best of his knowledge, are valid contributions to this Technical Report, and therefore takes ownership of the ideas and values as they pertain to the current Technical Report.

2.4 Units of Measure

With respect to units of measure, unless otherwise stated, this Technical Report uses:

- Abbreviated shorthand consistent with the International System of Units (International Bureau of Weights and Measures, 2006).
- 'Bulk' weight is presented in metric tonnes (tonnes; 1,000 kg or 2,204.6 lbs).
- Geographic coordinates are projected in the Universal Transverse Mercator (UTM) system relative to Zone 15 of the North American Datum (NAD) 1983.
- Density is grams/cubic centimetre (g/cm^3).
- Test sieve sizes as outlined in American Society of the International Association for Testing and Materials (ASTM) E11 (ASTM, 1995).
- Proppant specifications of ISO 13503-2:2006/ Amd.1:2009E (International Standards, 2009).
- Currency in Canadian dollars (CDN$, or C$), unless otherwise specified (e.g., U.S. dollars, US$; Euro dollars, €).

3 Reliance of Other Experts

The authors are not qualified to provide an opinion or comment on issues related to legal agreements, royalties, permitting and environmental matters. Accordingly, the senior author disclaims portions of Section 4, Property Description and Location, in this Technical Report. This limited disclaimer of responsibility includes the following.

- The senior author of this Technical Report has reviewed but is not qualified to legally verify the legal status of the quarry leases discussed in Sections 4.1, and 4.2. Information related to the status of quarry leases was obtained by 1) verbal communication with CPS and their legal council during the preparation of this Technical Report; and 2) Manitoba's Integrated Mining and Quarrying System (iMaQs) at https://web33.gov.mb.ca/imaqs/. CPS and Darla Rettie of Pitblado LLP of Winnipeg, MB provided Quarry Lease status documents on May 23, 2019, and February 5, 2020, from the Manitoba Mines Branch that showed the 41 leases are active, in good standing and owned 100% by CPS. A review of iMaQs supports the number of leases, their ownership status, and their good standing, as of 14 October 2021.
- The senior author has reviewed but is not qualified to legally verify royalty structures and/or subsequent economic participation agreements that would be enacted in the event the Wanipigow Glass Sand Project was to go into commercial

production. A summary of the royalty and economic participation agreement payments was provided by CPS management (Mr. Anshul Vishal) to the authors on March 11, 2020. The information – as discussed in Section 4.5 – was partially verified by reviewing royalty agreements as stated in various CPS News Releases, but overall, the authors is reliant on the information as provided by CPS.

- The senior author relied on documents provided by CPS regarding permitting and environmental status of the Property. This information was provided by CPS to APEX in January 2019 and includes an Environment Act Proposal that was prepared by AECOM Canada Ltd. for CPS (Gifford and Samoiloff, 2018). The authors summary information from this report in Sections 4.6 and 4.7 with respect to environmental matters and potential future permitting. CPS obtained their Environmental Act Licence on May 16, 2019; the terms and conditions therein substantiated the authors understanding of the environmental requirements of the Wanipigow Glass Sand Project. On March 6, 2020, CPS (Mr. Anshul Vishal) indicated the Company will have to apply for an alteration for the EA Licence and Conditional Use Order based on the revised plant design.

4 Property Description and Location

4.1 Location and Description

The Wanipigow Glass Sand Project is located approximately 160 km northeast of the City of Winnipeg, Manitoba (Figure 2.1), within the jurisdictional boundaries of the Incorporated Community of Seymourville and is adjacent to the Hollow Water First Nation's reserve lands. Additionally, a portion of the Property occurs within the jurisdictional boundaries of the Community of Manigotagan. The Project is also located approximately 67 km north of the Town of Powerview-Pine Falls.

The Wanipigow Property is in the National Topographic System 1:50 000 map sheet: 062P-01. The centre of the Property and centre of the mineral resource area are located at approximately:

- 687600 m Easting, 5670650 m Northing, Zone 14, NAD83; and
- 686000 m Easting, 5671950 m Northing, Zone 14, NAD 83, respectively.

The lands on which the Project is situated are owned by the Crown in right of Manitoba (Manitoba). Manitoba has issued CPS a series of 41 contiguous quarry leases ("Quarry Leases") that grant CPS the exclusive right to mine quarry minerals on the Property (Figure 4.1). The legal descriptions of all 41 Quarry Leases are presented in Table 4.1.

The 41 Quarry Leases collectively encompass a contiguous area of 2,147.87 ha (5,307.50 acres; Table 4.1; Figure 4.1). The quarry leases individually range in size from 20.0 to 168.0 acres. CPS owns 100% of the legal interests in all 41 Quarry Leases, and its interests are fully registered.

Figure 4.1 Spatial orientation of issued Quarry Leases at the Wanipigow Glass Sand Project.

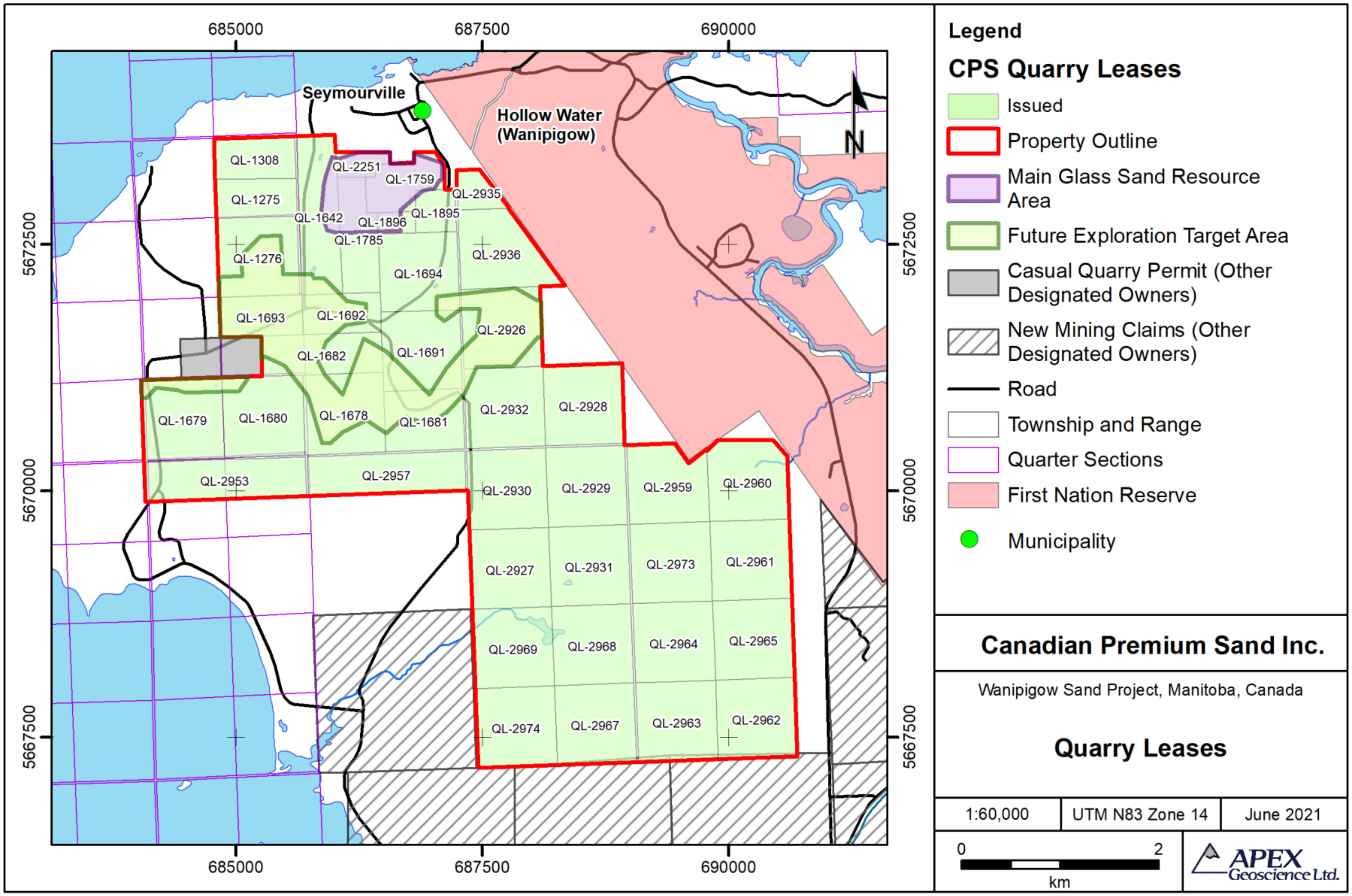


Table 4.1. Description of issued Quarry Leases at the Wanipigow Glass Sand Project. Quarry Leases associated with the main glass sand mineral resource presented in this Technical Report are highlighted in grey.

Lease Number	Lease Type	Status	Designated Title Holder	Public Land Survey System (section, township, range, meridion)	Area (acres)	Area (hectares)	Issue Date	Expiry Date
QL-1275	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 36 TWP 25 RGE 8 E1	79.99	32.37	1996-07-16	2021-08-15
QL-1276	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 36 TWP 25 RGE 8 E1	160.00	64.75	1996-07-16	2021-08-15
QL-1308	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 36 TWP 25 RGE 8 E1	79.99	32.37	1997-03-03	2022-04-02
QL-1642	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 31 TWP 25 RGE 9 E1	160.00	64.75	2002-06-26	2021-07-26
QL-1678	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 30 TWP 025 RGE 009 E1	164.00	66.37	2003-06-20	2021-07-20
QL-1679	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 25 TWP 025 RGE 008 E1	154.28	62.44	2003-06-20	2021-07-20
QL-1680	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 25 TWP 025 RGE 008 E1	160.00	64.75	2003-06-20	2021-07-20
QL-1681	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 30 TWP 025 RGE 009 E1	119.99	48.56	2003-06-20	2021-07-20
QL-1682	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 30 TWP 025 RGE 009 E1	122.00	49.37	2003-06-20	2021-07-20
QL-1691	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 30 TWP 25 RGE 9 E1	158.47	64.13	2003-09-24	2021-10-24
QL-1692	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 30 TWP 25 RGE 9 E1	73.83	29.88	2003-09-24	2021-10-24
QL-1693	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 25 TWP 25 RGE 8 E1	77.90	31.53	2003-09-24	2021-10-24
QL-1694	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 31 TWP 25 RGE 9 E1	152.49	61.71	2003-09-24	2021-10-24
QL-1759	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 31 TWP 25 RGE 9 E1	87.52	35.42	2004-12-10	2022-01-09
QL-1785	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 31 TWP 25 RGE 9 E1	110.01	44.52	2005-05-25	2022-06-24
QL-1895	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 31 TWP 25 RGE 9 E1	26.76	10.83	2007-03-21	2022-04-20
QL-1896	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 31 TWP 25 RGE 9 E1	20.00	8.09	2007-04-16	2022-05-16
QL-2251	Quarry Lease	Issued	(259535) Canadian Premium Sand	SEC 31 TWP 25 RGE 9 E1	22.49	9.10	2009-10-16	2019-10-16
QL-2926	Quarry Lease	Issued	(259535) Canadian Premium Sand	NW1/4 SEC 29 TWP 025 RGE 009 E1	159.88	64.70	2019-04-30	2022-05-30
QL-2927	Quarry Lease	Issued	(259535) Canadian Premium Sand	SW1/4 SEC 20 TWP 025 RGE 009 E1	159.88	64.70	2019-11-12	2021-12-12
QL-2928	Quarry Lease	Issued	(259535) Canadian Premium Sand	SE1/4 SEC 29 TWP 025 RGE 009 E1	158.64	64.20	2019-11-12	2021-12-12
QL-2929	Quarry Lease	Issued	(259535) Canadian Premium Sand	NE1/4 SEC 20 TWP 025 RGE 009 E1	159.88	64.70	2019-04-30	2022-05-30
QL-2930	Quarry Lease	Issued	(259535) Canadian Premium Sand	NW1/4 SEC 20 TWP 025 RGE 009 E1	159.88	64.70	2019-04-30	2022-05-30
QL-2931	Quarry Lease	Issued	(259535) Canadian Premium Sand	SE1/4 SEC 20 TWP 025 RGE 009 E1	159.88	64.70	2019-11-12	2021-12-12
QL-2932	Quarry Lease	Issued	(259535) Canadian Premium Sand	SW1/4 SEC 29 TWP 025 RGE 009 E1	159.88	64.70	2019-04-30	2022-05-30
QL-2935	Quarry Lease	Issued	(259535) Canadian Premium Sand	LS 12 SEC 32 TWP 025 RGE 009 E1	38.03	15.39	2016-06-16	2022-07-16
QL-2936	Quarry Lease	Issued	(259535) Canadian Premium Sand	LS 2,3,4,5 SEC 32 TWP 025 RGE 009 E1	150.83	61.04	2016-06-16	2022-07-16
QL-2953	Quarry Lease	Issued	(259535) Canadian Premium Sand	LS 13,14,15,16 SEC 24 TWP 025 RGE 008 E1	36.79	14.89	2019-04-30	2022-05-30
QL-2957	Quarry Lease	Issued	(259535) Canadian Premium Sand	LS 13,14,15,16 SEC 19 TWP 025 RGE 009 E1	159.14	64.40	2019-04-30	2022-05-30
QL-2959	Quarry Lease	Issued	(259535) Canadian Premium Sand	NW1/4 SEC 21 TWP 025 RGE 009 E1	151.77	61.42	2019-04-30	2022-05-30
QL-2960	Quarry Lease	Issued	(259535) Canadian Premium Sand	NE1/4 SEC 21 TWP 025 RGE 009 E1	154.44	62.50	2019-11-12	2021-12-12
QL-2961	Quarry Lease	Issued	(259535) Canadian Premium Sand	SE1/4 SEC 21 TWP 025 RGE 009 E1	159.63	64.60	2019-11-12	2021-12-12
QL-2962	Quarry Lease	Issued	(259535) Canadian Premium Sand	SE1/4 SEC 16 TWP 025 RGE 009 E1	160.12	64.80	2019-11-12	2021-12-12
QL-2963	Quarry Lease	Issued	(259535) Canadian Premium Sand	SW1/4 SEC 16 TWP 025 RGE 009 E1	158.64	64.20	2019-11-12	2021-12-12
QL-2964	Quarry Lease	Issued	(259535) Canadian Premium Sand	NW1/4 SEC 16 TWP 025 RGE 009 E1	159.63	64.60	2019-11-12	2021-12-12
QL-2965	Quarry Lease	Issued	(259535) Canadian Premium Sand	NE1/4 SEC 16 TWP 025 RGE 009 E1	158.89	64.30	2019-11-12	2021-12-12
QL-2967	Quarry Lease	Issued	(259535) Canadian Premium Sand	SE1/4 SEC 17 TWP 025 RGE 009 E1	144.80	58.60	2019-11-12	2021-12-12
QL-2968	Quarry Lease	Issued	(259535) Canadian Premium Sand	NE1/4 SEC 17 TWP 025 RGE 009 E1	159.88	64.70	2019-11-12	2021-12-12
QL-2969	Quarry Lease	Issued	(259535) Canadian Premium Sand	NW1/4 SEC 17 TWP 025 RGE 009 E1	159.88	64.70	2019-11-12	2021-12-12
QL-2973	Quarry Lease	Issued	(259535) Canadian Premium Sand	SW1/4 SEC 21 TWP 025 RGE 009 E1	159.63	64.60	2019-04-30	2022-05-30
QL-2974	Quarry Lease	Issued	(259535) Canadian Premium Sand	SW1/4 SEC 17 TWP 025 RGE 009 E1	147.77	59.80	2019-11-12	2021-12-12
				Total combined Quarry Leases	**5,307.50**	**2,147.87**		

The main glass sand mineral resource area reported in this Technical Report occurs within a smaller subset of 6 contiguous Quarry Leases within the Wanipigow Property (Figure 4.1 and highlighted in Table 4.1). For comparison, CPS's frac sand mineral resource/reserve reported in Eccles et al. (2019, 2020) was completed over 22 Quarry Leases. Hence, the glass sand mineral resource reported herein represents a small sub-portion of the overall silica sand deposit and focuses only on the Lower Black Island sub-member of the Winnipeg Formation.

The previous updated 2020 Prefeasibility Study Technical Report (Eccles et al., 2020) documented 42 Quarry Leases, one of which, QL-2925 (65 ha) was pending lease approval. At the time, an agreement between the Manitoba Department of Transportation and CPS was expected that would allow Manitoba and CPS access to the aggregate and underlying silica sand, respectively. The lease, QL-2925 was subsequently included in the Eccles et al. (2019) resource/reserve estimations.

However, Since the effective date of the Eccles et al. (2020) Technical Report, which was effectively dated 28 May 2019, the Government of Manitoba stated that the province wants to maintain the lease for municipal aggregate supply. The QL-2925 was located on the western side of the Property. QL-2925 has been omitted in this updated 2020 Prefeasibility Study Technical Report and its updated resource/reserve estimations which supersede those of Eccles et al. (2020). It is possible that QL-2925 become available for sand extraction once the surficial aggregate resource has been depleted.

4.2 Nature of Land Titles: Quarry Lease Acquisition

CPS (formerly Claim Post Resources Inc.) was incorporated on September 21, 2005, under the laws of the Province of Ontario. On November 15, 2018, the Company filed Articles of Amendment to continue under the laws of Canada. CPS obtained 100% ownership of the Wanipigow Glass Sand Project Quarry Leases through a series of acquisitions as described below:

- On April 16th, 2013, CPS (then Claim Post Resources Inc.) initiated 100% acquisition of 9 contiguous silica sand quarry leases (the Seymourville Property), from Char-Crete Ltd. (Canadian Premium Sand Inc., 2013). The lease acquisition became marred in legal issues until May 28, 2018, when CPS announced the company had acquired the same 9 quarry leases from several third parties, including Char Crete Ltd., Simmons Construction Ltd., and O/S Investment Corp. (Canadian Premium Sand Inc., 2018a).

- On June 16, 2016, CPS (then Claim Post Resources Inc.) acquired 2 quarry leases via application to the Manitoba Government (QL-2935 and QL-2936).

- On September 14, 2017, CPS (then Claim Post Resources Inc.) announced the company had completed the purchase of an additional 9 quarry leases from Gossan Resources Limited (Canadian Premium Sand Inc., 2017). The contiguous amalgamation of the 20 quarry leases to this point in time form the main mineral resource area that is reported in this Technical Report.

- On November 15, 2018, Claim Post Resources Inc. changed its name to Canadian Premium Sand Inc. (Canadian Premium Sand Inc., 2018b).

- Finally, in 2018, CPS applied to Manitoba for the issuance of an additional 22 quarry leases, and these applications were approved in May 2019 broadening CPS's current Property to the 41 contiguous Quarry Leases as presented in Table 4.1 and Figure 4.1.

4.3 Manitoba Quarry Lease Definition, Fees and Royalties

In Manitoba, a quarry lease grants the holder the exclusive rights to explore for, develop and produce (which includes the rights to dig, work, mine, recover, procure, and carry away) the quarry minerals within the leased area, subject to the payment of royalties. "Quarry minerals" include silica sand, and this term is more fully defined under *The Mines and Minerals Act,* s. 1(1) where "quarry mineral" means a mineral, other than a diamond, ruby, sapphire, or emerald, that is obtained from a quarry, and includes:

(a) sand, gravel, clay, shale, kaolin, bentonite, gypsum, salt, coal, and amber,

(b) rock or stone that is used for a purpose other than as a source of metal, metalloid, or asbestos, and

(c) a mineral that is prescribed as a quarry mineral.

A quarry lease is issued for a term not exceeding 10 years, and is renewable for further terms of 10 years, provided regulatory requirements are met.

The Manitoba quarry lease schedule of fees, rentals, deposits, and expenditures is available at: https://www.manitoba.ca/iem/mines/quarry/quarry_pdfs/quarry_fees.pdf; pertinent points from these appendices are summarized as follows:

- Quarry leases are exempt from assessment work but are subject to an annual tax that is payable when: 1) applying for new leases; or 2) renewing to hold current leases. Rental for a first term quarry lease and renewals for quarry minerals other than peat is $27 per hectare or fraction thereof per year.

- Leases are crown grants and include access to the surface. Accordingly, quarry leases in Manitoba include surface rights. Rental for a surface lease is $7 per hectare or fraction thereof per year but not less than $144.

- The cash deposit required upon application for a Quarry Exploration Permit is $1,000 or $25 per hectare, whichever amount is greater.

- Any silica sand production from quarry leases is subject to a provincial royalty of \$0.50 per tonne (for silica sand greater than 95% silica content, using a conversion factor of 1.78 tonnes per cubic metre).

- Other applicable provincial quarry mineral royalties include, for example:

  1) Heavy Mineral Sand containing minerals such as ilmenite, rutile, zircon, garnet, monazite, magnetite, kyanite, tourmaline, sphene, apatite and biotite of \$0.39/tonne.

  2) Gravel - including crushed or screened sand and gravel suitable for use (inter alia) in concrete aggregate, asphalt aggregate, mortar sand, and railroad ballast of 0.50/tonne.

  3) Mining Backfill - quarry mineral used in a mining operation as structural fill at \$0.21/tonne.

4.4 Rehabilitation Levy

A rehabilitation levy is required as per *The Mines and Minerals Act*. An operator of an aggregate quarry owned by the Crown will, no later than the 30th day following the anniversary date, or expiry of the quarry mineral disposition, remit to the recorder a rehabilitation levy in respect of the aggregate quarry minerals produced by the operator in the preceding year. That is, every operator of an aggregate quarry shall pay an annual rehabilitation levy equal to the product of the number of tonnes of aggregate quarry mineral produced multiplied by \$0.12.

4.5 Royalties and Economic Participation Agreements

CPS has entered into Economic Participation Agreements with Hollow Water First Nation and the Incorporated Community of Seymourville (Canadian Premium Sand Inc., 2018d). The Economic Participation Agreements are for the life of the Wanipigow Glass Sand Project and reflect the parties' non-financial commitment and support for the Wanipigow Glass Sand Project. The Economic Participation Agreements also commit CPS to certain participation payments over the life of the project.

CPS has also entered into various contractual agreements relating to the acquisition of title of 18 quarry leases that included advance and future royalty payments (Gossan Resources Limited, 2017; Canadian Premium Sand Inc., 2018a).

Collectively, these Royalty and Economic Participation Agreements commit CPS to quarterly payments if/once production commences that total:

- \$3.30 per tonne silica sand sold as fracture proppant.

- \$2.80 per tonne of silica sand sold.

- $0.50 per tonne of construction aggregates sold.

There is a further royalty payment of $1.00 per tonne of silica sand sold as fracture proppant, $0.50 per tonne of silica sand sold and $0.50 per tonne for construction aggregates sold relating to tonnes mined and sold specifically related to the quarry leases acquired from Gossan Resources Limited.

As part of certain agreements, CPS has made advance royalty payments that are recoverable as follows:

- Upon the Company attaining commercial production, the Company is entitled to recover $1.3 million plus interest at 9% compounded annually before the production royalty owing to Char Crete Ltd. commences.

- The Company pays Gossan a semi-annual advance royalty payment of $50,000 prior to initial production which started December 18, 2015. These advance royalty payments can be deducted from future production royalties owing once commercial production commences. The Company also has an option to re-acquire 50% of the production royalty for $1,500,000.

Lastly, in Manitoba, any silica sand production from quarry leases is subject to a Provincial royalty of $0.50 per tonne (for silica sand greater than 95% silica content, using a conversion factor of 1.78 tonnes per cubic metre).

4.6 Environmental Act Licence Issued to the Company on May 16, 2019

The Project requires a licence issued by Manitoba, pursuant to *The Environment Act* (C.C.S.M. c. E125), which applies across all phases of the project, from the earliest build phases to decommissioning.

On May 16, 2019, the Company was issued Environment Act Licence No. 3285 (EA Licence), subject to commercially reasonable terms and conditions. A copy of Licence No. 3285 can be found at:
https://www.gov.mb.ca/sd/eal/registries/5991wanipigow/index.html.

As outlined in the EA Licence, the Wanipigow Glass Sand Project will consist of an open pit sand quarry including:

1) Sequential annual quarry site reclamation.

2) Sand washing and drying within a fully enclosed wash and dry facility.

3) Ancillary facilities including permanent office and storage building.

4) A paved 6 km-long main access road.

5) A 1.5 km gravel access road for use during Project construction and for emergencies during Project operation.

The materials submitted to Manitoba, in support of the EA Licence and additional comments or questions arising from CPS's Environment Act Proposal (EAP) outlined studies that were completed on behalf of CPS to assess the potential environmental impacts of the Wanipigow Glass Sand Project including:

1) effects to the physical, aquatic, terrestrial and atmospheric environments.

2) Indigenous peoples.

3) Socioeconomic environment.

None of the Project mining components or mine-site activities occur in or immediately adjacent to fish-bearing waterbodies and no Project effects to fish-bearing waterbodies, including Lake Winnipeg, are anticipated. A Traditional Ecological Knowledge study and a walk through the Project area with a respected local elder knowledgeable of traditional medicinal plants showed that the natural resources in the Project area were common to the regional area. A Heritage Resource Impact Assessment Study conducted throughout the Project site during November 2018, prior to significant snowfall, showed that no archaeological resources were identified.

As per Gifford and Samoiloff (2018), monitoring and follow-up studies proposed for the Wanipigow Glass Sand Project include development of a Closure Plan, revegetation monitoring program, air quality monitoring (dust and noise), and on-going groundwater monitoring throughout the life of the Project. CPS has conducted a hydrogeological study and pump test of groundwater conditions at the Project Site, which is required to determine the feasibility and sustainability of groundwater use for Project operations.

The EA Licence contains a set of general terms and conditions that are intended to provide implementation guidance and to ensure the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation, and leisure for present and future Manitobans. Additional detail of the EA Licence is provided in Section 20.

4.7 Canadian Environmental Assessment Act, 2012, Oversight Not Required

On May 17, 2019, the Federal Minister of Environment and Climate Change, the Honourable Catherina McKenna, issued CPS a letter informing the Company that the Wanipigow Glass Sand Project has not been designated as a project requiring federal environmental oversight under the *Canadian Environmental Assessment Act (2012).*

4.8 Conditional Use Order

As the Project substantially falls within the jurisdictional boundaries of The Incorporated Community of Seymourville, the Company was required to apply to the Incorporated Community of Seymourville, to utilize lands that are zoned "natural areas", under applicable Zoning and Development Plan By-laws, for the purpose of harvesting silica sand and other ancillary commercial purposes. The Company made the required Conditional Use Application, and a hearing on its application was held on May 3, 2019.

On May 9, 2019, the Incorporated Community of Seymourville issued a Conditional Use Order to the Company, approving the conditional use of lands within its jurisdictional boundaries for a silica sand extraction operation, including accessory uses, building and structures.

A summary of the Quarry Leases (in whole or in part) that occur within the area of the Conditional Use Order are presented in Table 4.2. The Conditional Use Order applies to the Project through all phases of its lifecycle. Note: CPS will need to submit an amended Conditional Use Order application based on the revised mine plan outlined in this Technical Report.

4.9 Influence of Updated Mine Plan on Licencing and Conditional Use Order

Under issuance of the Environmental Act Licence approval, CPS was able to proceed with designing the required plans. The Company did not proceed with the detailed design while it undertook a review of the Project. That Project review resulted in several modifications to the plant design and Project logistics expanded elsewhere in this document.

Because the proposed and updated mine plan constitutes a change from frac sand to glass feed sand production, which will include significantly lower annual production volumes and related processing, CPS will be required to submit:

- A notice of alteration to the issued Environmental Act Licence.
- An amended Conditional Use Order application.

CPS has engaged a consulting firm to assist in identifying outstanding permitting requirements and expects to have this process completed in 2021.

Table 4.2 Quarry Leases (in whole and in part) and their legal descriptions within the Conditional Use Order.

Quarry Lease	Legal Land Description
QL-2953	NE Sec-24, Twp-025, Rge-08 Mer E1
QL-1276	SE Sec-36, Twp-025, Rge-08 Mer E1
QL-1680	SE Sec-25, Twp-025, Rge-08 Mer E1
QL-1693, QL-1682	NE Sec-25, Twp-025, Rge-08 Mer E1
QL-2959	NW Sec-21, Twp-025, Rge-09 Mer E1
QL-2973	SW Sec-21, Twp-025, Rge-09 Mer E1
QL-2926	NW Sec-29, Twp-025, Rge-09 Mer E1
QL-2936	SW Sec-32, Twp-025, Rge-09 Mer E1
QL-2932	SW Sec-29, Twp-025, Rge-09 Mer E1
QL-1692, QL-1682	NW Sec-30, Twp-025, Rge-09 Mer E1
QL-1678	NE Sec-30, Twp-025, Rge-09 Mer E1
QL-1694, QL-1895, QL-1896	SE Sec-31, Twp-025, Rge-09 Mer E1
QL-2929	NE Sec-20, Twp-025, Rge-09 Mer E1
QL-2930	NW Sec-20, Twp-025, Rge-09 Mer E1
QL-1681, QL-1691	SE Sec-30, Twp-025, Rge-09 Mer E1
QL-2957	NE Sec-19, Twp-025, Rge-09 Mer E1
QL-2957	NW Sec-19, Twp-025, Rge-09 Mer E1
QL-1642, QL-1785	SW Sec-31, Twp-025, Rge-09 Mer E1
QL-1759, QL- 1895	NE Sec-31, Twp-025, Rge-09 Mer E1
QL-1759, QL- 1785	NW Sec-31, Twp-025, Rge-09 Mer E1

4.10 Other Approvals

With its EA Licence now in hand, the Company will now be required to proceed with approval applications such as, for example:

- CPS will coordinate with Manitoba Infrastructure on approvals for the development of Project access roads, intersections and any other infrastructure development required as part of the revised logistics plan.

- General work permit(s) for the clearing of trees and land use will be requested in accordance with *The Crown Lands Act* (C.C.S.M. c C340) and applicable regulations.

- Burning permits to dispose of woody debris will be requested, as required, in accordance with Section 19(1) of *The Wildfires Act* (C.C.S.M. c W128).

- Water rights license(s) for use of groundwater needed to support the sand wash plant and associated facilities will be acquired in accordance with *The Water Rights Act*.

- CPS is in discussions with Manitoba Hydro to coordinate development of the powerline, including powerline capacity, required for the Wanipigow Glass Sand Project.

No other federal permits or approvals are expected to be required for the Wanipigow Glass Sand Project.

4.11 Community Consultation

Potential operations associated with the Wanipigow Glass Sand Project are anticipated to be a substantial benefit to the Local and Regional Project Area communities in terms of training, employment, and potential business opportunities related to the services that will be required for the Project.

CPS has conducted its own extensive public engagement that has resulted in letters of support for the Project from local communities, including the Incorporated Communities of Seymourville, the Northern Affairs Settlement of Aghaming and Hollow Water First Nation. CPS now has Participation Agreements in place with Hollow Water First Nation and the Incorporated Community of Seymourville.

The Company participated in all consultation initiatives, required by Manitoba, prior to EA Licencing. The consultation process has provided local Indigenous communities with an opportunity to become engaged and informed about the Wanipigow Glass Sand Project and share any comments, concerns, and recommendations to protect Indigenous rights and environmental interests (Indigenous Business & Finance Today, 2019). The Mayor and Council of Seymourville has stated,

> "*We are simply taking the next steps first envisioned in the 1970s by our Elders to promote the development of this valuable resource. We have thoughtfully reviewed the detailed plans and worked with the Company to ensure this project fits into the economic development strategy of our community. We are satisfied that our concerns have been addressed*." (Indigenous Business & Finance Today, 2019).

Other CPS actions that will further contribute to the socioeconomic benefits of the area are set out in the issued EA Licence (see Section 20) and Conditional Use Order (see Section 4.9).

4.12 Parks and Protected Areas

The nearest park or protected area to the Wanipigow Property is the Hecla/Grindstone Provincial Park (designated in 1969 and 1997 respectively). The Park is located approximately 2 km northwest of the Property and includes Hecla Island, Grindstone, Black Island, and several other small islands in Lake Winnipeg. The Park is 1,084 km^2 in size and is considered an IUNC Category V Protected Landscape/Seascape protected area. The Park area includes the historical silica sand mining quarry(s) at Black Island.

4.13 Significant Factors and Risks

The business of exploration for, and development of, silica sand involves a high degree of risk and there can be no assurance that the current program will result in profitable operations. The Company's continued existence is dependent upon the preservation of its interest in the underlying properties, the discovery of economically recoverable resources/reserves, the achievement of profitable operations, and the ability of the Company to raise additional financing, if necessary, or alternatively upon the Company's ability to dispose of its interests on an advantageous basis.

Ownership in mineral properties involves certain risks due to the difficulties in determining the validity of certain leases and the potential for problems arising from the ambiguous conveyance history characteristics of many mining interests.

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The Canadian Premium Sand's Wanipigow Glass Sand Project is located approximately 160 km northeast of the City of Winnipeg, MB, the capital and largest city in Manitoba (Figure 5.1). The property is located along the east shore of Lake Winnipeg and occurs directly south of the Incorporated Community of Seymourville, MB and southwest of the Hollow Water (Wanipigow) First Nation Reserve. The largest community within an 80 km radius is Gimli, MB, which is located about 70 km west of the Property (across Lake Winnipeg) and has a population of over 6,000 people.

From Winnipeg, the Property is best accessed by:

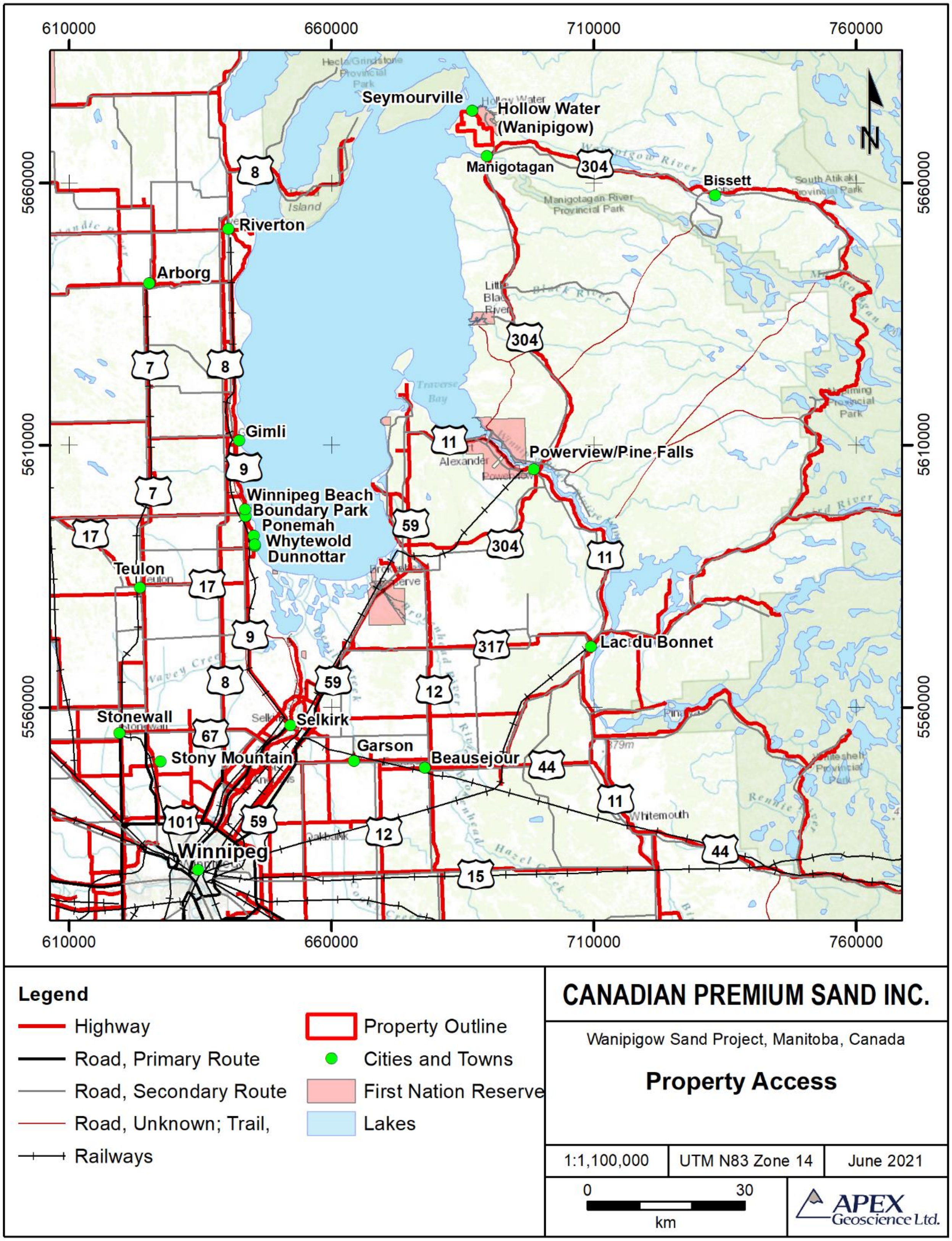
1. Travelling approximately 110 km on Provincial Trunk Highway 59N.

2. East and north on highway MB-304 N to the Town of Powerview-Pine Falls, MB, and continuing along highway MB-304 N for another approximately 75 km.

3. Exiting MB-304 N and driving straight north on an all-weather gravel road to Wanipigow (Figure 5.1).

Another gravel road is situated directly west of the Property, which serves the communities of Manigotagan and Seymourville and permits access to cottages along the Manigotagan River and Lake Winnipeg. This access route provides road access to the east part of the Property on its southern borders and extends northward through the northern portions of the Property.

Figure 5.1 Access to the Wanipigow Glass Sand Project.



The nearest commercial airport is Winnipeg International Airport in Winnipeg. Local general aviation airports include Riverton Airport (FAA ID: GKG2; approximately 53 km) and Gimli Industrial Park Airport (FAA ID: CJP7; approximately 95 km).

There is no rail line access to the Property; however, the Central Manitoba Railway (CEMR) Pine Falls subdivision once ran from Beach Junction in Winnipeg to Powerview-Pine Falls, MB. Most of the track is unused at present due to the closure of the mill in Pine Falls and much of the track north of Selkirk. MB (north of Winnipeg) has been lifted. In 2018, a refurbishment project was conducted for rebuilding the first several kilometres of the subdivision line and to bring the line up to 286K standard, among other improvements. The project was to include contributions from the Canadian federal government and Cando Rail Services.

Dunnottar and town centres historically grew around Canadian Pacific Railway stations. This railway is now owned and operated as one of five Shortline Railways (SLRs), which serve as a vital part of Manitoba's transportation system. The Lake Line Railroad was formed in July 2012 to operate trains over two pieces of track, a portion of the CP Winnipeg Beach subdivision from Gimli (mile 58 and end of track) to Selkirk (mile 26.13), and a portion of the CP Lac du Bonnet subdivision from Beausejour to Molson. The Gimli to Selkirk rail line portion runs along Highway 9 (Figure 5.1). The SLRs are governed the *Provincial Railways Act* and licensed by the Manitoba government. The Lake Line Railroad interchanges with the Canadian Pacific (CP) railway in Selkirk, MB.

5.2 Site Topography, Elevation, Vegetation and Wildlife

The Property is situated on the boundary between the Boreal Shield Ecozone and the Lac Seul Ecoregion. The boreal forest is the largest of Canada's 15 ecosystems and forms a continuous belt from the east coast to the Rocky Mountains. The Lac Seul Ecoregion, a subset of the Boreal Shield, is significantly smaller and extends eastward from Lake Winnipeg in Manitoba to the Albany River in northwestern Ontario.

The topography at the Property is relatively flat with elevation ranging from approximately 225 m to 250 m above sea level. The region is underlain with crystalline Precambrian bedrock of the Canadian Shield that forms broadly sloping uplands and lowlands. Hummocky Ordovician sandstone bedrock ridges and knolls unconformably overlie the basement rocks and are in turn covered with discontinuous and undulating glaciolacustrine and glaciofluvial deposits. Locally, sandy ridges, and fens and bog, dominate the northern and east-centre/southeast parts of the Property, respectively.

The dominant land cover is over-mature, mixed-wood forest. Characteristic vegetation includes trembling aspen with white and black spruce, jack pine and balsam fir. Mixed-wood Forest dominated by trembling aspen commonly occurs in areas that are moderately well- to poorly drained underlain by relatively flat Quaternary surficial deposits comprised of unconsolidated sand, gravel, and sandy clay, and ground moraine till. Poorly drained areas covered by fens and bogs are dominated by spruce.

Soils at the Property include: 1) Dystric Brunisols in areas of shallow to deep sandy glaciofluvial sediment, and in areas where bedrock crops out; 2) Organic Mesisols and Fibrisols dominate peat-filled depressions; and 3) Gray Luvisolic and Gleysolic soils occur in areas of glaciolacustrine sediment.

Wildlife includes wolf, lynx, ermine, fisher, mink, moose, black bear, woodland caribou, red squirrel, and snowshoe hare. Bird species include the spruce grouse, herring gull, and double-crested cormorant, as well as bald eagle, great horned owl, red-tailed hawk, and waterfowl. Wildlife species at risk in the region include Boreal Woodland Caribou (threatened); Little Brown and Northern Long-Eared bats (Endangered); and several threatened or endangered bird species (e.g., Common Nighthawk, Eastern Whip-poor-will, Barn Swallow, Golden-winged Warbler, Short-eared Owl).

There are no fish on the Property and the nearest fish habitats are Lake Winnipeg, and the Wanipigow and Manigotagan rivers. Lake Winnipeg's main fish species include walleye, sauger and lake whitefish. Other fish species include goldeye, mooneye, yellow perch, and emerald shiner. Aquatic Species at Risk as per the *Species at Risk Act* (SARA) include the Mapleleaf (*Quadrula quadrula*), a mussel species that is listed as Threatened in Schedule 1 of SARA.

5.3 Climate

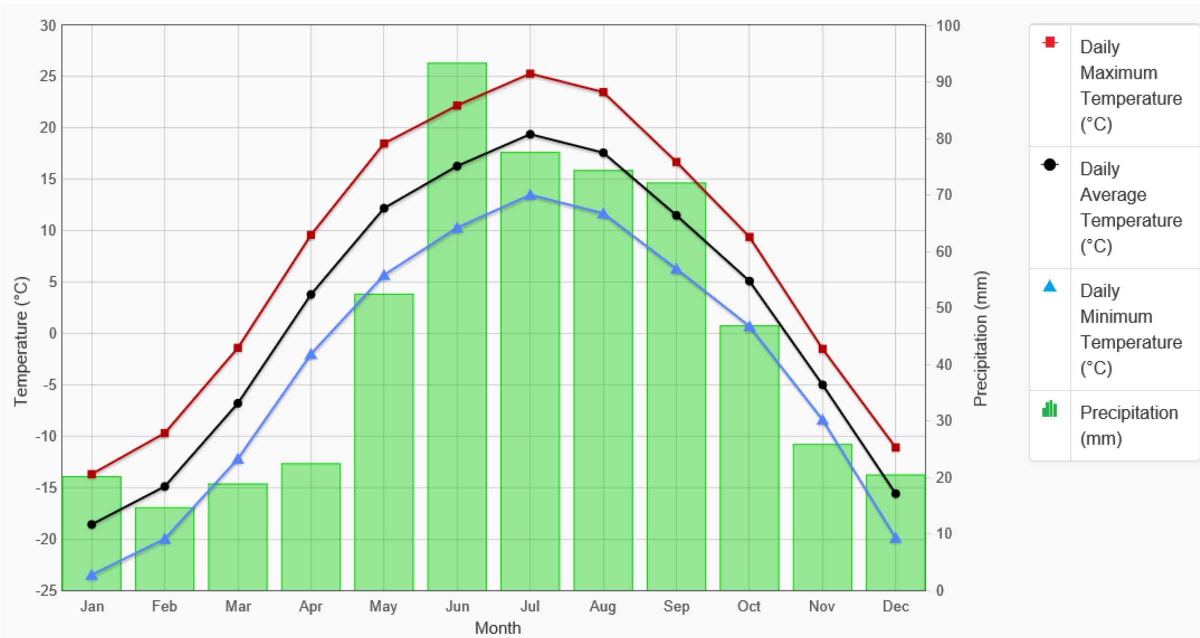
This ecoregion is classified as having a sub-humid mid-boreal eco-climate. The region has four distinct seasons, with short transitional periods between winter and summer. The property lies in the middle of the North American continent on a low-lying, flat plain. Due to its location in the Canadian Prairies, and its distance from both mountains and oceans, it has an extreme humid continental climate in that there are great differences between summer and winter temperatures (Figure 5.2).

Based on Powerview-Pine Falls and Seymourville climate records, the Wanipigow Property region has warm to hot summers and dry, cold subarctic winters. The mean annual temperature is approximately 2°C with a daily mean summer temperature of 19°C (July) and the daily mean winter temperature is -19°C (January). The mean annual precipitation is 540 mm with rainfall and snowfall averaging 439 mm and 100 m, respectively.

5.4 Local Resources and Infrastructure

Forestry, recreation, and hunting are the major land uses in this region. Powerview-Pine Falls was created as a paper mill town in the mid-1920's. In 2009, the mill was closed, and the site demolished in 2012. The mill was served by rail service, which ended after the mill closed. At present, the Interlake-Eastern Regional Health Authority Pine Falls Hospital (Pine Falls Health Complex) is the community's largest employer.

Figure 5.2 Temperature and precipitation graph for Powerview-Pine Falls. Source: Environment Canada 1971 to 2000 Canadian Climate Normals.



Other work opportunities for Powerview-Pine Falls, Seymourville and Hollow Water residents include gold exploration and mining opportunities associated with the Rice Lake gold belt. The Uchi Domain gold trend includes several significant gold deposits including Havilah Mining Corporation's True North (Rice Lake) Gold Mine near Bisset, MB, which is approximately 50 km northeast of the communities. Under the former guidance of Klondex Mines Ltd., True North Mine projects included refurbishing existing underground openings including test stope mining and conducting a historic tailings re-processing assessment project in 2016 (Puritch et al., 2016). Havilah Mining Corporation acquired True North in July 2018 and produced approximately 3,200 ounces of gold in roughly 4 months at an average grade of approximately 1 gram/tonne and the re-processing operation ran at an approximate rate of 900 tonnes per day (Havilah Mining Corporation, 2018).

Other past-producing or advanced projects near the True North Mine include Gunnar, Ogama-Rockland, Central Manitoba, Bissett Project and Cryderman Central gold deposits. The estimated total gold endowment in the belt is more than 5.6 million ounces (resources and past production), making it the largest gold deposit region discovered to date in Manitoba (Manitoba Commodity Files, 2017).

Workers from these communities were historically involved in mining silica sand at the Black Island silica sand quarry, which is directly northwest of the Property. The Black Island Quarry was mined periodically between 1929 and 1993 when extraction activities were abandoned, and the island became a Provincial Park. Hence, there is a history of silica sand mining in the region and neighboring communities offer potential sources for skilled and knowledgeable workers.

There is also an abundance of material and human resources that are available to support a mining operation from the City of Winnipeg.

Exploration in the region can be conducted year-round. Due to the cold winters, it is not uncommon for mining operations to close during the winter months. For example, the True North Mine has shut down its tailing reprocessing operation during the coldest winter months; current plans are to restart operations in April 2019 (Havilah Mining Corporation, 2018).

6 History

6.1 Silica Sand History: Off the Wanipigow Property

The authors have been unable to verify the information presented in this historical off-Property section, and therefore, the reader should be aware that the information is not necessarily indicative of the mineralization on the Wanipigow Property.

Silica sand was reportedly first discovered in Manitoba in 1859 prior to being formerly documented in 1900 (Dowling, 1900; Watson, 1985). Since then, Quaternary, Cretaceous and Ordovician quartz-rich sand has been explored for and even quarried in various forms in some areas of southern Manitoba.

The Ordovician Winnipeg Formation contains the largest known deposits of high-silica sand in Manitoba (Watson, 1985). The Winnipeg Formation, which is the focus of the Wanipigow Glass Sand Project and this Technical Report, was first described in 1900 (Watson, 1985) and is primarily exposed along the eastern shore and islands of Lake Winnipeg. Documented deposits – and their spatial relation to the Wanipigow Glass Sand Project include:

- Black Island, which is 5 km west of the Wanipigow Property.
- Smith Point, which is 7.5 km south-southwest of the Wanipigow Property.
- Punk Island, which is 11 km west-northwest of the Wanipigow Property.

The first claims for silica sand were staked on Black Island in 1910 and the first silica sand production occurred in 1929 when silica sand was barged from Black Island to Mid-West Glass in Winnipeg (Watson, 1985). Silica sand mining on Black Island continued (on and off) between 1929 and 2003 for use as feedstock to manufacture glass, fibreglass, foundry sand and silica sand for hydraulic fracturing the oil and gas industry (Puritch et al., 2014). Sand for glass processing was historically barged from the deposit to manufacturing operations in both Winnipeg and Selkirk, MB (Spiece, 1980; Pearson, 1984; Watson, 1985). The sand was taken from the island quarry in Lake Winnipeg down the Red River system to the plants. The silica sand quarry on the south shore of Black Island is still accessible and possesses some of the best outcrop exposures of the Winnipeg Formation in Manitoba (Lapenskie, 2016).

6.2 CPS's Wanipigow Glass Sand Project: Discovery and Historical Exploration Work

Earlier references to the Wanipigow Glass Sand Project area describe the silica sand deposit as the Seymourville deposit. This nomenclature remained intact up to November 2018 when Claim Post Resources Inc. changed its name to Canadian Premium Sand Inc. CPS renamed the deposit and thus it is referred to as the Wanipigow Glass Sand Project in this Technical Report.

Outcrops of silica-rich Winnipeg Formation sandstone have been known to occur on the east shore of Lake Winnipeg since Dowling (1900) made his initial investigations in the area. Due mainly to accessibility issues through the early and mid 1990's, the Property area was not investigated in detail until the late 1970's and 1980's (Watson, 1985). Since this time, the Wanipigow Property area – and immediate Property area – has undergone numerous exploration programs conducted by Government and Industry. These programs tested the subsurface geology at the Property as summarized in Table 6.1 and in the text below.

Table 6.1 Summary of historical drilling conducted by Government and various companies at the Wanipigow Glass Sand Project. The number of holes and drill information depicts only those holes that were drilled within the Wanipigow Property.

					Drill depth			Analytical work documented		
Year	Company	Number of holes	Drill type	Total drilling (m)	Min (m)	Max (m)	Avg (m)	Grad-ation	Proppant API	Reference
1981	Manitoba Energy & Mines	2	Diamond drill	39.0	12.0	27.0	19.5	Yes	/	Bamburak (1996)
1989	Manitoba Energy & Mines	7	Diamond drill	128.4	12.2	24.7	18.3	/	/	Bamburak (1996)
1992	Manitoba Energy & Mines	3	Diamond drill	18.4	4.9	6.6	6.1	/	/	Bamburak (1996)
2002	Claymore Kaolin	2	Diamond drill	36.6	15.2	21.3	18.3	Yes	/	Chornby (2003)
2004	Gossan Resources	11	Reverse Circulation	188.4	11.0	21.3	17.1	/	/	Pedersen (2007)
2006	Gossan Resources	23	Auger drill	378.1	7.3	22.9	16.4	/	/	Pedersen (2007)
2008	Gossan Resources	26	Sonic drill	377.4	10.7	19.2	14.5	Yes	Yes	Cooke (2008), Cooke (2010)
2014	Canadian Premium Sand	2	Sonic drill	36.6	18.3	18.3	18.3	/	/	CPS (pers. comm., 2014)
2014	Canadian Premium Sand	3	Auger drill	23.7	5.5	9.1	9.1	/	/	CPS (pers. comm., 2014)

In some instances, drilling took place adjacent to, or near, the Wanipigow Property. The authors have attempted to make a clear distinction between on- and off-Property drilling, and therefore, Table 6.1 and the text below focuses only on drilling and drill information that occurred within the boundaries of the Wanipigow Property.

In 1981, Manitoba Energy and Mines conducted a drill program across the Wanipigow area in which they drilled 12 diamond drillholes. Only 2 of the 12 holes were drilled on the present-day CPS quarry leases (Table 6.1). Of these two holes, a 25 m Winnipeg Formation silica sand intersection was reported (hole ID M20-81) with a silica yield of up to 96% SiO_2. The gradation and whole-rock geochemical tests completed on the samples returned an 80% recovery of well-rounded silica sand with sand sizes ranging from 20 to 100 mesh. The processed Winnipeg Formation sand had a silica purity of 98.2%, which was upgraded to 99.8% after an acid wash (Puritch et al., 2014). Manitoba Energy and Mines returned to the drill site on the Property in 1989 to drill 7 additional drillholes with silica sand intersections of 18 m (Bamburak, 1996).

In 1992, 3 diamond drill holes were drilled on the Property by Manitoba Energy and Mines. The results obtained less than 10 m thick intersection of Winnipeg Formation sand in the immediate drill area. This was possibly the result of erosion of the overlying beds (Bamburak, 1996). To the best of the authors knowledge, no other data is available for these holes.

In 2002, Claymore Kaolin Ltd. & Cando Contracting Ltd. conducted exploration work on the Wanipigow Property. The work consisted of drilling 2 vertical diamond drillholes (S-1 and S-2); of the 2 holes, only S-2 intersected silica sand with a thickness of 14.19 m that analyzed 95.2% SiO_2. Gradation size analysis concluded that 12.1% of the sand was 20/40 mesh and 78.8% of the sand was in the 40/140 mesh fraction (Chornoby, 2003).

Gossan Resources Limited (Gossan Resources) acquired 9 quarry leases on the Wanipigow Property in 2001. In 2004 the Company completed a reverse circulation (RC) drill program that completed 11 drillholes. Reportedly, there was significant contamination of samples because of using the RC drilling process in a sandy substrate (Pedersen, 2007). In 2005, Gossan Resources acquired the quarry leases previously owned by Claymore Kaolin Ltd.

In 2006, Gossan Resources completed a 23-hole auger drill program on the property totalling 378.07 m (Pedersen, 2007). The goal of this program was to determine a more accurate extent of the deposit and to delineate the sub-surface stratigraphy. Whole-rock geochemical analytical work on samples acquired during the drill program resulted in an average of 94.31% SiO_2, 2.50% Al_2O_3, 0.67% Fe_2O_3, and 0.23% CaO (Pedersen, 2007).

In addition to geochemical work, a grain size analysis study on the Gossan samples provided average percentages of 9.7% of 20/40 fraction and 71.6% of 40/200 fraction (Pedersen, 2007). The size analysis was questionable at the time because of potential contamination using the auger drill. While the program did lead to a more in depth understanding of the deposit dimensions, the drilling method lead to generally poor sample return with contamination.

In 2007, Gossan Resources conducted a trenching program with no significant results published (Cooke, 2008). In 2008, Gossan Resources conducted further drilling in a program that utilized a sonic drill rig and resulted in 26 drillholes totalling 377.41 m (Note: only 366.13 m were logged due to a loss of sample material). The sonic drill provided a better sample return than what was previously acquired using a RC or auger drill; even then, complications did happen during the project and subsequently only 7 of the 26 holes were fully drilled through the Winnipeg Formation and into the underlying Precambrian basement rock (Cooke, 2008). Analyses were carried out on the sonic drill samples in the following years (from 2009-2010) to further evaluate the proppant quality of the sand.

The Gossan 2008 drill program samples were separated by colour and averaged to delineate the purity of the sand by colour. Geochemical analysis on these sample splits resulted in assay results as presented in Table 6.2, in which the multi-coloured sand splits yielded similar silica results of between 93.46% SiO_2 (intermixed sand colours) and 94.75% SiO_2 (tan-coloured sand). The sand was also sent for attrition scrubbing and sieve analysis revealed that approximately 60-75% of the sand was in the 40/140 fraction size.

Table 6.2 Assay results of the 2008 Sonic Drill program (Cooke, 2008).

Sand Colour	Average SiO_2 (%)	Range (%)	Average Al_2O_3 (%)	Range (%)	Average Fe_2O_3 (%)	Range (%)
Brown	94.12	89.15-96.37	1.51	0.39-3.78	1.73	0.28-2.19
Orange	94.67	90.94-98.26	1.08	0.46-3.25	2.10	0.66-3.52
White	94.40	88.33-98.84	1.66	0.42-5.56	1.60	0.16-2.08
Intermixed	93.46	89.24-97.61	1.98	0.45-4.26	1.56	0.04-2.84
Tan	94.75	93.20-98.02	1.16	0.64-2.15	1.75	0.29-2.84

In 2010, Gossan Resources conducted a market study to assess the viability and cost of maintaining the property (World Industrial Minerals, 2010). The study concluded that the sand "*meets specifications, and appears suitable for the following markets: frac, fiberglass, recreation, metallurgical, construction, filtration and well pack.*"

In 2014, CPS (then Claim Post Resources Ltd.) drilled 5 drillholes at the Property. The program consisted of 3 auger drillholes and 2 sonic drillholes. The program was unsuccessful due to

1. The auger drill not being powerful enough to penetrate the Pleistocene glaciofluvial; and

2. The sonic drill yielding poor material recovery and not being able to drill deeper than approximately 10 m.

Due to the drilling problems encountered and a small exploration budget, the program was cancelled with no adequate sample being collected.

In 2018 CPS drilled a total of 93 sonic drill drillholes. This work forms the foundation of this Technical Report and the frac sand, and glass sand, mineral resource estimations, and is described in detail in Section 10, Drilling.

7 Geological Setting and Mineralization

7.1 Regional Geology

The regional bedrock geology of the Wanipigow Glass Sand Project area comprises Ordovician sandstone of the Winnipeg Formation that unconformably overlies the Precambrian crystalline basement (Figure 7.1). The Winnipeg Formation is overlain regionally by the Red River Formation carbonate rocks. The Ordovician units collectively form part of the WCSB, which can be viewed as a wedge of Phanerozoic strata above Precambrian crystalline basement. The WCSB wedge tapers from a maximum thickness of about 6000 m in the axis of the Alberta Syncline (just east of the Rock Mountains foothills front in Alberta) to a zero-subcrop-edge to the northeast-east along the Canadian Shield (in parts of Alberta, Saskatchewan, and Manitoba).

The Winnipeg Formation is an erosional isolated element of the eastern North America Cratonic platform succession deposited across the Transcontinental Arch; a northeast–southwest trending tectonic feature across the western midcontinent of North America that had a significant tectonic influence during the Phanerozoic (Osadetz and Haidl, 1989; Bezys and Conley,1996). The Winnipeg Formation was deposited in shallow marine seas during the Middle Ordovician (Bezys and Conley,1996), and therefore is manifested laterally as a flat lying to shallow westerly dipping unit of clastic sedimentary rocks.

Regionally, the Winnipeg Formation consists of a complex sequence of interbedded sand and shale, ranging in composition from >90% shale to >90% sandstone (Bezys and Conley,1996). Sandstone dominant, and more specifically, silica sand-rich intervals of the formation are known to crop out on the eastern and western shores of Lake Winnipeg and on several islands in the eastern part of Lake Winnipeg including Black, Punk, Little Punk and Deer islands (Watson, 1985; Lapenskie, 2016). The Winnipeg Formation represents the silica sand unit that is being targeted by CPS along with the overlying Quaternary surficial material, which includes reworked Winnipeg Formation sandstone.

Geological descriptions of the Precambrian Basement, the Ordovician Winnipeg Red River formations, and the Quaternary surficial deposits are described in a regional perspective in the text below.

7.1.1 Precambrian Basement

The Precambrian crystalline basement is the lowermost geological unit in the project area (Figure 7.1). The basement rocks form part of the Archean Superior Province and may mark the Mesoarchean western margin of the North Caribou terrane, which is one of the largest blocks of Mesoarchean crust in the Superior Province (Percival et al., 2001).

While the regional basement geology is partially obscured by the Ordovician sedimentary rocks and Quaternary surficial deposits – especially in the Property area – the regionally underlying Archean rock assemblages include from north to south: North

Caribou Terrane biotite granodiorite (ca. 2.715 Ga); layered quartz diorite-diorite; Hole River arkose and conglomerate (ca. <2.706 Ga); and Rice Lake Belt greywacke and basalt (Percival et al., 2001). The East Shore Plutonic Complex contains a 1-2 km wide body of homogeneous hornblende-biotite tonalite that underlies the east shore of Lake Winnipeg and eastern islands (Figure 7.1). The pluton grades eastward into layered tonalite, quartz diorite, diorite, and sheets of gabbro. Gabbroic sills minor serpentinite schist occurs sporadically within the tonalite within and near the Property.

The sedimentary-volcanic Lewis-Storey assemblage unconformably overlies the tonalitic basement along the eastern side of Lake Winnipeg. The assemblage includes arkosic grit overlain by quartzite, talc-serpentine schist, komatiite, and banded iron formation. These are in turn overlain by lower greenschist-facies volcanic and volcaniclastic rocks of the Black Island assemblage (Bailes and Percival, 2000). A poorly preserved sedimentary-volcanic sequence occurs along the southern margin of tonalite in the Wanipigow River area.

Tectonic reconstruction of major lithotectonic domains is hindered by structural complexity and the general lack of exposure. The east trending Seymourville shear zone runs along the northern edge of the Property (Figure 7.1) and marks the southern limit of the Hole River sedimentary sequence.

A set of northwest-trending high-strain zones converge into this area, corelate with the Lewis-Storey assemblage and may bound structural domains (Percival et al., 2001). The Wanipigow Fault occurs east of the Property and separates tonalite to the north from metagreywacke to the south (Figure 7.1; Weber, 1991).

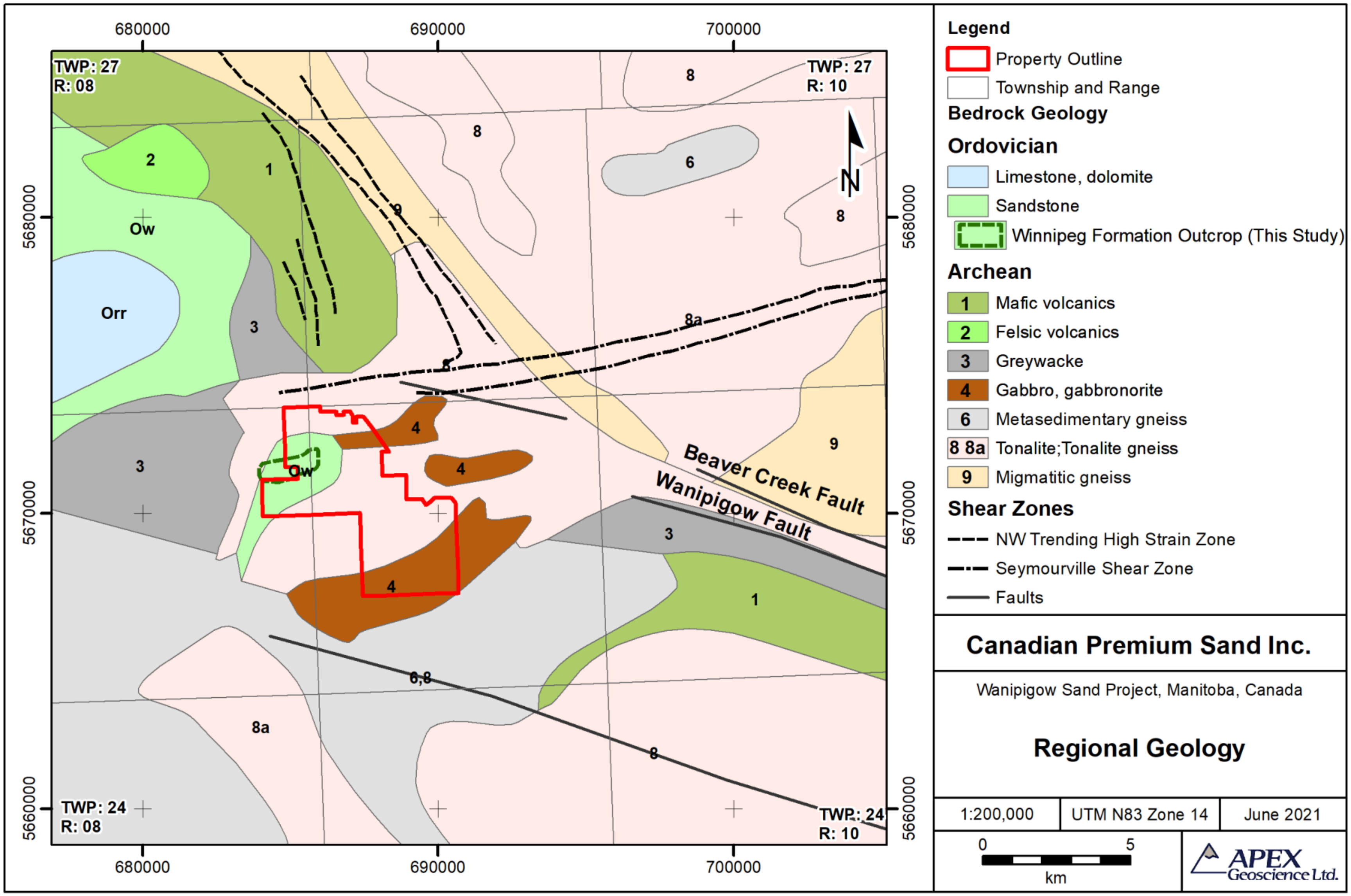
7.1.2 Ordovician Winnipeg Formation

The Winnipeg Formation unconformably overlies the Precambrian basement in the project area. The Formation ranges in thickness from 0-60 m and consists of interlayered sand and shale that were deposited in a shallow marine sea during the Middle Ordovician. Bezys and Conley (1996) describe the sands of the Winnipeg Formation as mostly poorly consolidated, medium grained, mature, well rounded, and quartzose. The Winnipeg Formation shale is mostly light olive-grey, kaolinitic, with variable sand and silt content.

The Winnipeg Formation can be sub-divided into the Black Island and the Iceberg members (Figure 7.2). The Black Island member is the lower stratigraphic member and consists of a thin basal sandstone overlain by interbedded sand and shale. Some shale zones of the Black Island Member contain pyritic, phosphatic, and/or limonitic concretions and ooids (Bezys and Conley, 1996).

The Iceberg Member is the upper stratigraphic member of the Winnipeg Formation and is considered a transitional zone between the Winnipeg Formation and the overlying Red River Formation (Bezys and Conley, 1996). The Iceberg Member is composed of grey and red shale and argillaceous sandstone.

Figure 7.1 Generalized bedrock geology in the Wanipigow Glass Sand Project area.



7.1.3 Ordovician Red River Formation

The Red River Formation overlies the Winnipeg Formation with the Dog Head Member representing the lowermost subunit. It consists of carbonate dolostone and limestone. A transitional zone between the Winnipeg Formation and the Red River Formation is occasionally observed in the basal Red River Formation as strata containing argillaceous interbeds of Winnipeg-like lithology (Bezys and Conley, 1996). The Red River Formation is present on Black Island but does not occur within the Wanipigow Property.

7.1.4 Quaternary/Pleistocene Surficial Deposits

The northern and southern parts of the Property are dominated by Ordovician Winnipeg Formation bedrock and Quaternary surficial deposits, respectively (Figure 7.3). The authors have used Manitoba's Surficial Geology Compilation Map Series to make regional observations of Quaternary material in the general Property area (Matile and Keller, 2004a,b).

The Wanipigow Property is near major southern Manitoba landforms that include the Precambrian Shield, Birds Hill-Belair moraine and the northeast limit of carbonate glacial debris. In the Precambrian Shield region, Quaternary sediments can be quite thick, but discontinuous, and rarely completely infill bedrock lows.

In the Property area, the glacial advance was generally from the northeast and the glacial material such as glaciofluvial deposits are typically sand rich. The Interlake region of Manitoba is dominated by streamlined landforms in the lower areas and glacial retreat occurred in a series of steps marked by moraines such as the Birds Hill-Belair moraine, which extends 100 km from the Red River lowland northward to the eastern shore of Lake Winnipeg (Burt, 2002).

Glacial striations on Precambrian outcrops near the Property show the dominant direction of ice flow is east-northeast flowing to west-southwest (Matile and Keller, 2004a,b). Dominate surficial deposits in the Property area include:

- Offshore glaciolacustrine sediments composed of clay, silt and sand. These deposits are commonly 1 to 20 m thick and form low relief, massive and laminated deposits. The sediments were deposited from suspended offshore, deep water of glacial lake Agassiz, and were commonly scoured and homogenized by icebergs.

- Marginal glaciofluvial sediments of sand and gravel. The deposits are 1-20 m thick and form ridges, spits, bars, and littoral sand and gravel. Typically, these deposits were formed by wave action at the margin of glacial Lake Agassiz. Marginal glaciolacustrine are also evident.

Less prominent, sporadic surficial material includes organic deposits (peat and muck) that accumulated in in low relief wetland areas (fen, bog, swamp and marsh). Diamicton deposits, or till, occur as clay-rich subglacial deposits in low-relief areas.

Figure 7.2 Stratigraphic section examples for the Winnipeg Formation in the Wanipigow Glass Sand Project area. The far right (C) section was constructed during the preparation of this Technical Report and its nomenclature is used throughout the report.

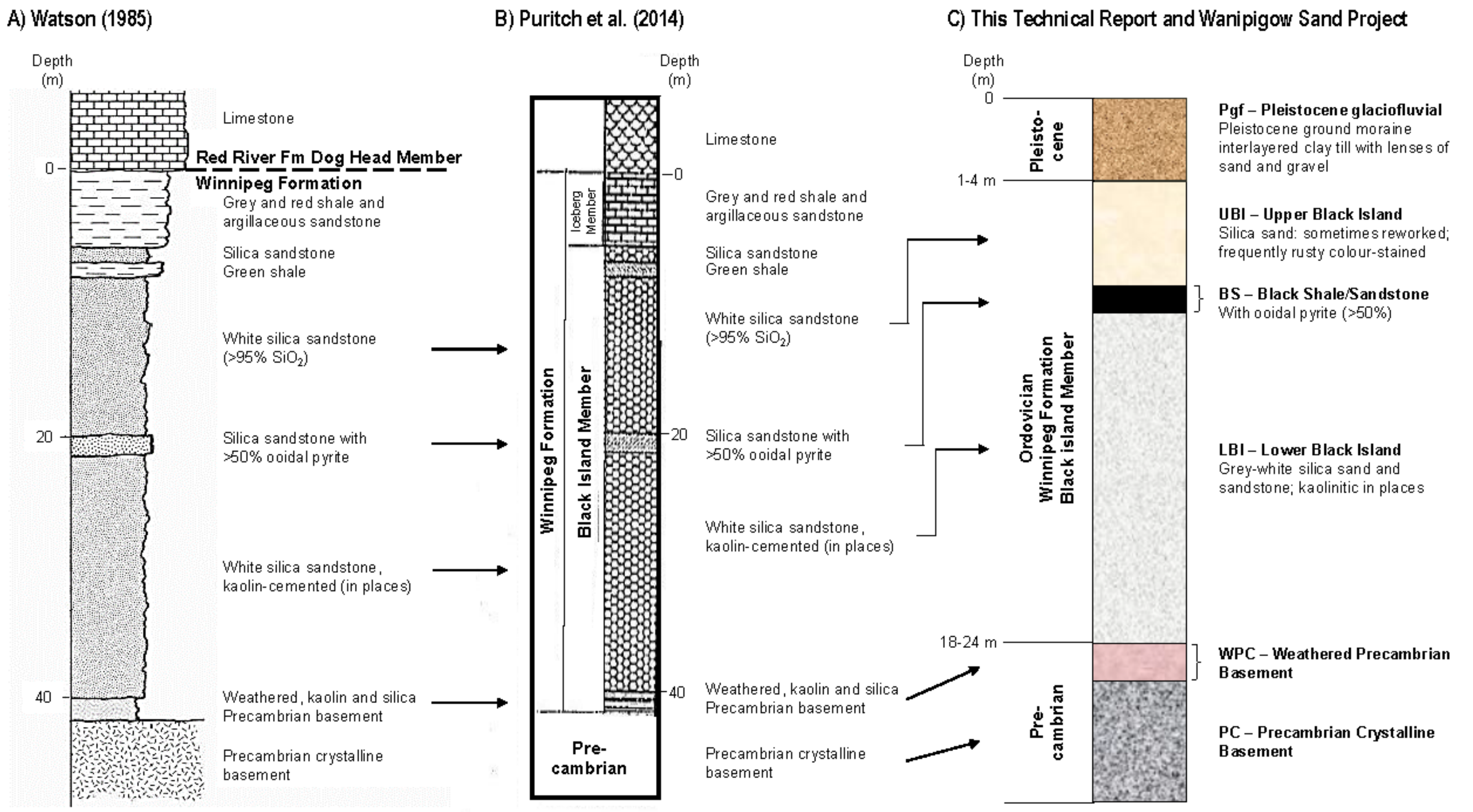
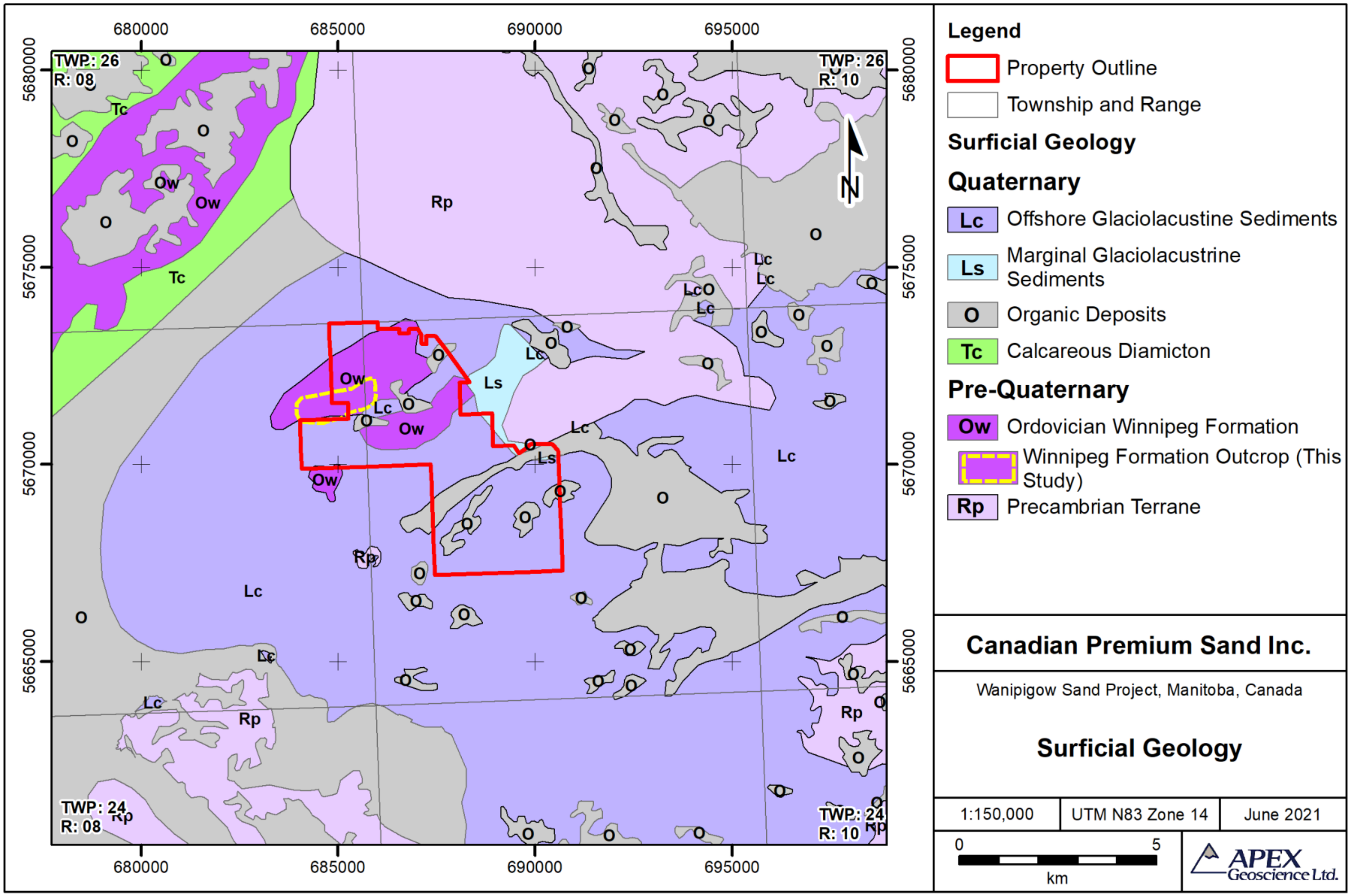


Figure 7.3 Quaternary surficial deposits in the Wanipigow Glass Sand Project area.



7.2 Property Geology

The Winnipeg Formation unconformably overlies the Precambrian crystalline basement and crops out in the eastern part of the Wanipigow Property (Figure 7.1 and 7.3). All CPS 2018 drillholes (n=93) were drilled through the entire Winnipeg Formation sedimentary rock package and penetrated downward into the uppermost basement surface. Hence, the crystalline basement rocks form the basal surface of Wanipigow Glass Sand Project's geological model. In drill core, the Precambrian basement is manifested as dominantly crystalline mafic volcanic and intrusive rocks that become increasingly weathered, kaolinitic and silica-enriched at the basement rocks uppermost contact with the Winnipeg Formation.

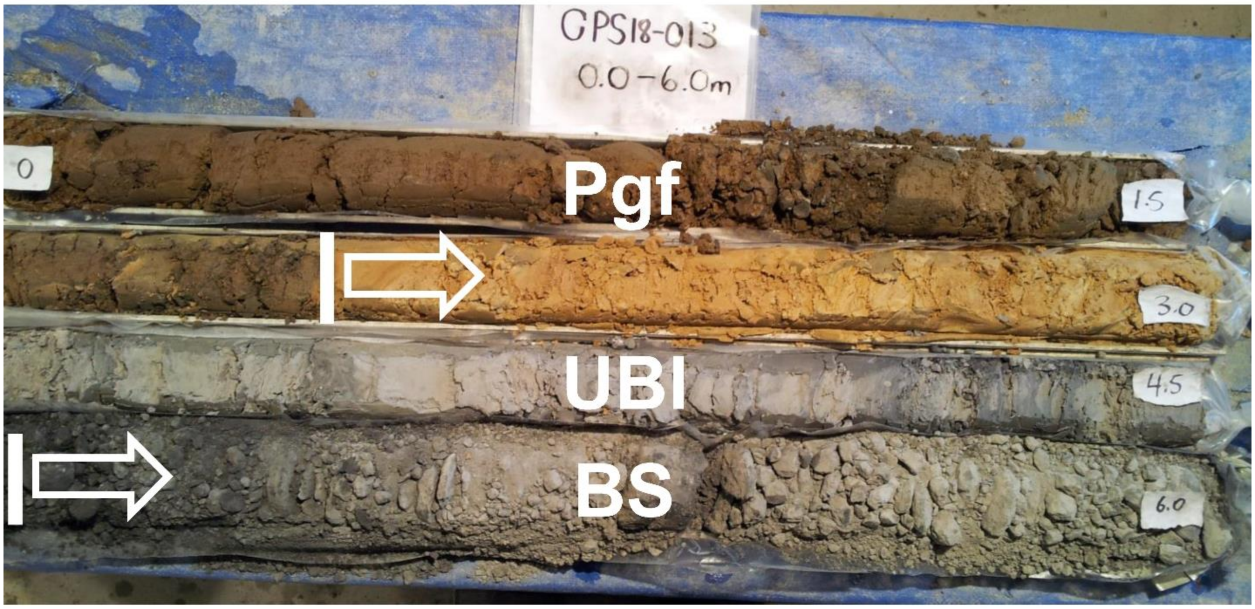
Drilling to the Precambrian basement allowed the authors to assess the entire Winnipeg Formation as it exists at the Property. Based on drill logs, lithological observations and grain size particle distributions, this current study subdivides the Winnipeg Formation into four distinguishable subunits that are presented in Figure7.2 and include from bottom to top: Lower Black Island; Black Shale; Upper Black Island; and Pleistocene glaciofluvial.

The units – as they exist at the Property – are described in the text that follows and shown in core photographs in Figure 7.4.

Lower Black Island (LBI): The basal subunit of the Winnipeg Formation is characterized by grey-white silica sand with minor kaolinite cement (Figure 7.4). The LBI was intersected in 45 drillholes (or 48% of the 2018 drillholes; see Section 10, Drilling). The thickest LBI intersections were up to 15.9 m and average approximately 7.9 m when present. As the LBI nears its contact with the overlying Black shale/sandstone unit, some orange-coloured staining is occasionally observed (especially if exposed at surface like on Black Island off property). This is most likely due to iron oxidation in the BS leaking into the surrounding units. The staining has been documented to be removed easily with scrubbing processes. The top of the LBI represents the most distinguishable and best understood contact in the Wanipigow Property subsurface.

Black Shale/Sandstone (BS): The BS shale/sandstone overlies LBI and is characterized by a thin layer of black shale that periodically comprises ooidal pyrite. The shale is often intermixed with sandstone and siltstone, which is stained black and therefore distinguishable from the underlying and overlying LBI and UBI (Figure 7.4). The BS unit occurs in the western part of the Property and resource area drilling showed that the BS pinches out completely in the east part of the Property. The BS was intersected in 14 drillholes (or 15% of the 2018 drillholes; see Section 10, Drilling). The thickest BS intersections were up to 3.5 m and average approximately 2.0 m when present.

Figure 7.4. Core photos illustrating the Lower Black Island (LBI), Black Shale (BS), Upper Black Island (UBI) and Pleistocene glaciofluvial (Pgf) subunits used in this Technical Report. From drillhole CPS18-013. Units in metres.



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Upper Black Island (UBI): An upper Winnipeg Formation subunit (UBI) overlies the BS and is characterized by a white to rust-coloured/stained silica sand (Figure 7.4). Staining is likely related to the pyritic black shale underlying the UBI. Like the BS, the UBI is also best represented in the western part of the Property. The UBI crops out in the far western portion of the Property and pinches out eastward. The UBI was intersected in 22 drillholes (or 24% of the 2018 drillholes; see Section 10, Drilling). The thickest UBI intersections are up to 19.0 m and average approximately 4.6 m when present.

Pleistocene glaciofluvial (Pgf): Sand and gravel surficial deposits are more-or-less ubiquitous at the Property; only 7 drillholes, or 8% of the 2018 drillholes, did not intersect Quaternary material. The maximum thickness of the Pleistocene glaciofluvial is 24 m and averages approximately 10.7 m when present. At the Property scale, the Pgf is characterized by ground moraine till material comprised mainly of interlayered clay with lenses of sand and gravel. In places, the Pgf includes intercalated and/or lenses of reworked UBI, and black clay till with pebbles and cobbles to distinguish from mudstone. The Pgf overlies UBI in the eastern part of the Property. As the BS and UBI units pinch out in the central and western parts of the Property, the Pgf takes over and directly overlies LBI in the western Property.

The Red River Formation, which stratigraphically overlies the Winnipeg Formation, does not appear within the Property.

7.3 Mineralization

With respect to the silica content of the Winnipeg Formation, Watson (1985) reported that the current Wanipigow Property comprises high-silica sand that is low in deleterious elements and cemented by kaolin and iron oxides that are readily removed by washing. In assessment of numerous potential sources of silica sand in Manitoba, it was reported that the Wanipigow Property area yielded the highest silica purity (up to 99% SiO_2) of all samples tested (e.g., Watson, 1985; Lapenskie, 2016).

Puritch et al. (2014) demonstrated the quartz-rich nature of the sand in that 255 sand samples from the Wanipigow Property had a mean silica value of 94.2% SiO_2. It is important to note that there was no differentiation between the LBI and UBI in this work, and hence the silica value is not representative of the LBI unit *stricto sensu*.

During 2021, CPS collected and geochemically analyzed a series of 10 composite LBI samples from the 6 drillholes that occur within the main glass sand resource area (see Section 9.2 Geochemical Study). The LBI sand in the main glass resource area had high SiO_2 values of between 96 and 99 wt. % SiO_2 with mean values of 98 wt. % SiO_2. In comparison, LBI samples on the west margin of the main glass sand resource area, which are partially 'contaminated' with UBI sand, had lower silica and higher iron. Hence, and from a geochemical perspective, the clean portions of LBI sand represent the mineralized portion of the Wanipigow silica sand deposit with respect to glass sand potential.

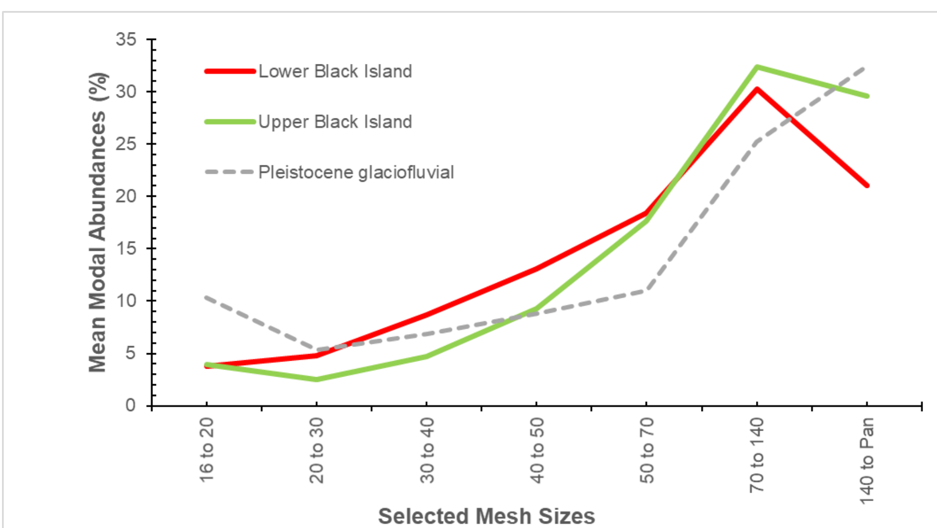
Analytical work conducted during CPS's 2018 drill program focused on the particle grain size distribution of the sand as an advanced approach to model and evaluate the proppant resource potential of the deposit. The analysis shows the Wanipigow Glass Sand Project yields particle gradation sizes that show:

- The Lower Black Island subunit comprises the highest mean percentages of 20-mesh to 70-mesh sand.
- The overlying Upper Black Island sand has the highest modal abundances of 70/140 fraction sand.
- The Pleistocene glaciofluvial has the highest amount of fine (140- and 200-mesh sand and Pan or -200 mesh sand; Table 7.1; Figure 7.5).

Table 7.1 Gradational summary of the of the Lower Black Island, Upper Black Island and Pleistocene glaciofluvial subunits.

Mesh size	Lower Black Island (mean %; n=236)	Upper Black Island (mean %; n=57)	Pleistocene glaciofluvial (mean %; n=451)
16 to 20	3.76	3.98	10.31
20 to 30	4.80	2.51	5.37
30 to 40	8.68	4.72	6.84
40 to 50	13.06	9.25	8.82
50 to 70	18.43	17.61	11.03
70 to 140	30.26	32.33	25.21
140 to Pan	21.01	29.60	32.43

Figure 7.5. Mean modal abundance of selected gradation sizes for Lower Black Island, Upper Black Island and Pleistocene glaciofluvial samples.



8 Deposit Types

8.1 Silica Sand

The best deposits of silica sand are characterized by super-mature marine shoreline sandstone deposits that have a long history of reworking, were never deeply buried, and underwent minimal diagenesis (or diagenesis that reduced or removed cements; Winfree, 1983; Dott et al., 1986; Dott, 2003). The depositional environment and factors to increase mineralogical maturity must include multiple cycles of mechanical reworking that enhance roundness, sphericity, and sorting of grains (Benson and Wilson, 2015). The most prospective settings for the accumulation of mineralogical and mechanically competent silica sand, therefore, occur in marine shoreline, marine shoreface, marine intertidal and deltaic settings, and coastal aeolian environments (e.g., Winfree, 1983; Dott et al., 1986; Dott, 2003).

The Wanipigow Glass Sand Project fits into this category. The Ordovician Winnipeg Formation contains the largest deposits of silica sand in Manitoba (Watson, 1985). The sand is distinguished from all other sediments in the Williston Basin portion of the WCSB due to its high-silica content, well-rounded shape and loosely kaolinitic cementation.

With respect to the geological model that shaped the Wanipigow deposit, the Williston Basin is a large intracratonic sedimentary basin in eastern Montana, western North Dakota, South Dakota, and southern Saskatchewan and Manitoba. The Winnipeg Formation represents the initial Williston Basin clastic sedimentary deposits as a result of a Late Ordovician transgression that influenced most of the North American craton. Based on the Shield proximal setting and composition and texture of the Wanipigow silica sand, it is apparent that the Wanipigow Black Island Member sand represents a mature marine shoreline sandstone deposit with a long history of reworking, was never deeply buried, and underwent minimal diagenesis.

8.2 Glass Sand

Silica sand is the major raw material for almost all common commercial glasses, comprising 60% to 70% of the furnace batch (e.g., McLaws, 1971, Valchev et al., 2011). Because it forms such a large component of the batch, its chemical quality is of paramount importance. The quality of sand depends largely on the type of glass made. For better grades of glass, the sand must have an extremely high silica content (99% or higher) and be essentially free of inclusions, coatings, stains, or accessory detrital heavy minerals. The quality must be guaranteed by the supplier, and the uniformity must be maintained.

Glass is divided into type based on its chemical composition. Soda-lime glass, lead glass and borosilicate glass represent the most common type of produced glass. However, as technology improves, the ability to manufacture glass with ultra high silica and ultra low iron has created significant interest in the solar application industry and to reduce energy usage. A summary of the most common glass types is provided as follows.

- Soda-lime glass, also known as soda-lime-silica glass (or window glass or architectural glass), is the most common and least expensive type of glass and is commonly used in windows (flat glass) and household glass containers (container glass). A typical composition of this glass is 70–75 wt. % SiO_2, 12–16 wt. % of Na_2O, and 10–15 wt. % CaO (Bauccio, 1994; Pfaender, 1996). The soda lowers the temperature at which the silica melts, while the lime stabilizes the silica. Flat glass has a higher magnesium oxide and sodium oxide content than container glass, and a lower silica, calcium oxide, and aluminium oxide content. Soda-lime accounts for 90% of glass manufactured.

- Lead glass, also called lead-oxide glass or lead crystal, is like soda-lime glass where lime is replaced by a larger part of lead oxide (PbO). Lead glass typically contains 55–65 wt. % SiO_2, 18–38 wt. % of PbO, and 13–15 wt. % Na_2O or K_2O (Bauccio, 1994; Pfaender, 1996). It has also been called flint glass since the original formula from the 1600s used calcined flint as a source of silica (flint is no longer used). It is a softer glass than soda-lime, making it easier to cut into designs that show off its high refractive index. It cannot withstand high temperatures or sudden changes in temperature. It is commonly used for decorative glass dishware and optical glasses because of its refractive index.

- Borosilicate glass contains substantial amounts of silica (SiO_2) and boron oxide (B_2O_3>8%) as glass network formers and is typically composed of 70–80 wt. % SiO_2, 7–13 wt. % of B_2O_3 4–8 wt. % Na_2O or K_2O, and 2–8 wt. % of Al_2O_3 (Bauccio, 1994; Pfaender, 1996). Durable and heat resistant, borosilicate glass is the material of choice for a wide range of applications, from cookware to laboratory use including test tubes, rods, beakers, graduated cylinders, pipettes, etc.

- Aluminosilicate glass is prepared from a ternary system with a typical composition 52–58 wt% SiO_2, 15–25 w. t% of Al_2O_3, and 4–18 wt. % CaO (Bauccio, 1994). It has comparable properties to borosilicate glass but is more heat resistant, tolerating temperatures up to 800º Celsius, and has a better chemical resistance. Aluminosilicate glass is commonly used for touch displays, such as smartphone screens, and for solar cells cover glass and laminated safety glass.

- High silica glass is composed of 95 to 99% silica making it extremely hard to melt, with a deformation temperature as high as 1,700° C. High silica glass has a very low thermal expansion, very good chemical durability, optical properties, and mechanical properties, but the extremely high processing temperatures is a limiting factor in the production and application on a larger scale. As technology improves, the ability to reach a greater purity of high silica glass has improved, making it possible to fabricate higher and higher qualities of glass.

- Low-iron glass, also known as optically clear glass, uses high quality grades of silica sand that are virtually free of iron oxide. This results in a transparent, high clarity glass that has higher transmission characteristics compared to normal soda lime glass. Maximizing light transmittance is important in solar applications where low-iron glass can improve solar performance, optimize energy usage, and reduce the reliance on artificial lighting. Light transmission levels are typically >90% with low-iron glass. Even higher transmission (up to 95% total transmission) can be achieved by specifying an anti-reflective thin film coating. However, there is no ASTM specification for low-iron glass, and clarity levels can vary widely based on the levels of iron in the manufacturer's formula.

- Photovoltaic glass (PV glass) is a technology that enables the conversion of light into electricity. To do so, the glass incorporates transparent semiconductor-based photovoltaic cells, which are also known as solar cells. The PV cells are protected by PV glass with high transmittance of light, and sometimes sandwiched between two sheets of PV glass.

- Specialty glass relies on high-tech research that has generated new and profitable products. Numerous products are considered specialty glass such as tableware, fibre optics, flat panel display glass, scientific and medical equipment, light bulbs, and special impediment windows. The outlook for specialty glass is evolving rapidly in that the most profitable products today did not exist a decade ago.

8.3 Exploration Concepts and Standards

Geological models and concepts applied in the investigation of silica sand in southeastern Manitoba generally involve delineation of areas underlain by prospective rock units (i.e., Ordovician Winnipeg Formation); drilling or trenching to determine potential deposit dimensions and to obtain representative sample material for evaluation; and physical and chemical parameter testing of the sand unit to determine its quality and potential for petro hydraulic fracturing and/or applications glass manufacturing.

General proppant test parameters include sand size fraction percentages, roundness, sphericity, crush strength, and silica content. Standard measurement properties of proppants used in hydraulic fracturing and gravel-packing operations is defined in accordance with ISO 13503-2:2006/ Amd.1:2009E (International Standards, 2009).

With respect to sand specifications in glass manufacturing, the suitability of silica sand for different industrial applications is determined by the quality of the sand in terms of:

- Chemical analysis: The grade is determined by the impurities content of the quartz sand in the ground.

- Color: Very low iron content results in naturally white quartz sands that are preferred for some industrial applications.

- Grain size distribution: Normally unprocessed sand may be suitable for a limited range of applications. Washing and sizing considerably increases the possible product range.

There is no current standard, or industry-wide specifications, for the quality of silica sand with respect to glass manufacturing. The chemical composition of the sand is critical with higher classifications of glass sand corresponding to higher levels of silica expressed as SiO_2. The 3 main chemical contaminates in silica sand are usually the iron content, expressed as Fe_2O_3, the alumina content expressed as Al_2O_3, and titanium expressed as TiO_2.

The 1988 British Standard BS2975 includes recommended compositional limits of silica (SiO_2), iron (Fe_2O_3), aluminum (Al_2O_3) and chromium (Cr_2O_3) of glass sand for specified grades of glass (Table 8.1). The general chemical specifications for different uses of silica sand are presented in Table 8.2.

In the production of standard glass, there is both the need and requirement for silica to be chemically pure (composed of over 98% SiO_2), of the appropriate diameter (a grain size of between 0.075 mm and 1.18 mm), and color (must contain between 0.025% and 0.04% Fe_2O_3).

Specialty glass can require even higher silica (over 98% SiO_2) together with low iron silica sand. Ultra-clear PV glass, or ultra clear rolled glass, is used mainly as sealing glass of solar cells and is an indispensable part of photovoltaic solar cells (solar photovoltaic and photo-thermal transformation systems) due to its high sun light transmittance, low absorption rate, low reflectivity, and low iron content. One company, XINYI Solar Holdings Limited, lists the glass sand iron requirements for ultra-clear glass of ≤120 ppm (≤0.012%) Fe_2O_3 (XINYI Solar Holdings Limited, 2021).

In contrast, coloured container glass can have high iron (e.g., up to 0.25% Fe_2O_3). These requirements are extremely specific and technical, and variations in these elements help dictate the specific glass application for the sand (e.g., Table 8.1).

There are also limitations on alkalis, colourants, and refractory minerals. Flat glass, for example, typically has <2 ppm Cr or Co and little to no Cu and Ni. Mineralogical parameters that can negatively affect glass manufacturing include, for example, 1) titanium and chromium minerals that may melt if the grains are fine enough and could colour the glass, 2) larger grains of refractory minerals (e.g., chromite, rutile) may not melt and cause flaws in the glass that could lead to fractures, and 3) aluminum, magnesium, calcium, and alkalis (sodium, potassium) can affect the melting properties and should be kept at consistent levels.

Grain size and grading is another important requirement by the glass manufacturers. Finer grains are more likely to carry iron oxide and refractory mineral grains, while larger grains will melt slower than smaller grains and may remain un-melted causing inclusions in the final product. British Standard (1988) recommendations for size grading of glass-making sands is presented in Table 8.3.

Table 8.1 Chemical specifications of selected optical glass products. Sources: Johnson (1961), British Standards (1988), and Verburg (2020).

Source	Glass product	Grade/ quality	Minimum SiO_2 (%)	Maximum Fe_2O_3 (%)	Maximum Al_2O_3 (%)	Maximum Cr_2O_3 (%)	Maximum CaO+MgO (%)	Maximum TiO_2 (%)	Maximum NaCl (%)
British Standard (1988)	Optical	A	99.7	0.013	0.2	0.00015	/	/	/
	Tableware	B	99.6 (± 0.1)	0.010	0.2 (± 0.1)	0.0002	/	/	/
	Borosilicate	C	99.6 (± 0.1)	0.010	0.2 (± 0.1)	0.0002	/	/	/
	Colourless container	D	99.8 (± 0.2)	0.03 (± 0.003)	nominal (± 0.1)	0.0005	/	/	/
	Flat	E	99.0 (± 0.2)	0.1 (± 0.005)	0.5 (± 0.15)	/	/	/	/
	Coloured container	F	97.0 (± 0.3)	0.25 (± 0.03)	nominal (± 0.1)	/	/	/	/
	Insulating fibres	G	94.5 (± 0.5)	0.3 (± 0.06)	3.0 (± 0.05)	/	/	/	/
Verburg (2020)	Photovoltaic	/	>99.3	<0.01	<0.2%	/	/	/	/
	Specialty	/	>99.0	<0.008	<0.5%	/	<0.5%	<0.05%	<0.05%
Johnson (1961)	Optical	1	99.8	0.1	0.020	/	0.1	/	/
	Flint, tableware	2	98.5	0.5	0.035	/	0.2	/	/
	Flint, tableware	3	95.0	4.0	0.035	/	0.5	/	/
	Sheet and rolled	4	98.5	0.5	0.060	/	0.5	/	/
	/	5	95.0	4.0	0.060	/	0.5	/	/
	Green and window	6	98.0	0.5	0.300	/	0.5	/	/
	Green	7	95.0	4.0	0.300	/	0.5	/	/
	Amber	8	98.0	0.5	1.000	/	0.5	/	/
	Amber	9	95.0	4.0	1.000	/	0.5	/	/

Table 8.2 General specifications for different uses of silica. Source: Sidex (2021).

Uses	Min. SiO_2 (wt%)	Max. Al_2O_3 (wt%)	Max. Fe_2O_3 (wt%)	Max. TiO_2 (wt%)	Particle size	Notes
Glass sand - containers: colored clear - flat glass	 98.9 99.5 99.5	 0.15 0.10 0.20	 0.15 0.035 0.007	 0.10 0.02 0.02	 0.1-0.5 mm	Other major elements need to be checked as well; <2 ppm Cr or Co for flat glass; avoid Cu and Ni
Foundry sand	88.0-99.0		Variable		0.08-0.85 mm	Highest SiO_2 content possible; particle shape sub-angular to rounded
Flux agent in smelting	90-95	1.5	1.5		2-5 cm	<0.2 wt% CaO+MgO
Hydraulic frac					0.4-0.85 mm	Rounded particle shapes
Silicon carbide (SiC)	99.3 99.7	0.08-0.25	0.03-0.20		0.15 mm	Specifications vary according to black or green product; <0.01 wt% CaO, <5% moisture
Silicon: - metal - chemical	 99.5 99.8	 0.20 0.10	 0.10 0.05	 0.006 0.005	0.17-1.7 mm [1] or >2.5 cm [2]	Resistance to thermal shock essential; completely avoid P and As; <0.2 wt% CaO & MgO
Ferrosilicon	98.7	0.60	0.30	0.05	0.17-1.7 mm [1] or 2-12 cm [2]	Resistance to thermal shock essential; <0.2 wt% CaO & MgO, <0.1 wt% P_2O_5
Fiberglass: - insulation - fabrics	 98.1 99.2	 0.52 0.60	 0.50 0.04	 0.05	~ 0.1-0.4 mm	 CaO+MgO <0.16 wt% CaO+MgO <0.20 wt%
Sodium silicate	99.4	0.20	0.05	0.05	0-6 mm	CaO+MgO <0.05 wt%
Lascas		<100 ppm Al	<100 ppm Fe		A few cm	Fe, Al, transition elements and alkaline elements <100 ppm, but preferably <10 ppm

Table 8.3 Recommended particle size distribution and moisture content of glass-making sands. Source: British Standard (1988).

Glass product Grade	Optical A	Tableware B	Boro-silicate C	Colourless container D	Flat E	Coloured container F	Insulating fibres G
Particle size distribution. Retained on sieve nominal aperature 1.00 mm (18 mesh) [1]	—	Nil	Nil	Nil	Nil	Nil	—
Particle size distribution. Retained on sieve nominal aperature 0.71 mm (25 mesh)	—	0.25 max.	0.25 max.	0.25 max.	0.25 max.	0.25 max.	—
Particle size distribution. Retained on sieve nominal aperature 0.50 mm (35 mesh)	—	5 max.	5 max.	5 max.	5 max.	5 max.	Nil
Particle size distribution. Retained on sieve nominal aperature 0.355 mm (45 mesh)	Nil	—	—	—	—	—	—
Particle size distribution. Retained on sieve nominal aperature 0.25 mm (60 mesh)	15 max.	—	—	—	—	—	20 max.
Particle size distribution. Retained on sieve nominal aperature 0.125 mm (120 mesh)	5 max.	5 max.	13 max.	5 max.	5 max.	5 max.	—
Particle size distribution. Retained on sieve nominal aperature 0.90 mm (170 mesh)	—	Nil	Nil	Nil	Nil	Nil	—

[1] Sieve sizes adapted to US Mesh sizes used in this Technical Report

9 Exploration

CPS's September to December 2018 drill program is described in Section 10, Drilling. Geological sample preparation, analyses and security is described in Section 11. Proppant and glass beneficiation test work results is discussed in Section 13.

9.1 Stratigraphic Study to Depict Lower Black Island Areas of Glass Potential

During 2021, the authors, in conjunction with CPS, reviewed the 2018 drill logs and core photos to depict areas of continuous LBI sand within the Wanipigow deposit. The main glass sand resource area was depicted and consists of a zone of continuous LBI sand as presented in cross-section Figure 9.1 (East-West) and Figure 9.2 (North-South). The stratigraphic review also made some minor adjustments to the LBI tops and bottoms within the main glass sand resource area (e.g., Figure 9.3). These adjustments were later verified based on the geochemical information presented in the text that follows.

9.2 Geochemical Study in the Main Glass Sand Resource Area

In conjunction with the stratigraphic study, the authors collected a total of 18 LBI unit samples from within the Wanipigow Property for whole-rock and trace-element geochemical analysis. The composite samples were divided as based on physical and textural variations of the LBI sand (e.g., Figure 9.4). The samples consisted of 1) a series of 10 composite LBI samples from the 6 drillholes that occur within the main glass sand resource area, 2) 4 samples from two drillholes that occur directly east of the main glass sand resource area to make geochemical comparisons between physical observations that depicted potential glass sand versus lower quality sand, and 3) 4 LBI samples from drillholes in the south and southwest portion of the Wanipigow Property that may have potential as future exploration targets for glass sand.

The sand samples were sent to the SRC for whole-rock analysis by ICP Total Digestion, SiO_2 by ICP whole rock assay, and trace-elements by ICP-MS Total Digestion. The bulk composite samples were first sieved, and the analytical work was completed on the >125 um and <710 um size fraction (20/120 mesh fraction; see Section 11.1). The analytical results are presented in Table 9.1. A histogram of the silica analysis is presented in Figure 9.5. Observations, with respect to silica analytical results, include:

- LBI sand in the main glass sand resource area has high SiO_2 values of between 96.1 and 98.9 wt. % SiO_2 (average 98.0 wt. % SiO_2 with an overall RSD% of 0.8%).

- LBI samples directly west of the main glass sand resource area have lower silica of between 82.4 and 96.6 wt. % SiO_2 in comparison to the results described in the previous bullet. While these results might help to illustrate background LBI silica contents in the Wanipigow Property, the authors hypothesize that the lower silica values result from some influence of mixing between the overlying UBI sand and the LBI. A preliminary conclusion is that exploration for glass quality sand should be restricted to those areas that have exclusive LBI sand.

- The LBI samples collected from the south and southwest parts of the Property yield silica of between 96.7 and 98.5 wt. % SiO_2, which supports the potential for high-silica sand in areas other than the main glass sand resource area. Further work is required in these areas, and consequently they should be considered future exploration targets at this stage of Wanipigow sand evaluation.

With respect to iron, the LBI sand from the main glass sand resource area has the lowest average iron content of 0.117 wt. % Fe_2O_3 (ranging from 0.032 to 0.247 wt. % Fe_2O_3) followed by the exploration target area (average of 0.261 wt. % Fe_2O_3) and the area directly west of the main glass sand resource area (average of 0.609 wt. % Fe_2O_3; Table 9.1). To reiterate, the authors hypothesize that the higher iron in the area west of the main glass sand resource area is potentially due to mixing of the UBI-LBI units. Perhaps the most noticeable observation in reviewing the iron geochemical results is the wide distribution of the iron in comparison to silica (compare Figure 9.5 and the histogram for iron in Figure 9.6). The iron content of the sand is investigated further in Section 13 via beneficiation studies to reduce the iron in the LBI sand.

Lastly, the SRC analytical results delineated 5 low-iron drillholes that included CPS18-018, CPS18-019, CPS18-024, CPS18-025, and CPS18-071. This information was used by CPS to narrow down the glass sand resource area to these 5 drillholes and CPS collected 50k g of representative sand from the archived material from the 5 drillholes to obtain a composite sample for detailed analysis and testing by glass sand expert in Germany (see Section 13.8, CM.Project.Ing GmbH and Industrial Minerals International Beneficiation Test Study).

Figure 9.1 East-west cross-section across the main glass sand resource area.

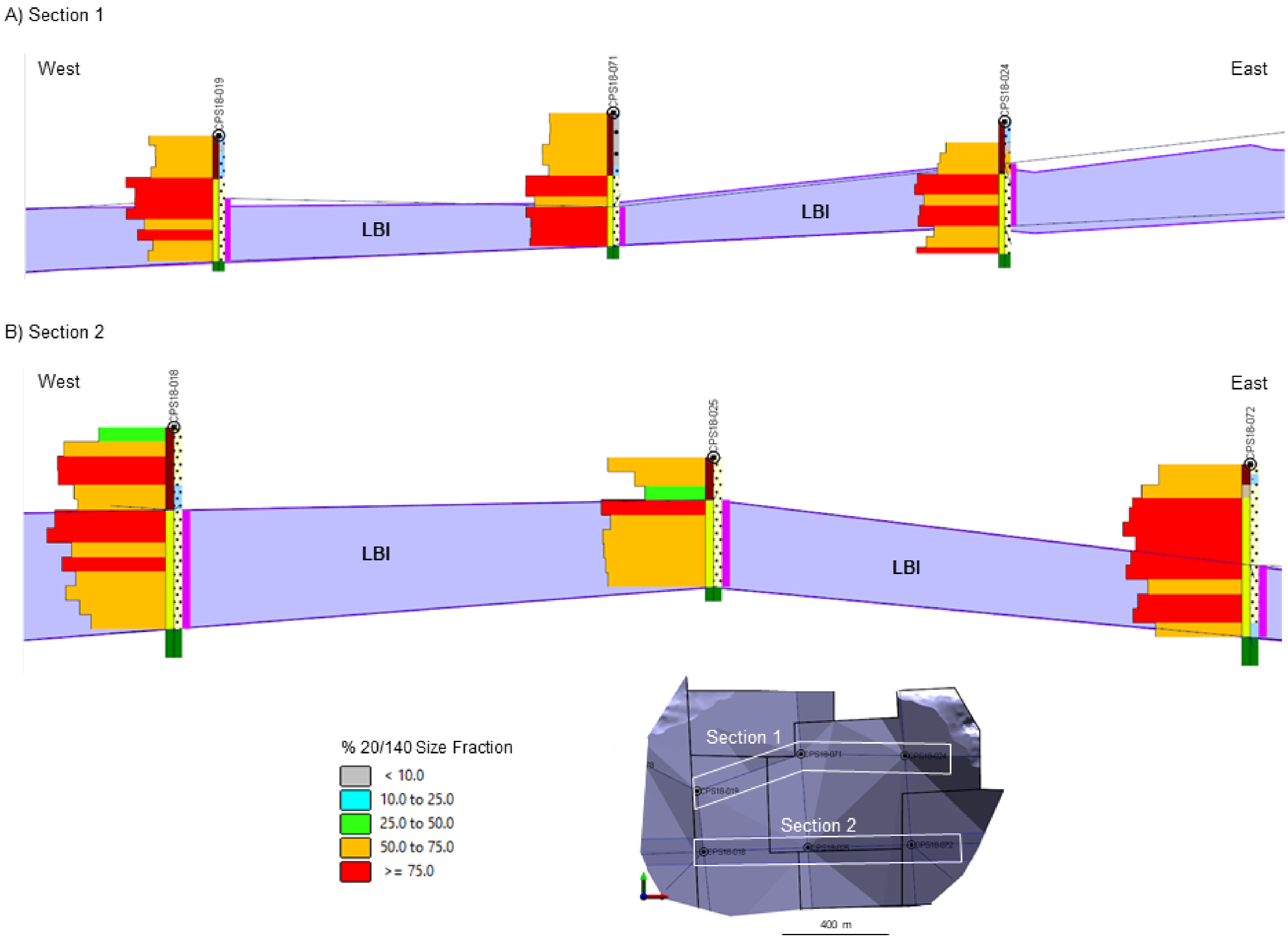


Figure 9.2 North-south cross-section across the main glass sand resource area.

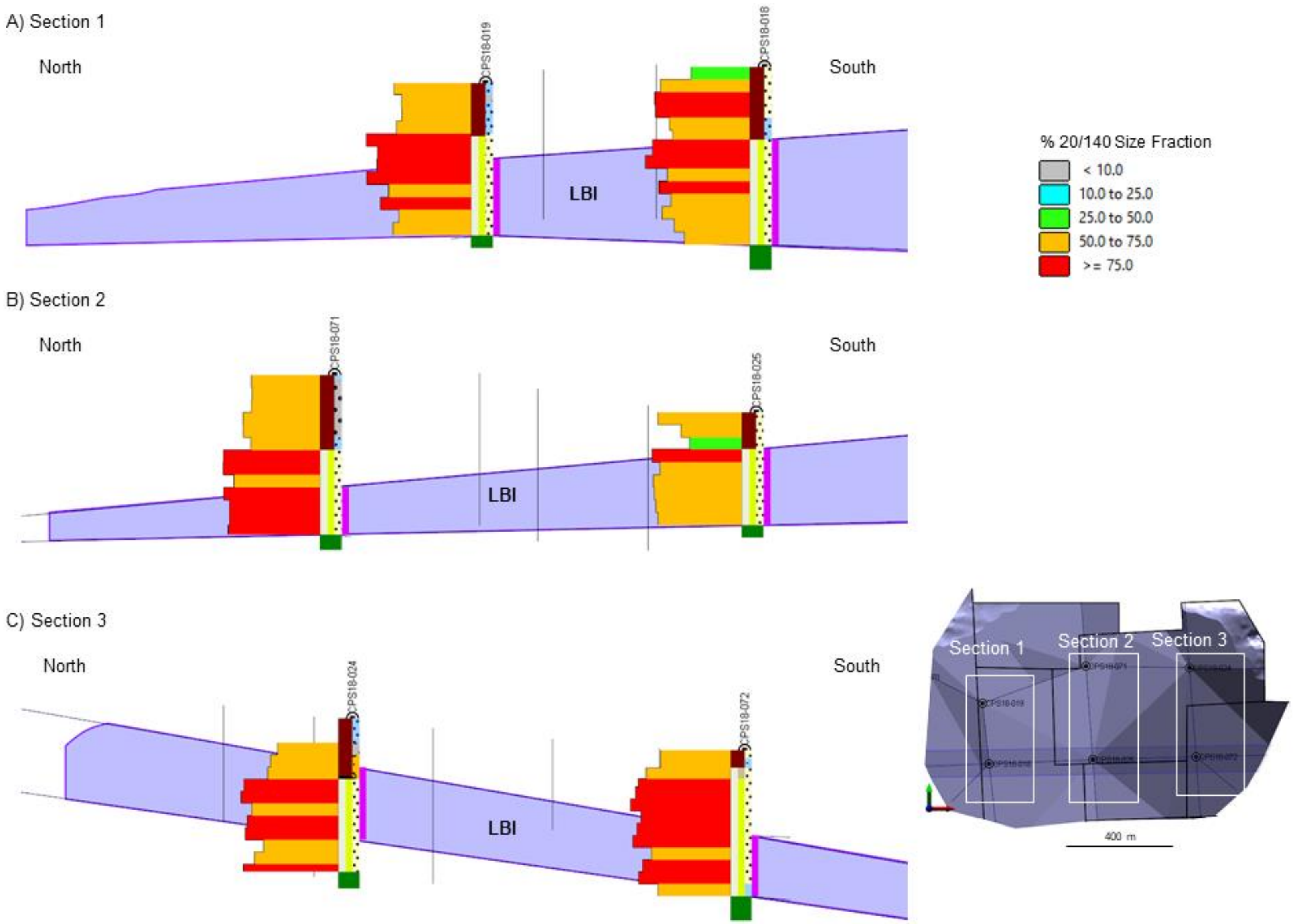


Figure 9.3 Revised cross-section in the main glass sand resource area based on a review of the 2018 drill logs and core photos.

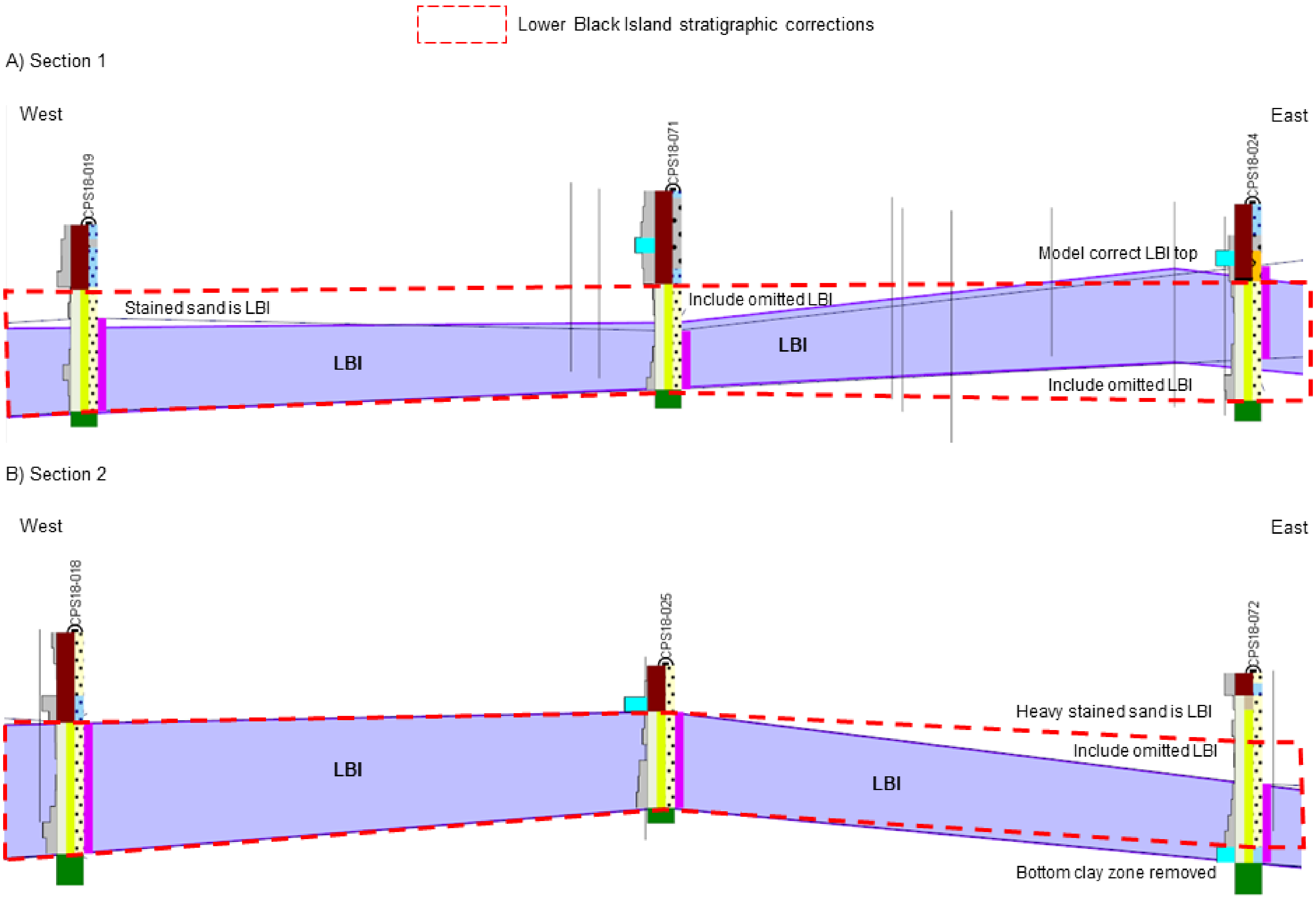


Figure 9.4 Core photo to illustrate how the LBI unit was divided into two composite samples within drillhole CPS18-72.

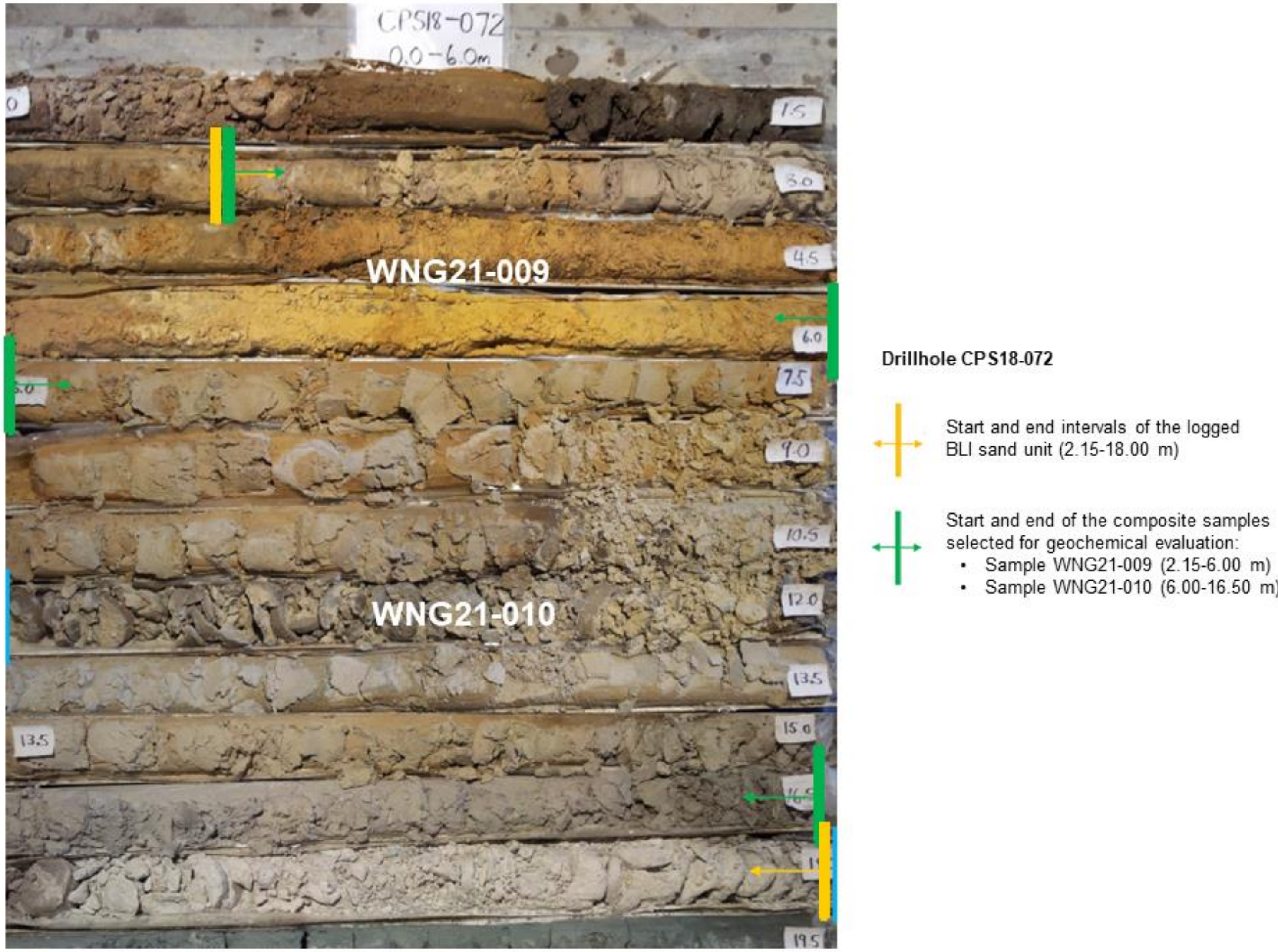


Table 9.1 Whole-rock and selected trace-element geochemical results of the LBI sand.

Sample ID	Drillhole ID	From (m)	To (m)	Lithology	SiO_2 (wt.%)	Fe_2O_3 (wt.%)	Al_2O_3 (wt.%)	CaO (wt.%)	K_2O (wt.%)	MgO (wt.%)	MnO (wt.%)	Na_2O (wt.%)	P_2O_5 (wt.%)
WNG21-001	CPS18-018	8.60	21.00	White sand with possible 15% brown color due to clays	98.40	0.067	0.58	0.10	0.177	0.026	<0.001	0.01	0.009
WNG21-002	CPS18-019	6.00	9.00	Stained sand, includes 10% brown sand	98.01	0.102	0.83	0.21	0.132	0.046	0.001	0.19	0.013
WNG21-003	CPS18-019	9.00	18.00	White sand with upto 25% brown material intermixed (clay contamination)	97.90	0.083	0.69	0.20	0.177	0.056	0.002	0.03	0.006
WNG21-004	CPS18-024	7.50	12.00	Stained sand	98.90	0.032	0.3	0.01	0.024	0.009	<0.001	<0.01	0.010
WNG21-005	CPS18-024	12.00	18.95	White sand	98.40	0.047	0.46	0.24	0.074	0.029	<0.001	<0.01	0.007
WNG21-006	CPS18-025	4.40	13.50	White sand with possible 2-3% gray color contamination (clay)	98.20	0.069	0.52	0.22	0.094	0.036	<0.001	<0.01	0.006
WNG21-007	CPS18-071	9.00	12.00	Stained sand with upto 5% brown sand	96.10	0.241	1.79	0.28	0.275	0.104	0.006	0.33	0.017
WNG21-008	CPS18-071	12.00	19.15	White sand with possible 5% brown staining due to clay	98.60	0.050	0.66	0.02	0.159	0.024	<0.001	<0.01	0.007
WNG21-009	CPS18-072	2.15	6.00	Orange stained Sand	98.40	0.235	0.66	0.02	0.191	0.029	0.001	0.02	0.011
WNG21-010	CPS18-072	6.00	16.50	White sand with <5% weak orange staining from above unit	97.40	0.247	0.74	0.33	0.088	0.051	0.002	<0.01	0.020
WNG21-011	CPS18-078	1.60	3.40	Weakly orange stained sand	82.40	1.038	9.36	1.73	1.740	0.988	0.013	2.45	0.038
WNG21-012	CPS18-078	3.40	6.50	White sand	96.60	0.244	1.42	0.30	0.343	0.142	0.003	0.22	0.012
WNG21-013	CPS18-001	6.00	12.00	Grey stained sand	84.10	0.957	7.61	2.16	1.480	0.601	0.012	2.09	0.054
WNG21-014	CPS18-001	12.00	16.85	White sand	95.80	0.197	1.58	0.60	0.345	0.158	0.003	0.30	0.012
WNG21-015	CPS18-031	3.00	12.00	Wk-mod orange stained sand	98.50	0.320	0.36	0.01	0.087	0.013	<0.001	<0.01	0.011
WNG21-016	CPS18-031	12.00	17.50	White sand, may include upto 30% darker grey staining (clay?)	97.70	0.139	0.96	0.04	0.152	0.021	<0.001	0.01	0.004
WNG21-017	CPS18-075	6.00	9.00	Grey sand	96.70	0.511	1.16	0.14	0.189	0.1	0.002	0.09	0.014
WNG21-018	CPS18-075	9.00	19.80	White sand	98.40	0.074	0.68	0.12	0.090	0.03	<0.001	0.03	0.009

	SiO_2	Fe_2O_3
Average - Main glass sand resource area	98.03	0.12
Standard deviation - Main glass sand resource area	0.79	0.09
RSD% - Main glass sand resource area	0.81	74.64
Average - western edge of the main resource area (with UBI)	89.73	0.61
Average - Future exploration target	97.83	0.26

Figure 9.5 Histogram of silica geochemical results.

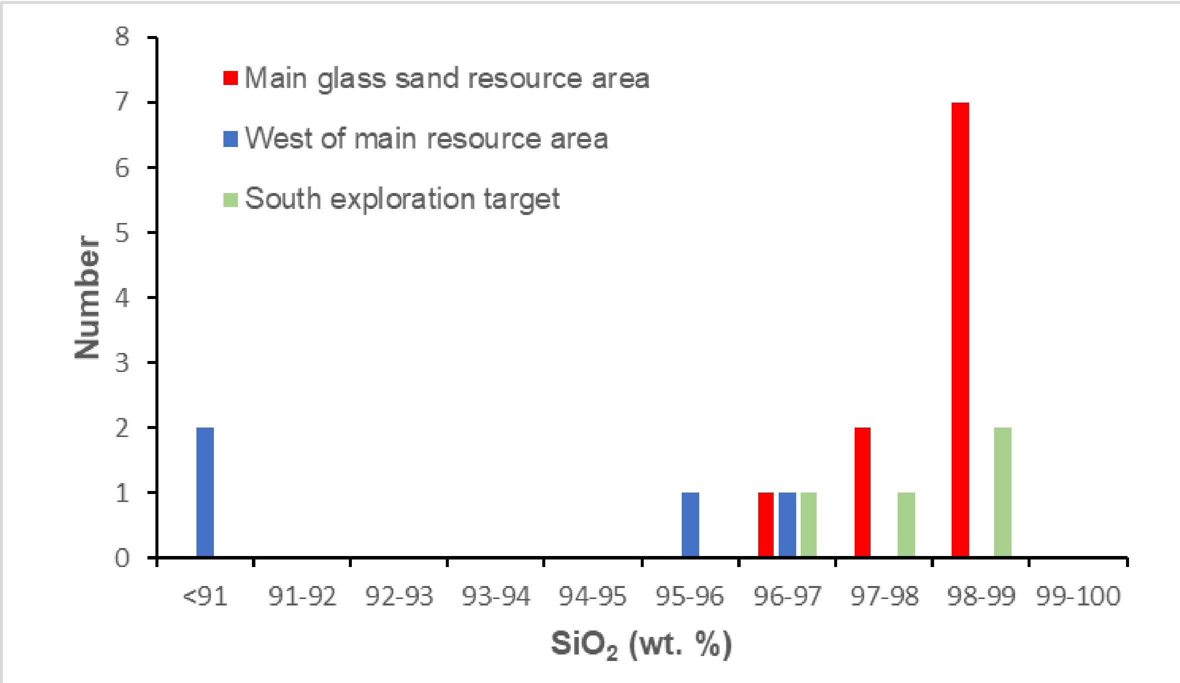
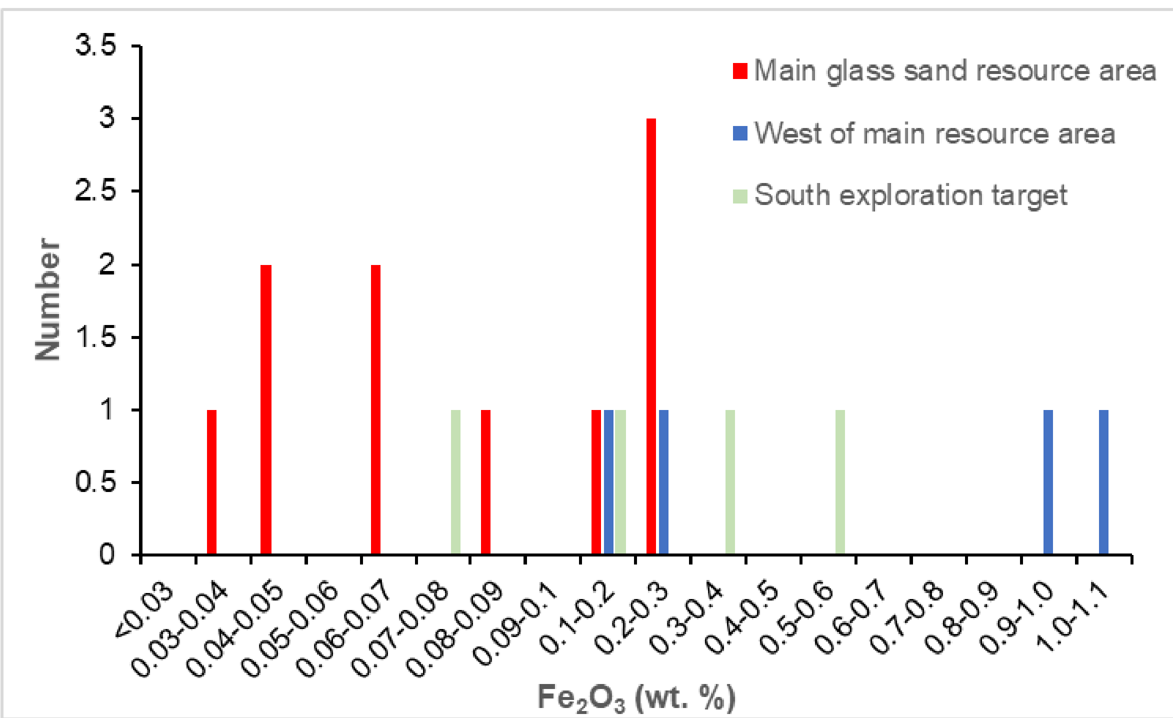


Figure 9.6 Histogram of iron (Fe_2O_3) geochemical results.



9.3 QEMSCAN Analytical Results

QEMSCAN analyses, which was completed by the Saskatchewan Research Council (Wudrick, 2021), represents a collection of back-scattered electron images and semi-quantitative point chemical analyses used to calculate various parameters such as particle size distribution, mineral associations and liberation, modal abundances, etc.

Based on the results of the geochemical analyses presented in Section 9.2, a split of the sieved sample fractions was amalgamated into 2 separate composite samples for QEMSCAN analysis:

1. A 'low iron' sample (n=8 samples) that ranges between 0.032 and 0.241 wt. % Fe_2O_3 with an average of 0.086 wt. % Fe_2O_3, and

2. A 'high iron' sample (n=6 samples) that ranges between 0.197 and 0.320 wt. % Fe_2O_3 with an average of 0.230 wt. % Fe_2O_3.

The objective of the QEMSCAN analysis was to determine the percentage of, and mineralogy, of iron-bearing grains.

A representative 5 g portion of the low- and high-iron samples were prepared as polished sections. The low iron sample analyzed a total of 20,002 grains using 894,615 x-ray data points at a pixel spacing of 4.76 µm. The high iron sample analyzed a total of 20,134 grains using 982,680 x-ray data points at a pixel spacing of 4.76 µm. The modal mineralogy is calculated from the combined analysis of the back-scattered electron images and the mineral identification from the semi-quantitative point chemical analyses (EDS). The volumetric abundance of the minerals is converted to mass percent from density data for typical mineral compositions.

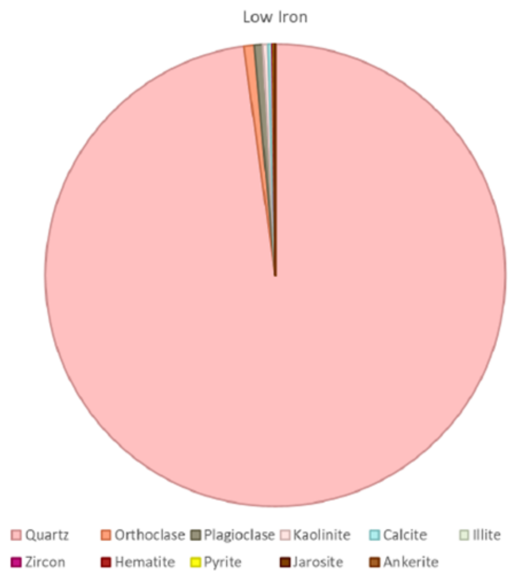
The low iron sample is almost entirely quartz (97.70%). Some plagioclase, orthoclase, calcite, and clay minerals such as kaolinite and illite are also present in lesser amounts. There are fewer iron minerals than above. They include hematite, pyrite, jarosite, and ankerite. Some minor zircon is also present (Figure 9.7a).

The high iron sample is almost entirely quartz (96.45%). Some plagioclase, orthoclase, calcite, and clay minerals such as kaolinite and illite are also present in lesser amounts. Some grains altered to chlorite are present. Iron minerals include biotite, jarosite, hematite, ilmenite, pyrite, and ankerite. Some minor zircon is also present (Figure 9.7b).

A review of individual grains is presented in Figure 9.8 and shows that iron-bearing minerals and/or grains within the LBI sand unit form as isolated grains within a remarkably clean, quartz-dominated sand. These unique grains comprise iron minerals that form mainly as alteration replacement minerals along the edges of grains, within fractures, or pervasively replacing, for example, a carbonate grains, and more rarely as, 2) inclusions within quartz grains.

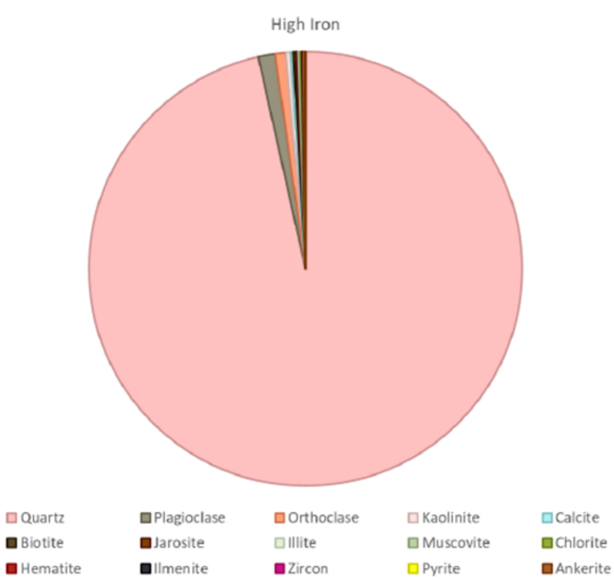
Figure 9.7 QEMSCAN analytical results of the low iron and high iron samples.

A) QEMSCAN results of a 5 g portion of the 'low iron' silica sand sample (average 0.086% Fe_2O_3).



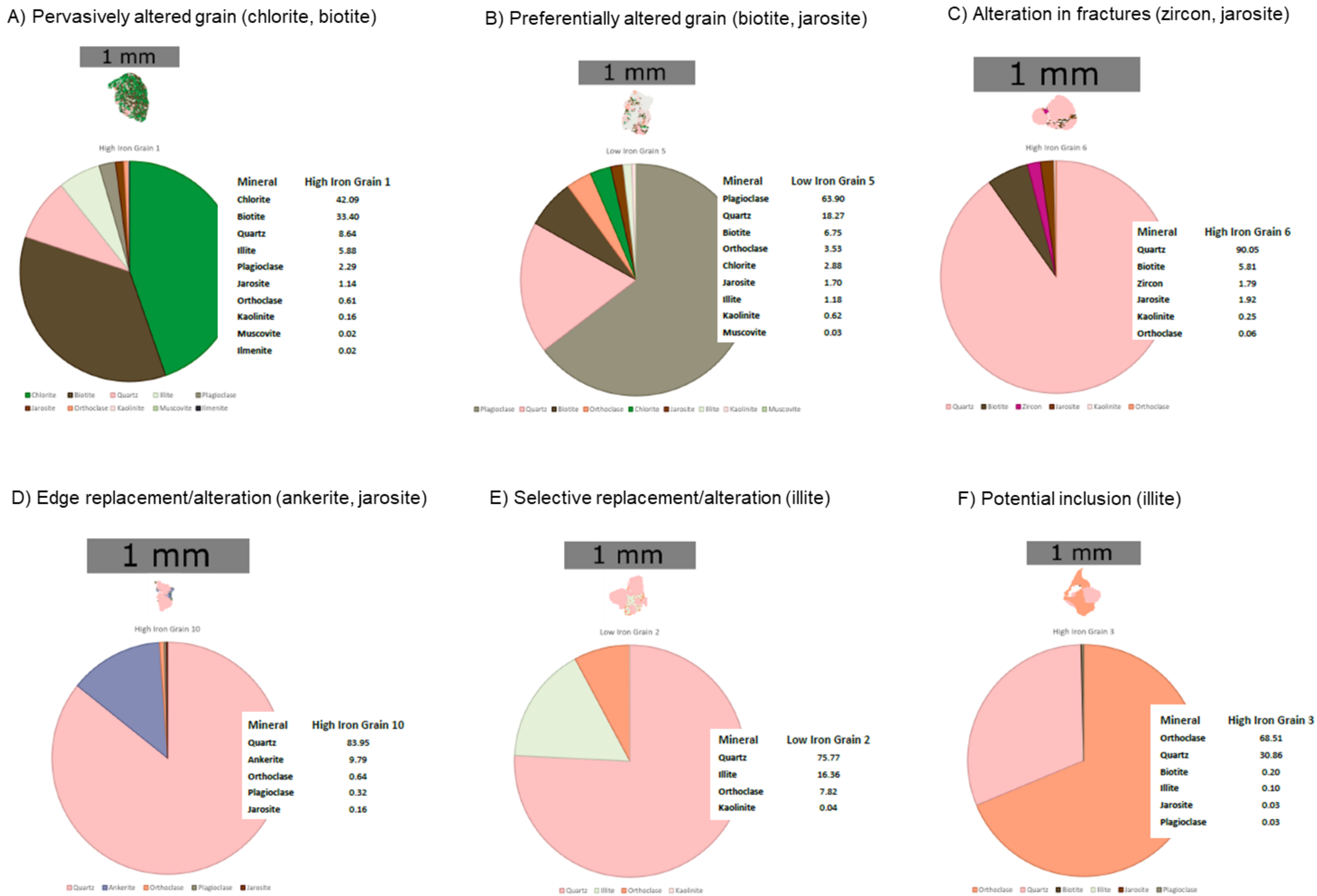
Mineral	Low Iron
Quartz	97.70
Orthoclase	0.72
Plagioclase	0.62
Kaolinite	0.34
Calcite	0.25
Illite	0.06
Zircon	0.06
Hematite	0.05
Pyrite	0.05
Jarosite	0.03
Ankerite	0.02

B) QEMSCAN results of a 5 g portion of the 'high iron' silica sand sample (average 0.230% Fe_2O_3).



Mineral	High Iron
Quartz	96.45
Plagioclase	1.25
Orthoclase	0.79
Kaolinite	0.35
Calcite	0.21
Biotite	0.18
Jarosite	0.17
Illite	0.11
Muscovite	0.09
Chlorite	0.09
Hematite	0.06
Ilmenite	0.06
Zircon	0.05
Pyrite	0.05
Ankerite	0.04

Figure 9.8 Mineralogical and textural examples of select iron-bearing mineral grains captured in the QEMSCAN analyses.



10 Drilling

10.1 Drilling Prior to Canadian Premium Sand's 2018 Drill Program

Historical drilling at the Wanipigow Silica Sand Project is documented in Section 6, History, and includes:

- 1981: 12 diamond drillholes drilled by Manitoba Energy and Mines.
- 1992: 3 diamond drillholes drilled by Manitoba Energy and Mines.
- 2002: 2 diamond drillholes drilled by Claymore Kaolin Ltd. and Cando Contracting Ltd.
- 2004: 11 RC drillholes drilled by Gossan Resources.
- 2006: 23 auger drillholes drilled by Gossan Resources.
- 2008: 26 sonic drillholes drilled by Gossan Resources.
- 2010: 3 auger holes and 2 sonic drillholes drilled by Gossan Resources.

The authors have reviewed the documentation (namely drill logs and associated analytical results) associated with this historical drilling and has determined that the log information and/or sampling and analytical methodology is generally lacking the quantitative proppant protocol required for silica sand mineral resource/reserve estimations as per this Technical Report. Specific issues include: 1) an inability to obtain drill core material associated with the unconsolidated Winnipeg Formation sandstone; 2) differences in unit nomenclature in comparison to those used in this Technical Report; and 3) analytical datasets that are more-or-less limited to whole rock analysis (silica) rather than sandstone particle grain size distribution analysis.

Consequently, the historical drillhole data are used only as general references within the 3-D geological model. The historical drill data are in no way used as part of the resource/reserve estimation presented in this Technical Report, and therefore, the historical drilling is not discussed in further detail in Section 10, Drilling. The historical proppant characterization analysis (as conducted by independent and accredited laboratory, PropTester of Cypress, TX) is valid and worth reporting here in comparison with current API lab testing conducted by CPS, and therefore, is discussed in Section 13, Mineral Processing and Metallurgical Testing.

10.2 Canadian Premium Sand 2014 Drill Program

In 2014, Claim Post Resources Ltd. drilled 5 drillholes at the Property. The program consisted of 3 auger drillholes and 2 sonic drillholes. The program was unsuccessful due to 1) the auger drill not being powerful enough to penetrate the Pleistocene glaciofluvial;

and 2) the sonic drill yielding poor material recovery and not being able to drill deeper than approximately 10 m. Due to the drilling problems encountered, the program was cancelled with no adequate sample collection.

10.3 Canadian Premium Sand 2018 Drill Program

In September 2018, CPS commissioned: 1) Boart Longyear of Calgary, AB as a third-party drill contractor; and 2) APEX to provide independent geological and geotechnical support related to a 93-drillhole program to test and delineate the Wanipigow Silica Sand Project. The drill program was initiated on September 27, 2018 and completed on December 13, 2018.

The 3-D geological model in the main glass sand resource area is defined by 5 out of 93 vertical drillholes. The 5 drillholes include CPS18-018, CPS18-019, CPS18-024, CPS18-025, and CPS18-071.

The drill collar descriptions and location of the 93 drillholes is presented in Table 10.1 and Figure 10.1, respectively. A total of 1,573.7 m of drilling was completed. The drillhole nomenclature includes the company name (CPS), drill year (2018) and drillhole number (e.g., CPS18-001). Table 10.1 shows that the drillhole ID's have incremental gaps where holes were not drilled or in those locations where a hole location was re-drilled with a second hole as designated with an "A" at the end of the drill ID (e.g., CPS18-004A). A total of 9 holes were re-spudded and drilled due to drill complications in the original hole.

All holes were drilled on the Property using a track-mounted LS 250 mini sonic drill. A sonic drill rig was selected to obtain the most representative sample of the underlying sandstone-based geological units. All drillholes were drilled vertically at Azimuth 0° and dip -90°. The drilling pattern was orientated in a grid pattern and spaced 400 m apart. Infill drilling was periodically conducted at a drillhole spacing of 150 to 200 m.

The drillhole collars were surveyed in the field using a Garmin 60CX handheld GPS that recorded Easting, Northing and Elevation data in UTM NAD 83 Zone 14 coordinates. The collar elevations were rectified afterwards using LiDar imagery to correctly position the vertical placement of the drill collar (Table 10.1).

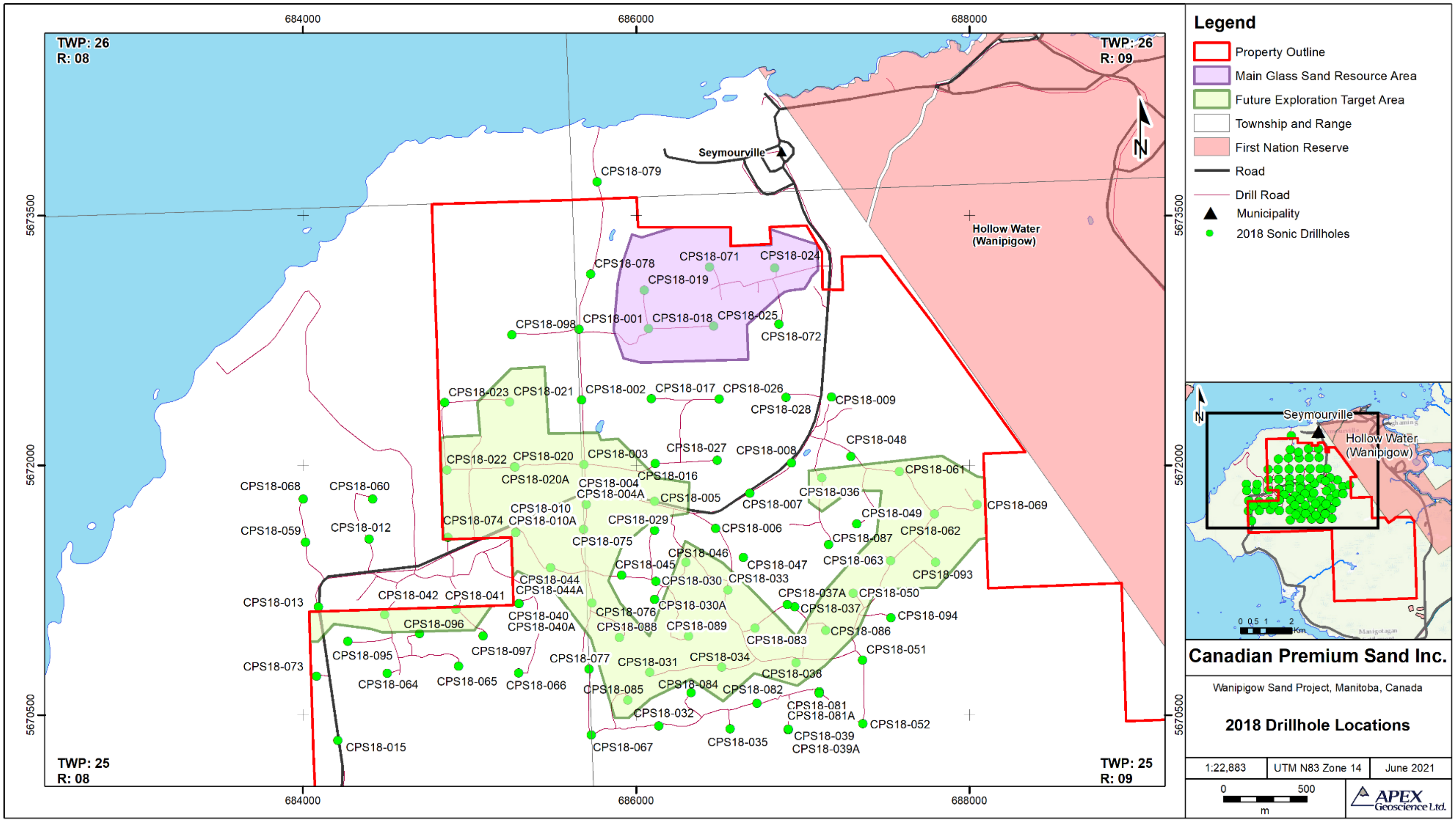
Sonic coring was conducted from the surface collar through the entire targeted Winnipeg Formation and terminated in Precambrian Basement. Core retrieval was conducted in continuous 1.5 m intervals (the length of the core tube), and the core was 10.8 cm in diameter. The sample material was vibrated out of the core barrel and collected in plastic PVC tubes that were labeled with the hole ID, depth interval and core direction. The tubes were capped and sealed with duct tape and delivered to the core shack for detailed logging and sampling. Upon arrival at the core shack three to four tubes were placed in order on the table and opened by cutting the plastic. The core was photographed logged and sampled. Sampling procedures are presented in section 11, Sample Preparation, Analyses and Security.

Table 10.1. Collar description of Canadian Premium Sand's 2018 drillhole program. The 6 drillholes within the main glass sand resource area are highlighted in grey.

Drillhole ID	Easting (m) (UTM, Z12, NAD83)	Northing (m) (UTM, Z12, NAD83)	Elevation (m)	Adjusted elevation (m) [1]	Azi-muth (°)	Dip (°)	End of hole (m)
CPS18-001	685657	5672814	248	246.80	0	-90	18.9
CPS18-002	685673	5672390	249	247.27	0	-90	14.93
CPS18-003	685687	5672003	250	251.76	0	-90	22.5
CPS18-004	685699	5671764	252	252.49	0	-90	7.5
CPS18-004A	685700	5671762	250	252.48	0	-90	23.62
CPS18-005	686714	5671022	255	250.10	0	-90	21
CPS18-006	686477	5671620	252	249.45	0	-90	21
CPS18-007	686683	5671830	247	247.23	0	-90	10.5
CPS18-008	686932	5672012	253	247.40	0	-90	16
CPS18-009	687173	5672407	250	247.08	0	-90	25.5
CPS18-010	685278	5671595	246	253.37	0	-90	9
CPS18-010A	685278	5671594	255	253.38	0	-90	27
CPS18-011			Hole not drilled				
CPS18-012	684397	5671555	251	252.58	0	-90	21
CPS18-013	684094	5671149	240	249.20	0	-90	24
CPS18-014			Hole not drilled				
CPS18-015	684209	5670346	235	229.29	0	-90	12
CPS18-016	686114	5672008	255	249.36	0	-90	19
CPS18-017	686092	5672398	241	246.48	0	-90	18
CPS18-018	686073	5672819	246	248.82	0	-90	24
CPS18-019	686048	5673049	247	246.92	0	-90	19.5
CPS18-020	685269	5671990	248	248.79	0	-90	7.5
CPS18-020A	685273	5671988	245	248.84	0	-90	21
CPS18-021	685241	5672378	247	246.80	0	-90	21
CPS18-022	684864	5671970	247	247.53	0	-90	19.5
CPS18-023	684850	5672374	238	241.30	0	-90	13.5
CPS18-024	686832	5673183	246	248.92	0	-90	21
CPS18-025	686466	5672835	245	245.68	0	-90	15
CPS18-026	686498	5672397	246	246.12	0	-90	18
CPS18-027	686486	5672028	252	246.97	0	-90	18
CPS18-028	686899	5672406	242	248.71	0	-90	21
CPS18-029	686111	5671608	257	250.17	0	-90	23
CPS18-030	686118	5671302	248	248.65	0	-90	9.45
CPS18-030A	686111	5671192	246	248.24	0	-90	18
CPS18-031	686082	5670754	253	248.23	0	-90	21
CPS18-032	686135	5670434	239	242.27	0	-90	15
CPS18-033	686550	5671248	255	248.51	0	-90	16.5
CPS18-034	686514	5670785	248	249.47	0	-90	21
CPS18-035	686564	5670415	243	240.94	0	-90	12
CPS18-036	687115	5671923	244	245.72	0	-90	18
CPS18-037	686951	5671149	250	247.03	0	-90	18
CPS18-037A	686906	5671162	244	246.79	0	-90	21
CPS18-038	686960	5670813	256	250.02	0	-90	18
CPS18-039	686912	5670409	239	238.88	0	-90	7.5
CPS18-039A	686913	5670414	239	238.94	0	-90	7.5
CPS18-040	685296	5671167	249	246.10	0	-90	20
CPS18-040A	685297	5671168	249	246.11	0	-90	19.5
CPS18-041	684918	5671132	257	246.69	0	-90	19.5
CPS18-042	684490	5671101	248	247.51	0	-90	21
CPS18-043			Hole not drilled				
CPS18-044	685487	5671383	250	249.51	0	-90	7.5
CPS18-044A	685487	5671383	250	249.51	0	-90	22.5
CPS18-045	685913	5671338	248	248.87	0	-90	17.68
CPS18-046	686299	5671415	256	248.78	0	-90	19.5
CPS18-047	686643	5671445	243	247.00	0	-90	18
CPS18-048	687288	5672051	250	243.13	0	-90	12
CPS18-049	686323	5671647	242	246.04	0	-90	18
CPS18-050	687302	5671229	243	247.77	0	-90	15
CPS18-051	687358	5670829	252	242.51	0	-90	11.5
CPS18-052	687361	5670447	239	236.99	0	-90	12
CPS18-053			Hole not drilled				
CPS18-054			Hole not drilled				
CPS18-055			Hole not drilled				
CPS18-056			Hole not drilled				
CPS18-057			Hole not drilled				
CPS18-058			Hole not drilled				
CPS18-059	684016	5671536	249	247.52	0	-90	21
CPS18-060	684419	5671796	243	248.37	0	-90	21
CPS18-061	687579	5671960	245	243.72	0	-90	10.5
CPS18-062	687791	5671707	249	251.03	0	-90	18
CPS18-063	687527	5671425	247	249.79	0	-90	16.5
CPS18-064	684505	5670749	239	237.90	0	-90	12
CPS18-065	684934	5670791	235	236.97	0	-90	16.5
CPS18-066	685295	5670750	236	238.88	0	-90	18
CPS18-067	685730	5670378	246	237.69	0	-90	18
CPS18-068	684002	5671796	247	243.78	0	-90	21
CPS18-069	688046	5671762	243	243.73			9
CPS18-070			Hole not drilled				
CPS18-071	686440	5673189	244	250.18	0	-90	21
CPS18-072	686857	5672845	246	244.98	0	-90	21
CPS18-073	684081	5670732	237	237.17	0	-90	10.5
CPS18-074	684871	5671564	247	254.00	0	-90	25.5
CPS18-075	685685	5671613	248	251.55	0	-90	21
CPS18-076	685734	5671171	251	246.00	0	-90	15
CPS18-077	685718	5670774	250	244.72	0	-90	18
CPS18-078	685727	5673147	242	236.48	0	-90	9.93
CPS18-079	685766	5673700	233	229.96	0	-90	12
CPS18-080			Hole not drilled				
CPS18-081	687098	5670639	254	243.52	0	-90	12
CPS18-081A	687099	5670628	253	243.37	0	-90	15
CPS18-082	686724	5670569	246	244.50	0	-90	13.5
CPS18-083	686714	5671021	253	248.58	0	-90	15
CPS18-084	686330	5670632	251	246.96	0	-90	19
CPS18-085	685949	5670588	248	247.81	0	-90	18
CPS18-086	687138	5671007	252	251.39	0	-90	18.7
CPS18-087	687154	5671522	251	246.49	0	-90	15.5
CPS18-088	685900	5670965	248	246.31	0	-90	18
CPS18-089	686313	5670971	250	248.27	0	-90	18
CPS18-090			Hole not drilled				
CPS18-091			Hole not drilled				
CPS18-092			Hole not drilled				
CPS18-093	687797	5671415	242	244.61	0	-90	12
CPS18-094	687528	5671082	239	242.58	0	-90	9
CPS18-095	684270	5670941	243	243.29	0	-90	18
CPS18-096	684699	5670988	244	241.58	0	-90	15
CPS18-097	685082	5670974	237	239.89	0	-90	18
CPS18-098	685254	5672782	241	238.48	0	-90	13.5

[1] Collar elevation adjusted to Light Detection and Ranging (LiDar) bare earth surface topography.

Figure 10.1. Location of 2018 drillholes drilled by Canadian Premium Sands at the Wanipigow Silica Sand Project. The main glass sand resource area (purple) and the future exploration target (green) are shown for reference.



A lithological summary of the drill logging is presented in Table 10.2 and Figures 10.2 and 10.3. Winnipeg Formation sandstone was intersected in 46 of the 93 drillholes with an additional 9 holes intersecting Pleistocene glaciofluvial material and "reworked" sandstone (i.e., potentially reworked Winnipeg Formation sand intermittent with glaciofluvial material). The thickness of the entire Winnipeg Formation ranged from 0.2 to 20.2 m. The strata are generally flat-lying, and hence, this thickness can be considered to represent the true thickness of the formation. In western Property drillholes where the thickest intersections of sandstone occurred, all three Winnipeg Formation members were present (UBI, PBS, LBI). In the eastern Property and in areas where the sandstone was less than 10 m thick, only the LBI member was present. A breakdown of the lithological logging results, as per Table 10.2, is as follows:

Lower Black Island (LBI): The LBI was intersected in 45 drillholes (or 48%) with the thickest LBI intersections were up to 15.9 m and averages 7.9 m.

Black Shale/Sandstone (BS): The BS was intersected in 14 drillholes (or 15%) with the thickest BS intersections were up to 3.5 m and averages 2.0 m when present.

Upper Black Island (UBI): The UBI was intersected in 22 drillholes (or 24%) with the thickest UBI intersections were up to 19.0 m and averages 4.6 m when present.

Pleistocene glaciofluvial (Pgf): Glaciofluvial material is more-or-less ubiquitous at the Property; only 7 drillholes, or 8%, did not intersect Quaternary material. The maximum thickness of the Pgf geo-unit is 23.6 m and averages 10.7 m when present.

There were instances where it was not possible to recover 100% of the core. This occurred mostly in the uppermost Pleistocene glaciofluvial units due to large cobbles or boulders that became lodged in the core barrel and caused sand to wash away. In cases where significant core loss occurred within the target Winnipeg Formation, the hole was re-drilled. In these instances, the drill was collared directly adjacent to the original drillhole and re-drilled to acquire Winnipeg Formation sandstone at this Property grid coordinate.

The sonic drill and re-drilling approach were successful, and overall, the drill program sampling achieved a 94% recovery rate. The exception to the re-drilling process to obtain completed cores include 1) Drillhole CPS 18-059, which lost core within the Winnipeg Formation from 12-15 m depth, and 2) Drillhole CPS 18-012, which lost core from 18-21m depth. In both cases the drill rods in these 2 holes became stuck and the sample was lost due to the force exerted by the drill when the drillers attempted to remove them.

A total of 761 samples and 15 field duplicate samples were collected during the 2018 drill program. Of the 761 samples: 1) 450 are of Pleistocene glaciofluvial; 2) 57 from Upper Black Island or UBI; 3) 17 from Black Shale or BS; and 4) 237 from Lower Black Island or LBI. The samples are discussed in Section 11, Sample Preparation, Analyses and Security.

Table 10.2. Lithological summary of core logging from CPS's 2018 drill program. Lithologies from within the main glass sand resource area are highlighted in grey.

DDH	Easting (m) UTM N83 Z14	Northing (m) UTM N83 Z14	Pliestocene glaciofluvial thickness (m)	Upper Black Island thickness (m)	Pyritic Black Shale thickness (m)	Lower Black Island thickness (m)	Precambrian thickness (m)	End of Hole (m)
CPS18-001	685657	5672814	6.0	6.0	0.0	4.9	2.1	18.9
CPS18-002	685673	5672390	14.8	0.0	0.0	0.0	0.1	14.9
CPS18-003	685687	5672003	0.0	6.0	3.0	11.9	1.6	22.5
CPS18-004	685699	5671764	0.0	6.0	1.5	0.0	0.0	7.5
CPS18-004A	685700	5671762	0.0	6.0	3.0	14.0	0.6	23.6
CPS18-005	686110	5671782	12.6	0.0	0.0	5.5	2.9	21.0
CPS18-006	686477	5671620	0.0	19.0	0.0	0.0	2.0	21.0
CPS18-007	686683	5671830	9.8	0.0	0.0	0.0	0.8	10.6
CPS18-008	686932	5672012	15.0	0.0	0.0	0.0	1.0	16.0
CPS18-009	687173	5672407	23.6	0.0	0.0	0.0	1.9	25.5
CPS18-010	685278	5671595	0.0	7.5	0.0	0.0	1.5	9.0
CPS18-010A	685278	5671594	0.0	7.5	1.9	14.6	3.0	27.0
CPS18-012	684397	5671555	1.5	6.8	2.2	10.5	0.0	21.0
CPS18-013	684094	5671149	1.8	2.7	3.0	14.5	2.0	24.0
CPS18-015	684209	5670346	10.7	0.0	0.0	0.0	1.3	12.0
CPS18-016	686114	5672008	18.0	0.0	0.0	0.0	1.0	19.0
CPS18-017	686092	5672398	17.7	0.0	0.0	0.0	0.3	18.0
CPS18-018	686073	5672819	8.6	0.0	0.0	12.4	3.0	24.0
CPS18-019	686048	5673049	6.3	0.0	0.0	11.7	1.5	19.5
CPS18-020	685269	5671990	6.0	1.5	0.0	0.0	0.0	7.5
CPS18-020A	685273	5671988	6.5	2.3	1.7	9.1	1.4	21.0
CPS18-021	685241	5672378	15.0	0.0	0.0	4.5	1.5	21.0
CPS18-022	684864	5671970	3.7	0.9	1.4	12.3	1.2	19.5
CPS18-023	684850	5672374	11.6	0.2	0.0	0.2	1.5	13.5
CPS18-024	686832	5673183	7.5	0.0	0.0	11.5	2.1	21.0
CPS18-025	686466	5672835	4.4	0.0	0.0	9.1	1.5	15.0
CPS18-026	686498	5672397	15.0	0.0	0.0	0.0	3.0	18.0
CPS18-027	686486	5672028	16.5	0.0	0.0	0.0	1.5	18.0
CPS18-028	686899	5672406	20.3	0.0	0.0	0.0	0.7	21.0
CPS18-029	686111	5671608	21.0	0.0	0.0	0.0	2.0	23.0
CPS18-030	686118	5671302	9.5	0.0	0.0	0.0	0.0	9.5
CPS18-030A	686111	5671192	16.5	0.0	0.0	0.0	1.5	18.0
CPS18-031	686082	5670754	1.5	0.9	0.6	15.4	2.5	20.9
CPS18-032	686135	5670434	14.2	0.0	0.0	0.0	0.8	15.0
CPS18-033	686550	5671248	9.0	0.0	0.0	6.5	1.0	16.5
CPS18-034	686514	5670785	12.0	0.0	0.0	6.0	3.0	21.0
CPS18-035	686564	5670415	9.5	0.0	0.0	0.0	2.5	12.0
CPS18-036	687115	5671923	6.0	0.0	0.0	9.0	3.0	18.0
CPS18-037	686951	5671149	17.6	0.0	0.0	0.0	0.4	18.0
CPS18-037A	686906	5671162	18.0	0.0	0.0	0.0	3.0	21.0
CPS18-038	686960	5670813	9.0	0.0	0.0	6.0	3.0	18.0
CPS18-039	686912	5670409	6.0	0.0	0.0	0.0	1.5	7.5
CPS18-039A	686913	5670414	6.0	0.0	0.0	0.0	1.5	7.5
CPS18-040	685296	5671167	18.0	0.0	0.0	0.0	2.0	20.0
CPS18-040A	685297	5671168	18.0	0.0	0.0	0.0	1.5	19.5
CPS18-041	684918	5671132	3.0	0.0	1.5	14.2	0.8	19.5
CPS18-042	684490	5671101	1.5	1.1	2.1	13.4	2.9	21.0
CPS18-044	685487	5671383	7.5	0.0	0.0	0.0	0.0	7.5
CPS18-044A	685487	5671383	9.0	0.0	0.0	9.6	3.9	22.5
CPS18-045	685913	5671338	17.7	0.0	0.0	0.0	0.6	18.3
CPS18-046	686299	5671415	13.0	0.0	0.0	2.0	4.5	19.5
CPS18-047	686643	5671445	15.0	0.0	0.0	0.0	3.1	18.0
CPS18-048	687288	5672051	10.0	0.4	0.0	0.0	1.6	12.0
CPS18-049	687323	5671647	16.2	0.0	0.0	0.0	1.9	18.0
CPS18-050	687302	5671229	9.0	0.0	0.0	4.5	1.5	15.0
CPS18-051	687358	5670829	10.1	0.0	0.0	0.0	1.4	11.5
CPS18-052	687361	5670447	11.0	0.0	0.0	0.0	1.0	12.0
CPS18-059	684016	5671536	0.9	3.2	3.5	12.0	1.5	21.0
CPS18-060	684419	5671796	4.5	0.0	1.5	13.5	1.5	21.0
CPS18-061	687579	5671960	5.4	0.0	0.0	4.8	0.3	10.5
CPS18-062	687791	5671707	10.3	0.0	0.0	6.8	0.9	18.0
CPS18-063	687527	5671425	9.0	0.0	0.0	5.6	1.9	16.5
CPS18-064	684505	5670749	9.0	0.0	0.0	0.0	3.0	12.0
CPS18-065	684934	5670791	13.3	0.0	0.0	0.0	3.2	16.5
CPS18-066	685295	5670750	17.1	0.0	0.0	0.0	0.9	18.0
CPS18-067	685730	5670378	16.5	0.0	0.0	0.0	1.5	18.0
CPS18-068	684002	5671796	18.0	0.0	0.0	0.0	3.0	21.0
CPS18-069	688046	5671762	5.7	0.0	0.0	1.6	1.7	9.0
CPS18-071	686440	5673189	9.0	0.0	0.0	10.2	1.9	21.0
CPS18-072	686857	5672845	2.2	0.0	0.0	15.9	3.0	21.0
CPS18-073	684081	5670732	7.5	0.0	0.0	1.5	1.5	10.5
CPS18-074	684871	5671564	0.0	8.5	1.4	14.1	1.5	25.5
CPS18-075	685685	5671613	2.1	3.5	1.9	12.3	1.2	21.0
CPS18-076	685734	5671171	12.0	0.0	0.0	1.6	1.4	15.0
CPS18-077	685718	5670774	15.0	0.0	0.0	0.0	3.0	18.0
CPS18-078	685727	5673147	1.6	1.8	0.0	3.1	3.4	9.9
CPS18-079	685766	5673700	2.8	7.9	0.0	0.0	1.3	12.0
CPS18-081	687098	5670639	12.0	0.0	0.0	0.0	0.0	12.0
CPS18-081A	687099	5670628	13.1	0.0	0.0	0.0	1.9	15.0
CPS18-082	686724	5670569	12.9	0.0	0.0	0.0	0.6	13.5
CPS18-083	686714	5671021	10.1	0.0	0.0	4.9	0.1	15.0
CPS18-084	686330	5670632	18.0	0.0	0.0	0.0	1.0	19.0
CPS18-085	685949	5670588	12.0	0.0	0.0	3.0	3.0	18.0
CPS18-086	687138	5671007	15.0	0.0	0.0	2.2	1.5	18.7
CPS18-087	687154	5671522	14.0	0.0	0.0	0.0	1.5	15.5
CPS18-088	685900	5670965	10.9	0.0	0.0	5.5	1.7	18.0
CPS18-089	686313	5670971	11.6	0.0	0.0	3.4	3.0	18.0
CPS18-093	687797	5671415	9.0	0.0	0.0	1.5	1.5	12.0
CPS18-094	687528	5671082	8.5	0.0	0.0	0.0	0.5	9.0
CPS18-095	684270	5670941	15.0	0.0	0.0	0.0	3.0	18.0
CPS18-096	684699	5670988	13.1	0.0	0.0	0.0	1.9	15.0
CPS18-097	685082	5670974	17.1	0.0	0.0	0.0	0.9	18.0
CPS18-098	685254	5672782	9.0	2.3	0.0	0.7	1.5	13.5
		Minimum	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**7.5**
		Maximum	**23.6**	**19.0**	**3.5**	**15.9**	**4.5**	**27.0**
		Average (where present)	**10.7**	**4.6**	**2.0**	**7.9**	**1.7**	**16.9**
		Total	**930.6**	**102.0**	**30.2**	**357.3**	**154.3**	**1,574.3**

Figure 10.2 Occurrence of Winnipeg Formation silica sand in the 2018 drillholes. The main glass resource area (purple) and future exploration target (green) are shown for reference.

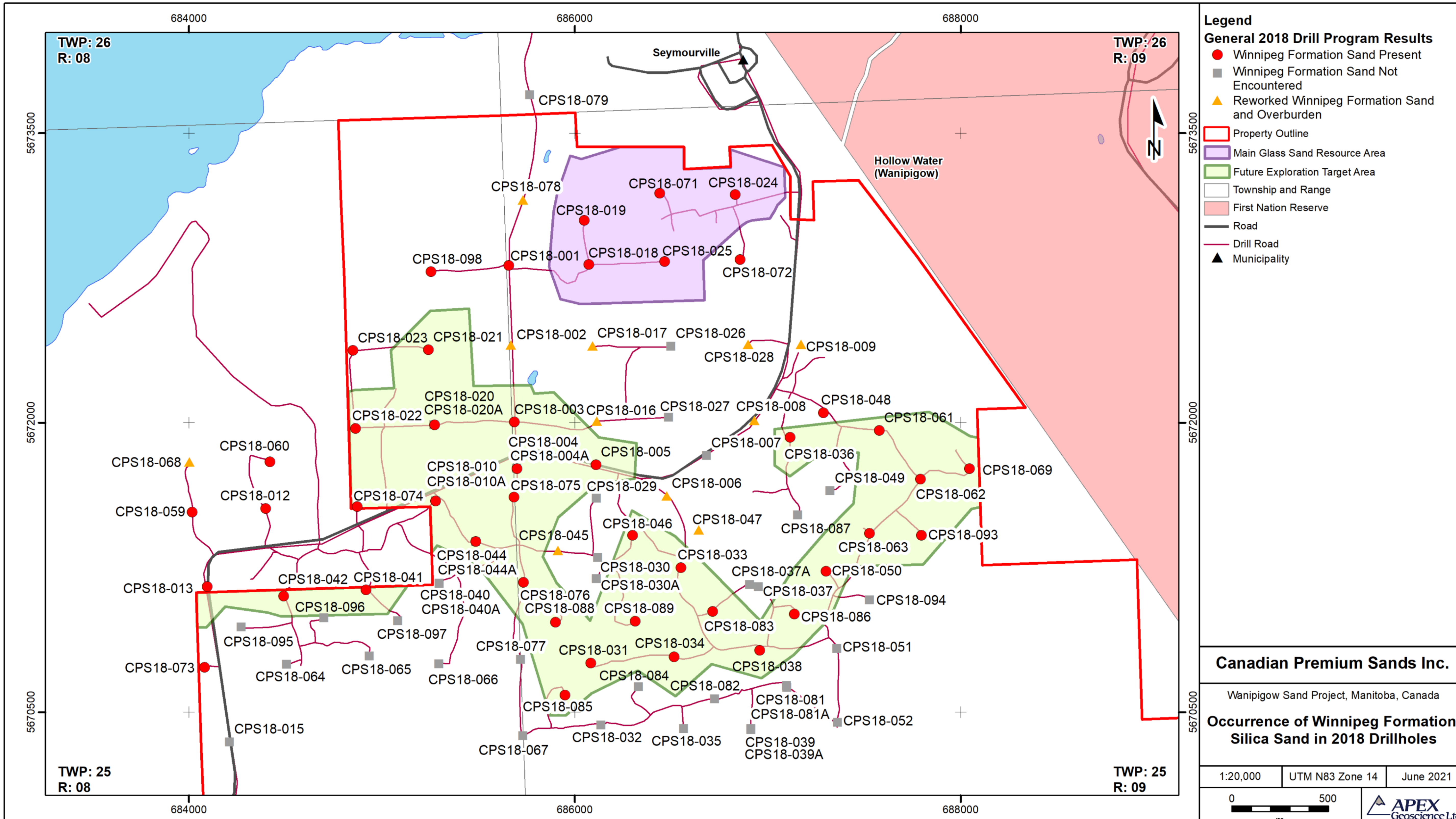
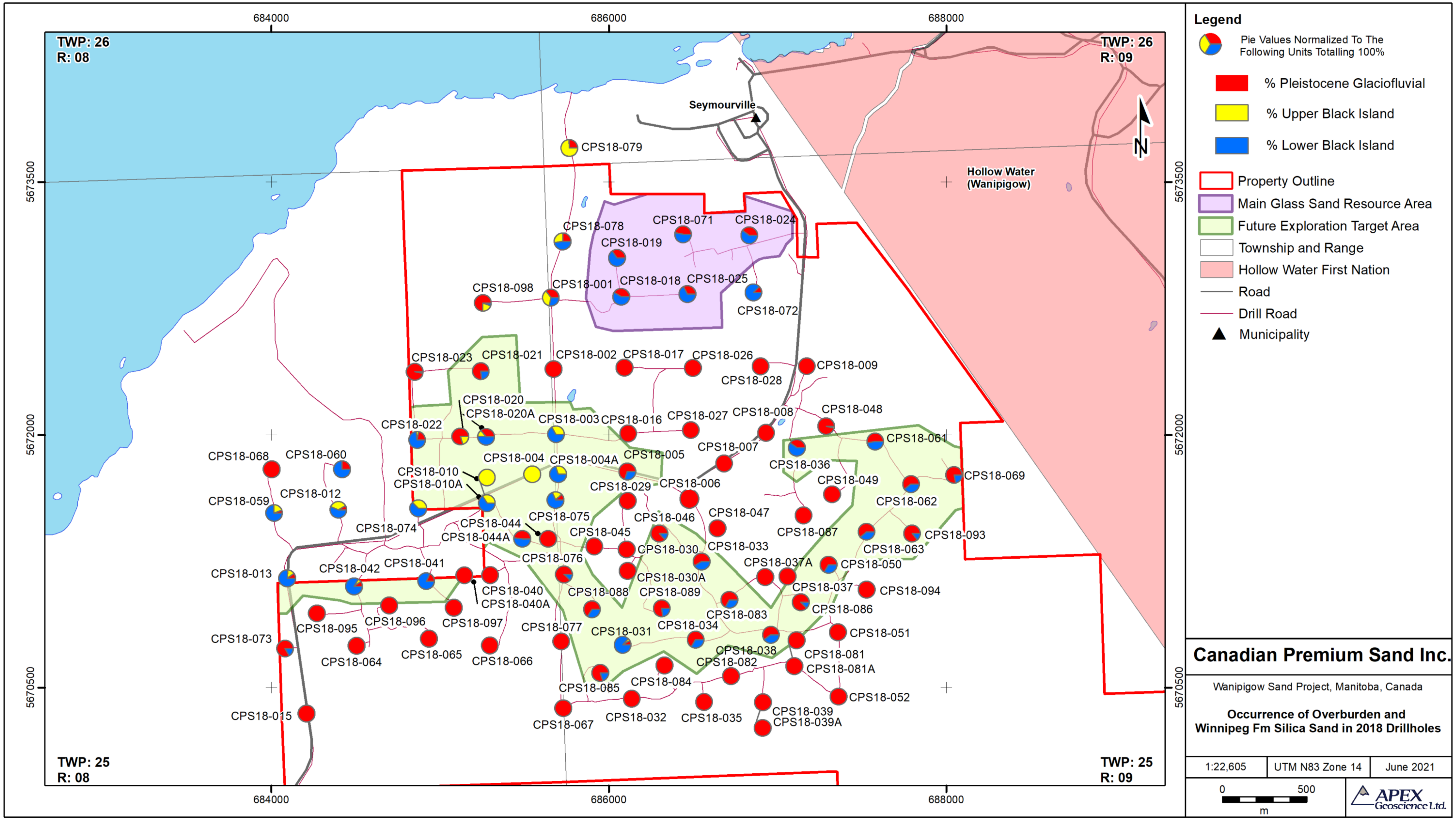


Figure 10.3 Normalized percentage of Pleistocene glaciofluvial, Upper Black Island and Lower Black Island thickness intersections in the 2018 drillholes. The main glass resource area (purple) and future exploration target (green) are shown for reference.



11 Sample Preparation, Analyses and Security

A total of 761 samples were collected and delivered to Turnkey Processing Solutions (TPS) in Ottawa, IL for analytical work. The samples included:

- 450 of Pleistocene glaciofluvial or surficial deposits consisting of glaciofluvial, glaciolacustrine and re-worked UBI material.

- 57 from Upper Black Island or UBI.

- 17 from Black Shale or BS.

- 237 from Lower Black Island or LBI (Table 11.1).

In addition, Quality Assurance – Quality Control (QA-QC) samples were collected and analyzed to test precision and accuracy of duplicate sample pairs for gradation and crush resistance (and at multiple labs: TPS, Stim-Lab and Lonquist). The objective of this section is to describe the sample collection, preparation, chain-of-custody, analytical procedures, and results of the QA-QC work.

11.1 Sample Collection, Preparation and Security

The core samples were collected from all sonic drillholes that recovered subsurface geological material, including 3 subunits of the Winnipeg Formation as allocated in this study (LBI, BS and UBI) and the overlying Pleistocene glaciofluvial (Pgf). The primary sampling objective for the Wanipigow Glass Sand Project was to collect a sample from all subsurface lithological materials that had a sand content of greater than 30%, omitting visual geological horizons that had a high modal abundance of clay, mudstone, or shale.

All core logging data including collar location, geological observations and sample information was captured on paper logs and then transferred to a digital format by APEX geologists under the supervision of Ms. Hough. The digital logs were checked for accuracy before being imported into the MicroMine drill database, which was then re-validated in MicroMine to be used in the resource.

The Pleistocene glaciofluvial and bedrock samples were collected in 1.5 m increments; occasionally, it was necessary to shorten or lengthen the channel sample length based on lithological changes (i.e., geological contacts). In instances were geological contacts influenced the sample stream, short sample increments were collected up to the contact (if necessary) at which point a new 1.5 m sample run was initiated downhole from the new lithological unit. Of the sample lengths that do not conform to the standard 1.5 m sample length standard, the minimum and maximum sample lengths were 0.40 m and 2.60 m.

Table 11.1 Summary of samples collected during the 2018 drill program. Abbreviations: Pgf – Pleistocene glaciofluvial; UBI – Upper Black Island; BS – Black Shale; and LBI – Lower Black Island. Samples collected within the main glass sand resource area are highlighted in grey (dominated by the LBI sand unit).

	Number of Samples Collected From:				
Drill Hole ID	**Pgf**	**UBI**	**BS**	**LBI**	**Total**
CPS18-001	4	4	-	3	11
CPS18-002	8	-	-	-	8
CPS18-003	-	4	2	8	14
CPS18-004	-	4	-	-	4
CPS18-004A	-	4	2	8	14
CPS18-005	9	-	-	4	13
CPS18-006	14	-	-	-	14
CPS18-007	6	-	-	-	6
CPS18-008	11	-	-	-	11
CPS18-009	15	-	-	-	15
CPS18-010	-	6	-	-	6
CPS18-010A	-	5	1	10	16
CPS18-011	Hole not drilled				
CPS18-012	1	5[1]	1	5	12
CPS18-013	1	2	2	10	15
CPS18-014	Hole not drilled				
CPS18-015	5	-	-	-	5
CPS18-016	11	-	-	-	11
CPS18-017	9	-	-	-	9
CPS18-018	6	-	-	8	14
CPS18-019	4	-	-	8	12
CPS18-020	Not Sampled				
CPS18-020A	4	2	1	6	13
CPS18-021	9	-	-	3	12
CPS18-022	1	1	1	8	11
CPS18-023	6	-	-	1[2]	7
CPS18-024	3	-	-	8	11
CPS18-025	3	-	-	6	9
CPS18-026	6	-	-	-	6
CPS18-027	4	-	-	-	4
CPS18-028	12	-	-	-	12
CPS18-029	6	-	-	-	6
CPS18-030	5	-	-	-	5
CPS18-030A	5	-	-	-	5
CPS18-031	1	1[3]		11	13
CPS18-032	8	-	-	-	8
CPS18-033	6	-	-	4	10
CPS18-034	5	-	-	4	9
CPS18-035	Not Sampled				
CPS18-036	3	-	-	6	9
CPS18-037	7	-	-	-	7
CPS18-037A	8	-	-	-	8
CPS18-038	6	-	-	4	10
CPS18-039	4	-	-	-	4
CPS18-039A	Not Sampled				
CPS18-040	8	-	-	-	8
CPS18-040A	4	-	-	-	4
CPS18-041	2	-	1	10	13
CPS18-042	-	1	1	9[4]	11
CPS18-043	Hole not drilled				
CPS18-044	2	-	-	-	2
CPS18-044A	3	-	-	6	9
CPS18-045	4	-	-	-	4
CPS18-046	8	-	-	1	9

	Number of Samples Collected From:				
Drill Hole ID	**Pgf**	**UBI**	**BS**	**LBI**	**Total**
CPS18-047	11	-	-	-	11
CPS18-048	7	-	-	1	8
CPS18-049	4	-	-	-	4
CPS18-050	2	-	-	3	5
CPS18-051	2	-	-	-	2
CPS18-052	1	-	-	-	1
CPS18-053	Hole not drilled				
CPS18-054	Hole not drilled				
CPS18-055	Hole not drilled				
CPS18-056	Hole not drilled				
CPS18-057	Hole not drilled				
CPS18-058	Hole not drilled				
CPS18-059	1	2	2	6	11
CPS18-060	3	-	1	9	13
CPS18-061	1	-	-	3	4
CPS18-062	2	-	-	4	6
CPS18-063	2	-	-	4	6
CPS18-064	4	-	-	-	4
CPS18-065	6	-	-	-	6
CPS18-066	9	-	-	-	9
CPS18-067	10	-	-	-	10
CPS18-068	11	-	-	-	11
CPS18-069	1	-	-	1	2
CPS18-070	Hole not drilled				
CPS18-071	6	-	-	7	13
CPS18-072	1	-	-	11	12
CPS18-073	1	-	-	1	2
CPS18-074		6	1	9	16
CPS18-075	1	3[5]	1	8	13
CPS18-076	8	-	-	1	9
CPS18-077	9	-	-		9
CPS18-078	1	1	-	2	4
CPS18-079	1	5	-		6
CPS18-080	Hole not drilled				
CPS18-081	10	-	-	-	10
CPS18-081A	Not Sampled				
CPS18-082	12	-	-	-	12
CPS18-083	8	-	-	4	12
CPS18-084	11	-	-		11
CPS18-085	7	-	-	2	9
CPS18-086	5	-	-	2	7
CPS18-087	7	-	-	-	7
CPS18-088	5	-	-	4	9
CPS18-089	8	-	-	2	10
CPS18-090	Hole not drilled				
CPS18-091	Hole not drilled				
CPS18-092	Hole not drilled				
CPS18-093	4	-	-	1	5
CPS18-094	1	-	-	-	1
CPS18-095	6	-	-	-	6
CPS18-096	6	-	-	-	6
CPS18-097	4	-	-	-	4
CPS18-098	4	1	-	1	6

[1] One sample is a mix of 75% UBI and 25% BS

[2] Sample is a mix of 15% OB, 10% UBI and 75%LBI

[3] Sample contains 15% BS 85% UBI

[4] One sample is a mix of 15% BS and 85% LBI

[5] Sample contains 15% BS 85% UBI

The initial core geotechnical work included 1) Removing the core sample from the sonic core barrel in its plastic 'sleeve' and lay the core out on a flat surface, 2) Cut and remove the plastic sleeve in a manner that did not degrade the integrity of the drill core, 3) Photograph the core in its 'original' state, 4) Measure the core and document any areas of lost core, 5) Log the core using the lithological units described in Section 7.2, Property Geology, and 6) Prepare the core for sampling by splitting the core along the length of the sample with a putty knife into 3 representative 'channel' samples or splits.

The 1.5 m composite channel samples for each of the core splits (n=3 samples/1.5 m core length) were placed into separate plastic bags labelled with: 1) sample ID; 2) drill hole ID; and 3) sample interval. The sample interval included the sample designation; that is, the 3 splits were designated as 1) 'TPS Lab samples', which were shipped to TPS for gradation and/or proppant characterization testing, 2) 'Archive samples' to be archived internally by CPS, and 3) 'Internal samples' to be archived internally by CPS for future check-work or QA-QC work.

Sample IDs were recorded on the outside and inside of the sample bag. Inside sample IDs were done inserting a waterproof sample ID tag into each bag. Internal and external sample IDs were constructed at the same time to ensure both tags were given identical sample IDs. All 3 sample bags (representing lab, internal and reference samples from a single sample site) were sealed with a cable tie.

Samples designated as lab samples were loaded into plywood shipping crates by the on-site geologists who maintained the chain of custody from the core sample site to camp to the laboratory (TPS). The crate was then sealed, and tamper evident security tape was affixed to four sides. The crate seals were then photographed. The shipping crate was picked up from the core shack by Gardewine Transport from Winnipeg, MB and delivered to TPS to undergo laboratory test work (gradation and proppant characterization testing). Ms. Hough managed the entire sample collection process including logging and sampling; onsite sample management; and overseeing loading the samples on a transport truck to be sent to the laboratory (TPS).

In addition to these 3 sample splits that were collected for every approximately 1.5 m of core, a 4th sample called a 'reference sample' was collected randomly approximately every 50 samples to serve as a representative field duplicate. In total 15 field duplicates were taken during the 2018 drill program. Samples designated as reference samples were placed into labelled plastic crates and stored onsite in a locked sea can at CPS's onsite storage facility.

In 2021, 18 composite samples were re-sampled from archived core samples based on physical and textural variations of the LBI sand. A representative portion of each sample was collected by 1) shaking the archive sample bags, 2) shoving a 50 mm PVC pipe (outside diameter) into the bag and right to the bottom of the bag, 3) covering the PVC pipe end and removing from the archive bag, and 4) adding the representative sample to the new composite sample.

In 2021, CPS collected LBI sand material from drillholes CPS18-018, CPS18-019, CPS18-024, CPS18-025, and CPS18-071, which is defined as the resource area being estimated in this Technical Report (Table 11.2). A total of 30 samples were collected representing a 44.55 m interval of LBI sand. The samples were collected using the same methodology described in the paragraph above. The samples were shipped directly from the Wanipigow Property site to CM.Project.Ing GmbH and Industrial Minerals International in Germany for beneficiation test work (see Section 13.8).

Table 11.2 Archived samples collected for the CM.Project.Ing GmbH and Industrial Minerals International beneficiation test study.

Composite Sample for CM.Project.Ing GmbH and Industrial Minerals International Beneficiation Test Study					Archived sample collection			
Composit Sample ID	Hole ID	From (m)	To (m)	General lithology	Individual Sample ID	From (m)	To (m)	Length (m)
WNG21-001	CPS18-018	8.6	21	White sand with possible 15% brown color due to clays	576703	8.6	10.5	1.9
					576704	10.5	12	1.5
					576705	12	13.5	1.5
					576706	13.5	15	1.5
					576707	15	16.5	1.5
					576708	16.5	18	1.5
					576709	18	19.5	1.5
					576710	19.5	21	1.5
WNG21-002	CPS18-019	6	9	Stained sand, includes 10% brown sand	576679	6	7.5	1.5
					576680	7.5	9	1.5
WNG21-003	CPS18-019	9	18	White sand with upto 25% brown material intermixed (clay contamination)	576681	9	10.5	1.5
					576682	10.5	12	1.5
					576683	12	13.5	1.5
					576684	13.5	15	1.5
					576685	15	16.5	1.5
					576686	16.5	18	1.5
WNG21-004	CPS18-024	7.5	12	Stained sand	725193	7.5	9	1.5
					725194	9	10.5	1.5
					725195	10.5	12	1.5
WNG21-005	CPS18-024	12	18.95	White sand	725196	12	13.5	1.5
					725197	13.5	15	1.5
					725198	15	16.5	1.5
					725199	16.5	18	1.5
					725200	18	18.95	0.95
WNG21-006	CPS18-025	4.4	13.5	White sand with possible 2-3% gray color contamination (clay)	576690/ 576691	4.4	6	1.6
					576692	6	7.5	1.5
					576693	7.5	9	1.5
					576694	9	10.5	1.5
					576695	10.5	12	1.5
					576696	12	13.5	1.5
WNG21-007	CPS18-071	9	12	Stained sand with upto 5% brown sand	725171	9	10.5	1.5
					725172	10.5	12	1.5
WNG21-008	CPS18-071	12	19.15	White sand with possible 5% brown staining due to clay	725173	12	13.5	1.5
					725174	13.5	15	1.5
					725175	15	16.5	1.5
					725176	16.5	18	1.5
					725177	18	19.15	1.15
							Number of archived samples collected	**30**
							Total sample interval (m) of archived samples collected	**44.55**

Sample intervals

11.2 Analytical Procedures

11.2.1 Gradation Analysis

At TPS, the 761 samples were washed and dried. A subset of the sample was analyzed using a Camsizer P4 Particle analyzer. The Camsizer uses dynamic image analysis to conform to ISO 13322-2 and characterize dry free-flowing bulk materials. The Camsizer P4 simultaneously measures particle size and shape at high resolution. The resulting TPS Camsizer sieve results are reported in mesh size fractions: 16 (1.180 mm), 20 (850 µm), 25 (710 µm), 30 (600 µm), 35 (500 µm), 40 (425 µm), 45 (355 µm), 50 (300 µm), 60 (250 µm), 67.5 (221 µm), 70 (212 µm), 80 (180 µm), 100 (150 µm), 120 (125 µm), 137.5 (108 µm), 140 (106 µm), 200 (74 µm) and Pan (< 74 µm).

In addition to the 761 lab samples, a total of 33 field duplicate samples were analyzed at TPS using 'anonymous' sample IDs. The analyses were conducted using the identical analytical procedure as the 761-sample stream. The test work was conducted to test the precision of the gradation work conducted at TPS on duplicate, but anonymous, samples.

Lastly, 14 duplicate samples were sent to Stim-Lab for both gradation analysis and proppant characterization test work. The objective of this test work is QA-QC on proppant characterization between laboratories (see Sections 11.2.2, 11.4.2 and 11.4.3).

11.2.2 Proppant Characterization

TPS conducted Krumbein shape factor (roundness and sphericity) measurements and crush resistance tests on 40/70 and 70/140 fractions. In total, 665 Krumbein shape factor and crush resistance tests were conducted on: 1) single 1.5 m samples (i.e., the lab samples); and/or 2) on composite groupings of samples. Crush test work conducted to date at TPS includes 1) 263 tests were performed on LBI sand, 2) 2 on the BS unit, 3) 8 on UBI sand, 4) 209 on Pgf, or Pleistocene glaciofluvial, and 5) 173 on multi-unit composite samples.

In addition to crush test analysis, the 14 duplicate samples were sent to Stim-Lab and a set of 16 samples were sent to Lonquist for proppant characterization test work. The results of the TPS, Stim-Lab and Lonquist proppant test work is presented in Section 13, Mineral Processing and Metallurgy. The analytical procedure is described in the following text. Where applicable, QA-QC analytical results are discussed in Section 11.4.

Sphericity is the measure of how spherical a given proppant particle is. Roundness is the measure of the lack of sharp edges or angularity.

Crush Resistance is a measurement of the strength of a mass of screened, fines-free dry proppant to force applied over a fixed cross-sectional area, providing an equivalent stress to the proppant under test. The mass of proppant introduced to the crush cylinder is a function of its bulk density and the specified loading of 4.0 pounds per cubic foot. The load is applied in a controlled rate and held at the final test stress level for 2.0 minutes.

The mass is re-screened to determine the number of fines generated by the applied stress, and the highest stress attained without producing more than 10.0% fines is the "K Number". As a QA-QC measure on the crush resistance test work, additional proppant characterization test work was conducted at Stim-Lab. This work included further testing on two separate split sets of 14 samples as described below:

1. A crush resistance laboratory check (n=14 sample fraction splits) in which Stim-Lab analyzed pre-washed 40/70 and 50/140 crush tests that were originally separated and analyzed for crush strength at TPS.

2. An identical set (i.e., same sample ID's) of 14 bulk samples for independent crush resistance test work at Stim-Lab. I.e., this sample set was not pre-washed and/or sieve separated at TPS. The crush tests were also conducted on the 40/70 and 50/140 fractions.

Acid Solubility is a mass loss (gravimetric) test method that determines the degree of solubility of natural sand in a 12:3 blend of Hydrochloric and Hydrofluoric acids. The technique measures the resistance of potential proppant contaminants to acid attack, which may negatively affect proppant performance.

Turbidity is a method using transmittance or reflectance of light to measure the number of fines that are <200 mesh in diameter, including clay, silt, proppant fines, etc. A fixed mass of proppant is added to a fixed mass of deionized water, agitated, and the water is drawn off and measured in a turbidity meter.

11.2.3 Bulk Density Measurements

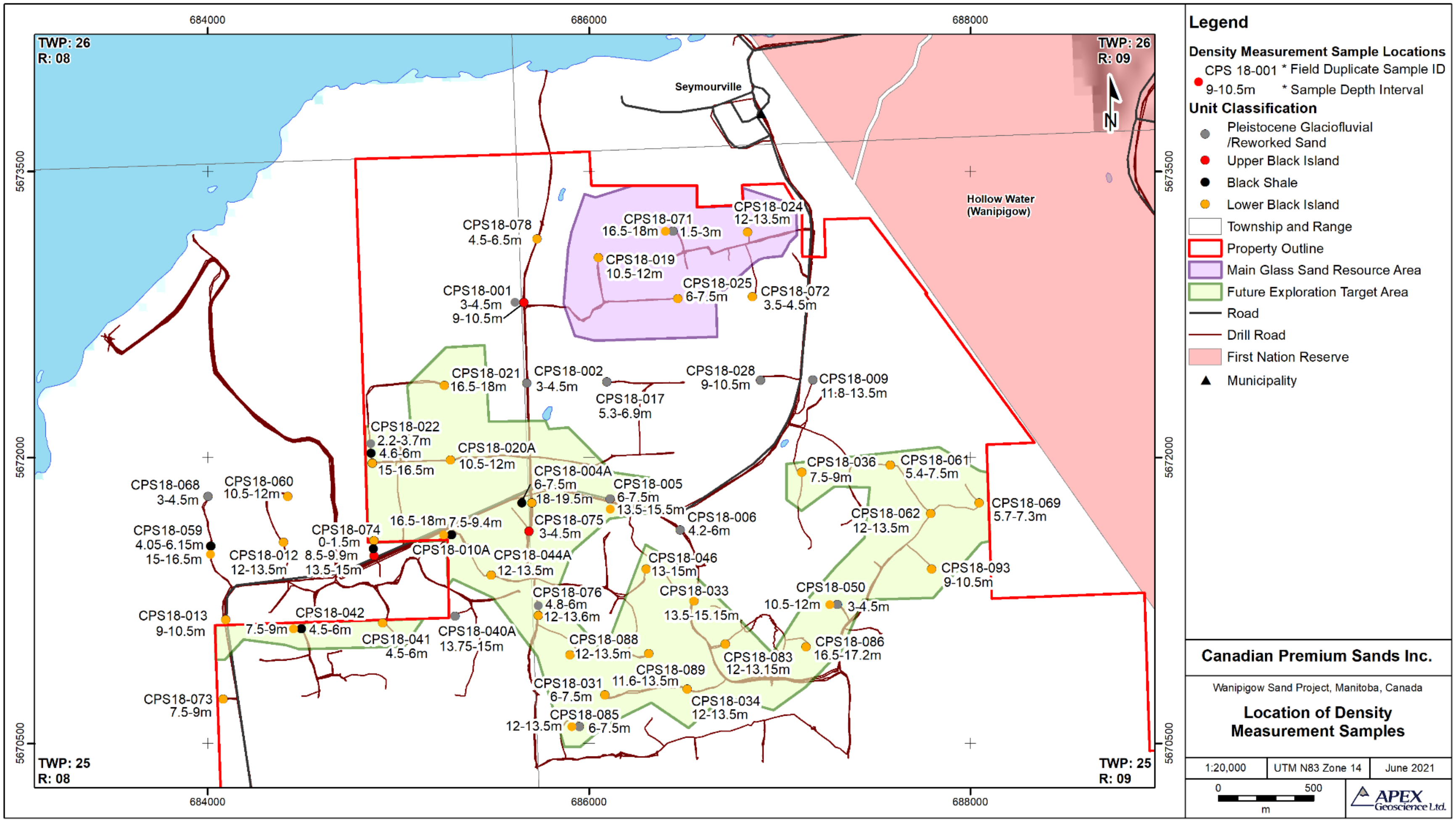
A subset sample split of the 58 samples were collected and sent to Stim-Lab in Duncan, Oklahoma for ISO 13503-2 standard loose-sand bulk density analysis. Loose bulk density is the unit mass of an untapped or unsettled proppant that will occupy a specific known volume (e.g., how many grams per cubic centimeter). Bulk Density includes both the mass of the proppant and the volume of air occupying the interstitial spaces between proppant particles.

The bulk density sample drillhole locations is presented in Figure 11.1. The 58 samples selected for density measurements included: 13 samples of Pleistocene glaciofluvial and/or reworked UBI sand; 3 samples of UBI; 6 samples of BS; and 36 samples of LBI.

11.2.4 Long-Term Conductivity and Permeability

A subset 40/70 and 50/140 fraction sample split of LBI sand was analyzed at Stim-Lab for long-term conductivity and permeability. The measurements were conducted in compliance with APIRP19D, which is the guideline procedure used for testing the long-term conductivity of proppant.

Figure 11.1 Location of drillholes in which selected samples were collected for loose bulk density measurements.



The conductivity and permeability data were acquired using the following specifications:

1. Conductivity was measured in 2000, 4000, 6000, 8000, and 10,000 psi closure stress at 150 °F.

2. The test fluid for the conductivity testing was 2% KCl. Flow rates are controlled with a Bronkhorst Liqui-Flow® mass flow meter/controller. The test flow rates were cycled at ~2 mL/min, ~3 mL/min, ~3 mL/min, ~3 mL/min, and ~2 mL/min or to maintain a ΔP of at least a minimum of 0.002 psi. Each rate was maintained for 3 minutes. After the 15-minute cycle, the cell is switched to the next cell in the test series and the cycle repeated. During the non-monitoring time, the other cells are held at a constant flow of ~2 mL/min. Once data is collected on all cells, the cycle returns to the first cell in the test series and the above protocol continued. This schedule is maintained throughout the 50 hours of data collection at each stress.

3. Pack widths are measured every 5 hours and recorded as described in the 'Width Measurement' section.

4. The transducer zero is checked every 5 hours and if necessary is re-zeroed with a HART 475 Field Communicator.

5. The raw data is monitored in real time as one point every 10 seconds and includes flow rate (mL/min), ΔP (psi), and temperature (°F). These are used with the Conductivity Equation ("Data Processing to Arrive at Conductivity and Permeability Values") to arrive at the calculated conductivity value. To correct for the temperature effect on viscosity of 2% KCl, the Laliberté (2007) equation was utilized.

11.3 Geochemical Analyses

A flowchart describing the preparation and analysis of CPS 2021 geochemical program is presented in Figure 11.1. It shows that the composite sand samples (n=41 samples) were homogenized, sieved to produce an analytical fraction of the fraction (20-140 mesh), and analyzed by: 1) whole rock SiO_2 by lithium borate fusion by ICP-OES, and 2) trace elements by ICP-MS.

The whole rock SiO_2 by lithium borate fusion by ICP-OES utilized the following procedure:

- The sand samples were dried in their original plastic bags, and then jaw crushed. A subsample was split out using a riffler. The subsample was pulverized using a grinding mill (puck and ring or agate, depending on the sample). The grinding mills were, at minimum, cleaned between samples, silica sand cleaning was employed in between groups. The pulp was transferred to a barcode labeled plastic snap top vial.

- An aliquot of sample was combined with flux and fused in the Claisse Ox Automatic Fusion Machine. The Ox places the sample and flux in the oven, mixes the sample, then pours the molten material into dilute HNO3. The solution was then topped up and analyzed by ICP-OES.

- Instruments were calibrated using certified commercial solutions. The instruments used were Optima 5300DV or Optima 8300DV.

The multi-element determination of sandstone samples by ICP-MS utilized the following procedure:

- The sand samples were dried in their original plastic bags overnight, and then jaw crushed. A subsample was split out using a sample riffler. The subsample was pulverized using an agate grinding mill. The pulp was transferred to a barcode labeled plastic snap top vial.
- An aliquot of pulp was digested to dryness in a hot block digesting system using a mixture of ultra-pure concentrated acids HF:HNO3:HClO4. The residue was dissolved and made to volume using deionized water prior to analysis.

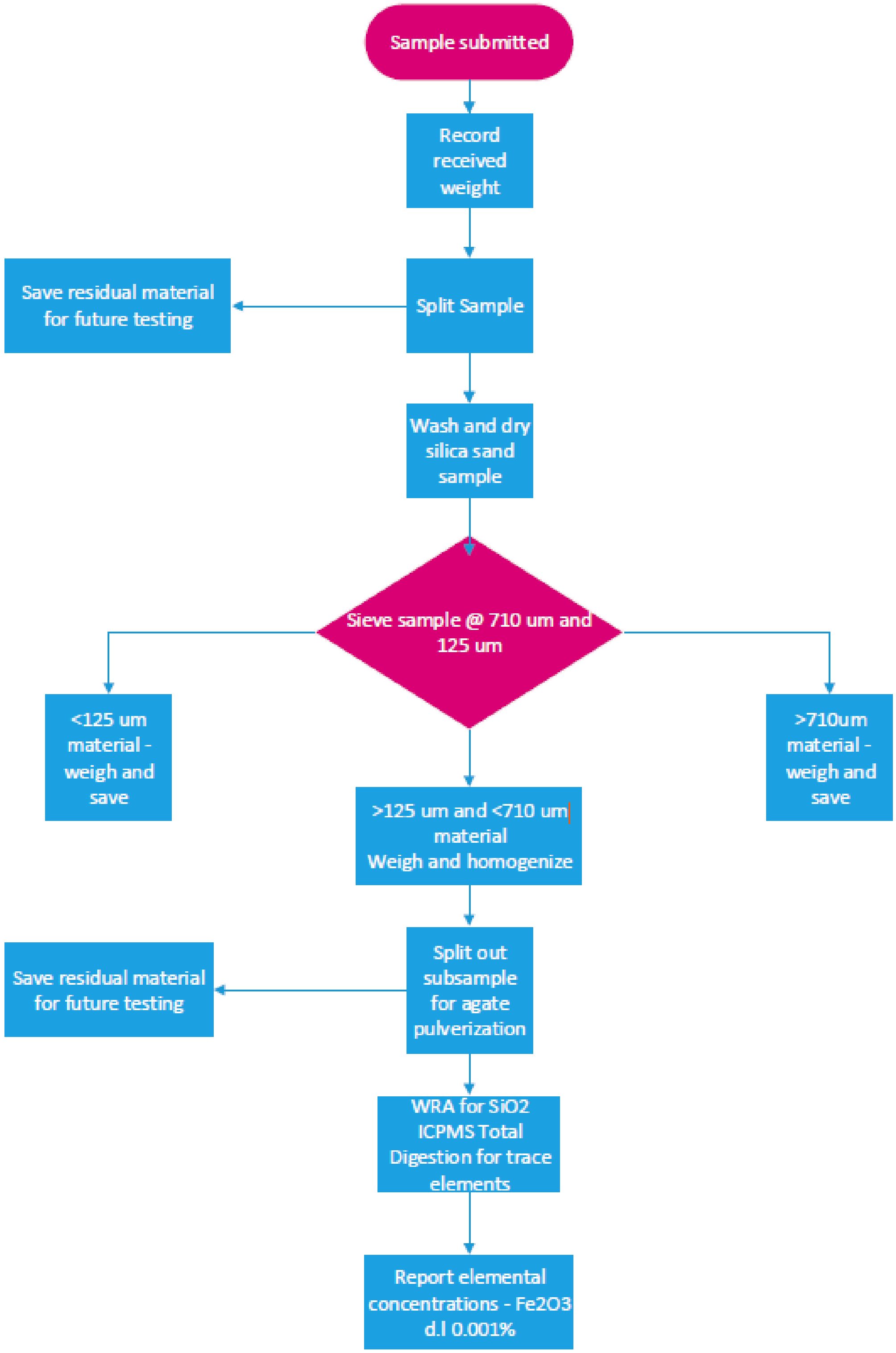
- The ICP-MS1 total digestion package detection limits are listed on the next page. Elements highlighted in blue are by ICP-OES, while the remaining elements are by ICP-MS. Instruments were calibrated using certified commercial solutions. The instrument used was Optima 5300DV and Perkin Elmer NEXION 2000.

11.4 QEMSCAN Analyses

The QEMSCAN at the SRC Advanced Microanalysis Centre is built on an FEI Quanta 650 scanning electron microscope fitted with a field emission gun (10nm resolution) and dual Bruker XFlash 5030 energy dispersive spectrometers with a maximum throughput of 1.5Mcps. Operating conditions were set to 25Kv and 10nA beam current, measured in a Faraday cup at the sample surface. Data were collected in Particle Mineral Analysis mode with a point spacing of 4.76 µm. Raw X-ray energy spectra were compared to a mineral composition database customized for this project.

The modal mineralogy is calculated from the combined analysis of the back-scattered electron images and the mineral identification is from semi-quantitative point chemical analyses (EDS). The volumetric abundance of the minerals is converted to mass percent from density data for typical mineral compositions.

Figure 11.1 Flowchart describing the sample preparation and geochemical analytical procedure employed to analyze 18 LBI sand samples at the SRC.



11.5 Laboratory Accreditations

Turnkey Processing Solutions is a third-party independent lab that provides mineral processing solutions for the mining, sand, aggregate, and bulk material handling industries. The analytical work is reviewed and approved by a Professional Engineer and the analytical methods carried out by the laboratory is standard and routine in the field of silica sand and proppant characterization test work and are pursuant to ISO 13503-2.

Stim-Lab is a third-party independent lab that has certified Professional Engineers and cite recognized ASTM specification for laboratory preparation, analysis, and reporting (i.e., ISO 17025:2005 in North America offering ISO 13503-2, ISO 13503-5, API RP19C and API RP56 tests for sand resin coated sand and engineered ceramic proppants).

Lonquist Frac Sand Services is a third-party independent lab with offices throughout North America that have been providing testing services to the sand, aggregate, and evaporite mining industries since 2011 and frac sand testing services meet API and ISO standards.

Glass sand geochemical and/or beneficiation studies were conducted by laboratories with experience in mineral sands metallurgical test work and include 1) the Institut für Glas- und Rohstofftechnologie (IGR) in Göttingen, Germany, 2) IHC Robbins (IHC) in Yatala, Australia, 3) Saskatchewan Research Council (SRC) in Saskatoon, SK, and 4) cm.project.ing GmbH (CMP) in Jülich, Germany and Industrial Mineral international (I.M.I.) in Aachen, Germany. IGR is accredited to DIN EN ISO / IEC 17025: 2018. IHC is accredited to ISO 45001 and ISO 9001 Quality Management System. The SRC is accredited in accordance with ISO/IEC 17025:2017. CMP is an independent, international holistic glass plant engineering company.

11.6 Bulk Density Results

The individual loose bulk density measurements are presented in Table 11.3 and a summary of results with the loose bulk sand being converted to a compacted bulk sand is presented in Table11.4.

The average 'loose' sand bulk densities range from 1.395 g/cm^3 to 1.470 g/cm^3 for the Black Shale and Upper Black Island geo-units, respectively. The Black Shale geo-unit has a distinct bulk density in comparison to the Pgf, LBI and UBI geo-units, which have similar loose bulk densities when rounded off to the nearest hundredths decimal place (e.g., 1.46, 1.47 and 1.44 g/cm^3; Table 11.4).

This supports the contention that the Pgf contains some component of UBI sand; particularly when the lithological descriptions of the Pgf and their corresponding loose bulk densities are reviewed in Table 11.3. The Pgf sand with a potential component of reworked UBI sand has significantly higher bulk densities than the PGF with silty-sand and clay components.

Table 11.3 Summary of individual loose bulk density results. The grey highlights represent LBI sand unit density measurements within the main glass sand resource area.

Original Sample ID	Hole ID	From (m)	To (m)	Lithology	Bulk loose density (g/cm^3)	Bulk loose density (lb/ft^3)	Lithological description
573183	CPS18-004A	6.00	7.50	BS	1.270	79.20	Black Shale
573198	CPS18-010A	7.50	9.40	BS	1.380	86.10	Black Shale+Sand
576653	CPS18-022	4.60	6.00	BS	1.440	89.90	Black Shale
573484	CPS18-042	4.50	6.00	BS+LBI	1.440	89.90	Black Shale+Sand
725156	CPS18-059	4.05	6.15	BS	1.430	89.20	Black Shale
556605	CPS18-074	8.50	9.90	BS	1.410	88.00	Black Shale+Sand
573191	CPS18-004A	18.00	19.50	LBI	1.510	94.20	LBI- Sand
576519	CPS18-005	13.50	15.50	LBI	1.400	87.40	LBI- Sand
573205	CPS18-010A	16.50	18.00	LBI	1.350	84.20	LBI- Sand
725138	CPS18-012	12.00	13.50	LBI	1.430	89.20	LBI- Sand
725102	CPS18-013	9.00	10.50	LBI	1.390	86.70	LBI- Sand
576682	CPS18-019	10.50	12.00	LBI	1.320	82.40	LBI- Sand
576669	CPS18-020A	10.50	12.00	LBI	1.460	91.10	LBI- Sand
576641	CPS18-021	16.50	18.00	LBI	1.520	94.80	LBI- Sand
576660	CPS18-022	15.00	16.50	LBI	1.380	86.10	LBI- Sand
725196	CPS18-024	12.00	13.50	LBI	1.410	88.00	LBI- Sand
576692	CPS18-025	6.00	7.50	LBI	1.330	83.00	LBI- Sand
573291	CPS18-031	6.00	7.50	LBI	1.360	84.90	LBI- Sand
573360	CPS18-033	13.50	15.15	LBI	1.470	91.70	LBI- Sand
573305	CPS18-034	12.00	13.50	LBI	1.450	90.50	LBI- Sand
576770	CPS18-036	7.50	9.00	LBI	1.410	88.00	LBI- Sand
576588	CPS18-041	4.50	6.00	LBI	1.420	88.60	LBI- Sand
573486	CPS18-042	7.50	9.00	LBI	1.460	91.10	LBI- Sand
573436	CPS18-044A	12.00	13.50	LBI	1.390	86.70	LBI- Sand
573448	CPS18-046	13.00	15.00	LBI	1.390	86.70	LBI- Sand
573257	CPS18-050	10.50	12.00	LBI	1.530	95.50	LBI- Sand
725162	CPS18-059	15.00	16.50	LBI	1.380	86.10	LBI- Sand
725124	CPS18-060	10.50	12.00	LBI	1.460	91.10	LBI- Sand
573268	CPS18-061	5.40	7.50	LBI	1.470	91.70	LBI- Sand
573262	CPS18-062	12.00	13.50	LBI	1.510	94.20	LBI- Sand
573266	CPS18-069	5.70	7.30	LBI	1.460	91.10	LBI- Sand
725176	CPS18-071	16.50	18.00	LBI	1.480	92.40	LBI- Sand
725180	CPS18-072	3.50	4.50	LBI	1.450	90.50	LBI- Sand
573495	CPS18-073	7.50	9.00	LBI	1.480	92.40	LBI- Sand
556608	CPS18-074	13.50	15.00	LBI	1.460	91.10	LBI- Sand
573218	CPS18-076	12.00	13.60	LBI	1.460	91.10	LBI- Sand
573140	CPS18-078	4.50	6.50	LBI	1.500	93.60	LBI- Sand
573348	CPS18-083	12.00	13.15	LBI	1.510	94.20	LBI- Sand
576555	CPS18-085	12.00	13.50	LBI	1.490	93.00	LBI- Sand
573465	CPS18-088	12.00	13.50	LBI	1.520	94.80	LBI- Sand
573457	CPS18-089	11.60	13.50	LBI	1.440	89.90	LBI- Sand
576764	CPS18-093	9.00	10.50	LBI	1.550	96.70	LBI- Sand
573120	CPS18-002	3.00	4.50	Pgf	1.530	95.50	Pgf Reworked Sand
576513	CPS18-005	6.00	7.50	Pgf	1.420	88.60	Pgf Reworked Sand
573375	CPS18-006	4.20	6.00	Pgf	1.490	93.00	Pgf Reworked Sand
573411	CPS18-009	11.80	13.50	Pgf	1.430	89.20	Pgf Reworked Sand
576726	CPS18-017	5.30	6.90	Pgf	1.550	96.70	Pgf Sand/gravel
576651	CPS18-022	2.20	3.70	Pgf	1.540	96.10	Pgf-Clay
576741	CPS18-028	9.00	10.50	Pgf	1.490	93.00	Pgf Reworked Sand
573469	CPS18-040A	13.75	15.00	Pgf	1.590	99.20	Pgf Sand
573254	CPS18-050	3.00	4.50	Pgf	1.500	93.60	Pgf Clay+Gravel
725144	CPS18-068	3.00	4.50	Pgf	1.390	86.70	Pgf Reworked Sand
725166	CPS18-071	1.50	3.00	Pgf	1.440	89.90	Pgf Silty Sand
573213	CPS18-076	4.80	6.00	Pgf	1.230	76.80	Pgf Sand+Clay
576551	CPS18-085	6.00	7.50	Pgf	1.370	85.50	Pgf Sand+Clay
573132	CPS18-001	9.00	10.50	UBI	1.510	94.20	UBI-Sand
556599	CPS18-074	0.00	1.50	UBI	1.500	93.60	UBI-Sand
573168	CPS18-075	3.00	4.50	UBI	1.400	87.40	UBI-Sand

Table 11.4 Summary of loose and compacted bulk densities. The density of the LBI sand used in the resource estimation is highlighted in grey.

Lithology	Count	Average loose bulk density (g/cm^3)	Average compacted bulk density (g/cm^3) [1]	Average loose bulk density (lb/ft^3)	Average compacted bulk density (lb/ft^3) [2]
Pleistocene glaciofluvial	13	1.459	1.897	91.097	118.426
Black Shale	6	1.395	1.814	87.087	113.213
Upper Black Island	3	1.470	1.911	91.769	119.300
Lower Black Island	36	1.444	1.878	90.174	117.226
Main glass sand resource area	5	1.398	1.817	87.260	113.438

[1] Utilizing a 30% bulking factor (Mr. R. Farmer, pers. comm., 2019).
[2] 1 g/cm3 = 62.428 lb/ft3.

Obtaining an *in-situ* bulk density of the Winnipeg Formation was not possible. Alternatively, the authors convert the loose bulk density to a 'compacted', or *in-situ*, bulk density by utilizing a 30% bulk factor. The 30% bulking factor is appropriate when converting loose clean sand to an in-place sand and/or sandstone bedrock (with gravel and/or clay components) (e.g., Church, 1981; Hartman, 1992; Wilkinson, 1997; Ofoegbu et al., 2008; The Engineering ToolBox, 2009; Mr. R. Farmer, pers. comm., 2019). Utilizing the loose densities with a 30% bulking factor provides *in-situ* bulk densities as follows:

1. Pleistocene glaciofluvial and/or reworked UBI sand average *in-situ* bulk density of 1.897 g/cm^3 (n=13 density measurements);

2. Upper Black Island sand average *in-situ* bulk density of 1.911 g/cm^3 (n=3 density measurements); and

3. Lower Black Island sand average *in-situ* bulk density of 1.878 g/cm^3 (n=36 density measurements; Table 11.3).

The density of North America silica sand ranges from 1.6 to 2.6 g/cm^3 with average bulk densities of 1.84 g/cm^3 (Veatch et al., 2017) to 1.91 g/cm^3 (Mr. R. Farmer, pers. comm., 2019). The *in-situ* bulk density values determined in the current study is in accordance with other authors findings and therefore acceptable for use in the resource evaluation work presented in this Technical Report.

11.7 Quality Assurance – Quality Control

11.7.1 Field Duplicate Gradation QA-QC (Particle Grain Size Distribution Test)

The field duplicate test work was conducted to test the gradation analytical work conducted at TPS (n=33 field duplicates). The original lab samples were analyzed at TPS. Ms. Hough then collected an additional 33 field duplicates,15 of which included material from the reference sample splits plus an additional 18 samples from the internal samples (or CPS archive material). The duplicate samples were collected on January 22, 2019 by Ms. Hough, placed in a plastic bag labelled with a unique sample ID (i.e., other than the original sample ID) and shipped via FEDEX to TPS for gradation testing.

The field duplicate samples included: 11 Pleistocene glaciofluvial and reworked sand samples; 1 UBI sample; and 21 samples of LBI. An example of the original gradation analyses versus the field duplicate gradation analyses is presented in Figures 11.2. The comparison between the original and duplicate gradation analyses shows good to excellent correlation. Two of the 33 QA-QC gradation comparisons yield poor correlation results: CPS18-017 versus F-Dup-029 (Figure 11.2.AC), which may be attributed to Pleistocene glaciofluvial unpredictability and CPS18-063 versus F-Dup-033 (Figure 11.2.AG), which is an excellent sample of LBI and therefore the poor correlation may be attributed to analytical or data entry errors. Nevertheless, this QA-QC test enables the authors to have a high level of confidence in the gradation data.

11.7.2 Multi-Lab Crush Strength QA-QC

A crush resistance laboratory check (n=12 samples) compared pre-washed 40/70 and 50/140 crush test fractions that were prepared at TPS – with a sample fraction split then crushed again at Stim-Lab. The results are presented in Table 11.5. Unfortunately, the 40/70 and 50/140 pre-prepared sample fractions had a limited amount of material such that incrementally higher crush tests at Stim-Lab were not possible. However, the results do show that there is general agreement in the crush test values. In fact, several crush test measurements are incredibly close and demonstrate that the inter-lab crush test results are similar and hence there is no apparent concern with the crush test data generated by either lab.

11.7.3 Independent Laboratory Check

In addition to the 'multi-lab crush strength QA-QC', the authors selected an identical set of bulk sample material for independent proppant characterization work at Stim-Lab. That is, the bulk sample material was collected on January 22, 2019, by R. Hough and was completed independent of the work conducted at TPS. Stim-Lab was then instructed to conduct proppant characterization test work on the exact same 40/70 and 50/140 splits as the material analyzed at TPS.

The details of the proppant test work are presented in Section 13, Mineral Processing and Metallurgical Testing, but a comparison of the compatible analysis conducted by TPS and Stim-Lab is discussed as part of QA-QC work. The results are presented in Table 11.6 and show good to excellent correlation. Despite TPS having fewer crush tests per sample because of sample amounts, the crush tests performed at TPS and Stim-Lab still correlate. Overall, this QA-QC test gives a high degree of confidence in the crush test work conducted by the authors.

Figure 11.2 Comparison of original gradation analyses versus field duplicate gradation analyses. Presented as size fractions.

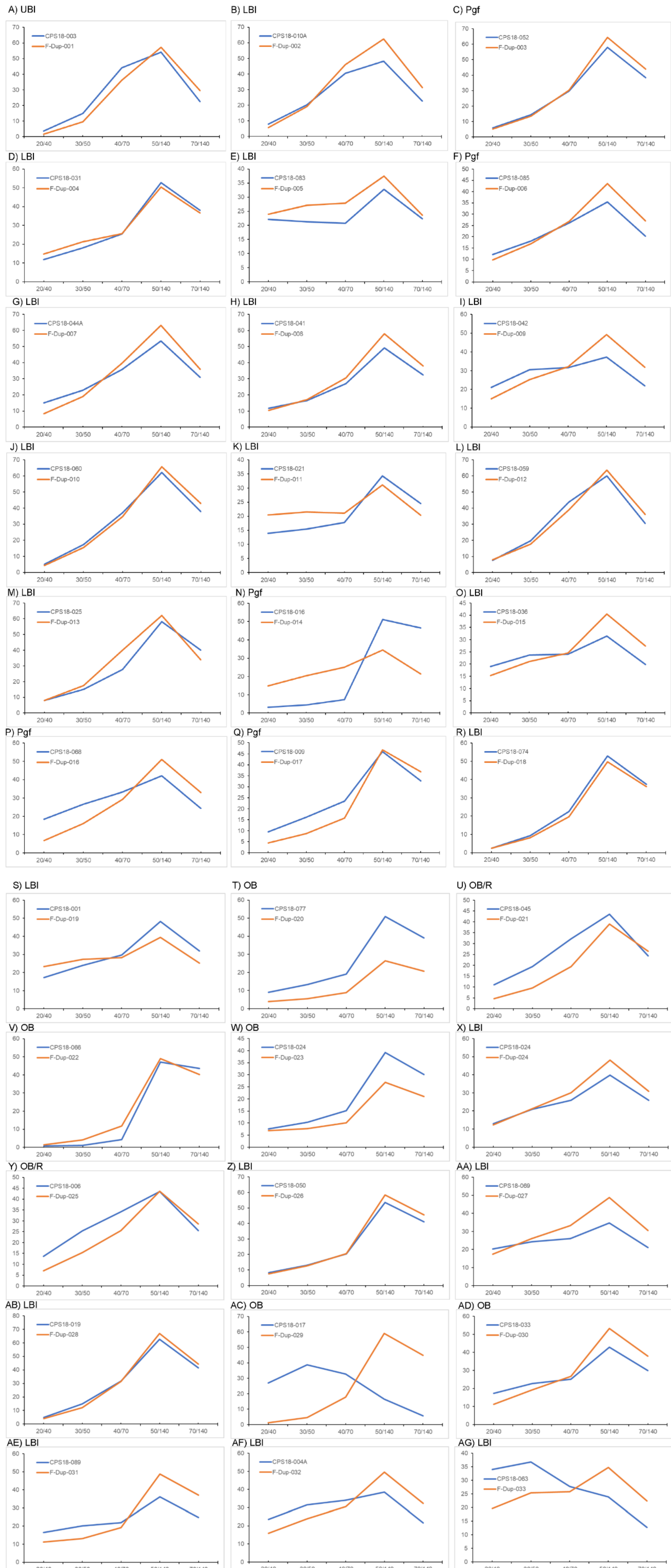


Table 11.5 Comparison of crush resistance test work that was conducted on 40/70 and 50/140 fractions that were pre-washed, sieved and split at Turnkey Processing Solutions LLC.

				Crush resistance (to 10% psi) [1]							
Sample ID	Fraction	Geo-unit	Lab	4000 (psi)	5000 (psi)	6000 (psi)	7000 (psi)	8000 (psi)	9000 (psi)	10000 (psi)	11000 (psi)
CPS18-002	40/70	Pfg	TPS	<------	11.0	18.3					
			Stim-Lab	<------	<------	18.1					
CPS18-010A	40/70	LBI	TPS			7.0	------>	------>			
			Stim-Lab			7.4	------>	------>			
CPS18-013	40/70	LBI	TPS			6.3	------>				
			Stim-Lab				<------	14.3			
CPS18-044	40/70	Pfg	TPS	<------	<------	13.5					
			Stim-Lab	<------	<------	19.0					
CPS18-045	40/70	Pfg	TPS	<------	14.3						
			Stim-Lab	<------	16.1						
CPS18-050	40/70	LBI	TPS			<------	11.3				
			Stim-Lab			<------	12.4				
CPS18-062	40/70	LBI	TPS			6.3	------>				
			Stim-Lab			9.9	----->				
CPS18-001	100-mesh	Pfg	TPS			<------	11.3				
			Stim-Lab			<------	13.1				
CPS18-004A	100-mesh	LBI	TPS						9.0	------>	
			Stim-Lab						7.0	----->	----->
CPS18-005	100-mesh	LBI	TPS						9.0	------>	
			Stim-Lab					6.6	----->	----->	
CPS18-012	100-mesh	UBI	TPS						9.8		
			Stim-Lab						7.8	----->	
CPS18-042	100-mesh	LBI	TPS					7.8	------>	------>	
			Stim-Lab					8.0	----->	----->	

[1] psi is pounds per square inch

Highest stress level in which the proppant generates no more than 10% crushed material.

Table 11.6 Comparison of TPS and Stim-Lab crush resistance test work that was conducted on 40/70 and 50/140 fractions with both labs using original bulk sample material.

			Crush resistance (to 10% psi) [2]								
Sample ID [1]	Fraction	Geo-unit	4000 (psi)	5000 (psi)	6000 (psi)	7000 (psi)	8000 (psi)	9000 (psi)	10000 (psi)	11000 (psi)	12000 (psi)
CPS18-002	40/70	Pfg	<------	11.0	18.3						
L-Dup-002			<------	10.6	14.5						
CPS18-010A	40/70	LBI			7.0	------>					
L-Dup-005				4.5		8.4	12.3				
CPS18-013	40/70	LBI			6.3	------>					
L-Dup-007				3.0			9.7	12.3			
CPS18-044	40/70	Pfg		<------	13.5						
L-Dup-010				8.1	12.8						
CPS18-045	40/70	Pfg	<------	14.3							
L-Dup-011			7.7	12.3							
CPS18-050	40/70	LBI			<------	11.3					
L-Dup-012				3.9		8.9	12.3				
CPS18-062	40/70	LBI			6.3	------>					
L-Dup-013				3.5	5.8	Ran out of material					
CPS18-001	100-mesh	Pfg			<------	11.3					
L-Dup-001				5.1	7.7	11.1					
CPS18-004A	100-mesh	LBI						9.0	------>		
L-Dup-003				1.6						9.3	13.5
CPS18-005	100-mesh	LBI						9.0	------>		
L-Dup-004				1.6					9.8	12.3	
CPS18-012	100-mesh	UBI						9.8			
L-Dup-006				1.9				8.8	10.2		
CPS18-031	100-mesh	LBI				<------	<------	16.3			
L-Dup-008				4.9		9.9	11.0				
CPS18-042	100-mesh	LBI					7.8	------>	------>		
L-Dup-009				2.5				9.9	12.5		

[1] 'CPS' samples analyzed at Turnkey Processing Solutions; 'L-Dup' samples analyzed at Stim-Lab.

[2] psi is pounds per square inch

Highest stress level in which the proppant generates no more than 10% crushed material.

11.8 Adequacy of Sample Collection, Preparation, Security and Analytical Procedures

The sample collection, preparation and security were conducted independently by APEX geologists under the supervision of Ms. Hough P. Geo. who was onsite for the drill program and ensured that sampling and chain of custody consistency and protocols were maintained during the entire 2018 Wanipigow silica sand drill program. In addition, the senior author has reviewed the adequacy of the sample collection, preparation and security and found no significant issues or inconsistencies that would cause one to question the validity of the data.

The laboratories that carried out the test work are independent laboratories. The analytical methods carried out by the laboratory is standard and routine in the field of silica sand and proppant characterization test work. The QA-QC tests conducted on the gradation data and crush tests enable the authors to have a high level of confidence in the laboratories, and precision and accuracy of the gradation data and crush resistance of sand from the Wanipigow Glass Sand Project. In turn, the QA-QC provides confidence of the dataset used in the resource estimation presented in this Technical Report and in assessing the quality of the Winnipeg Formation silica sand.

12 Data Verification

12.1 Data Verification Procedures

CPS's 2018 drill program was managed by an independent geological consulting company under the supervision of Ms. Hough P. Geo. who was onsite for the entirety of the 2018 drill program and can confirm through drill core logging and sampling duties that:

- Material changes in the form of a 93-hole drill program occurred on the Property.
- All drilling and associated activities were conducted using industry standard practices.
- All data pertaining to the 2018 drill program, including drilling notes, geotechnical work, photographs, drill logs, samples, and chain of custody notes, were entered electronically by independent APEX geologists. Hard copy notes (when present) were transferred to electronic form and reviewed by Ms. Hough.
- Any data errors pertaining to the 2018 drill program were corrected into a master dataset managed by Ms. Hough.

The 2018 drill program lithological logs were validated by the senior author and QP as part of the Wanipigow Property 3-D geological modelling process. During 2021, the well logs, drill core photos, and gradation results of the 6 drillholes within the main glass sand resource area were re-evaluated in the context of stratigraphic contacts within the new area. Minor corrections to the top and base of the LBI (see Figure 9.3) were implemented into the 3-D geological model used in the main glass sand resource estimation.

The analytical laboratory data was reviewed and validated by the senior author and QP (see Section 11.7). Any inconsistencies between the drill logs and analytical data were flagged and reviewed and corrected by Ms. Hough within the 3-D geological model.

The senior author and QP reviewed all beneficiation test work independent, internal, reports as it pertains to the glass sand resource. If the analytical methodologies were unclear, the QP contacted the laboratory managers (e.g., V. Polishchuk, CMP, October 7-8 and 8-11, 2021), until no further uncertainties in the test work procedures were noted.

12.2 Validation Limitations

No specific QA-QC sample blanks or standards were implemented into the 2021 geochemical sample stream. However, the results as presented in Table 9.1 and Figures 9.5 and 9.6 show that the analytical reproducibility between samples for silica within the main glass sand resource area is very good with an RSD% of 0.8%. In contrast, the RSD% of iron in the resource area is 75% illustrating the sporadic nature of iron in the sand. This illustrates an inhomogeneity of elements that can be detrimental to the glass manufacturing process, and CPS conducted subsequent mitigation test work through the Company's beneficiation testing as presented in Section 13.

12.3 Adequacy of the Data

With respect to the 761 samples that were processed for grain size particle distributions, the overall influence of the non-core-recoverable samples (only 6%; see text above) was minimal on the resulting gradation dataset. None of the lost core occurred at significant lithological contacts and the drill density was enough that limitations to the development of the three-dimensional geological model and resource estimation lodes (wireframes) were insignificant and in no way influence the resource estimation process.

It is the opinion of the authors that all activities relating to the 2018 drill program together with 2021 re-evaluation of the sand for glass manufacturing, were conducted using proper procedures and industry standard practices.

The geotechnical and geochemical data associated with the Wanipigow Glass Sand Project has been properly collected, recorded, and reviewed by the authors of this Technical Report.

Furthermore, the senior author and QP has found no significant issues or inconsistencies that would cause one to question the validity of the data. The data were generated with proper procedures, has been accurately transcribed form the original source and is suitable for use in this Technical Report.

Mr. Eccles, P. Geol. is satisfied to include all data generated into the resource modelling, evaluation, and estimations as part of the Wanipigow Glass Sand Project silica sand resource estimate presented in this Technical Report.

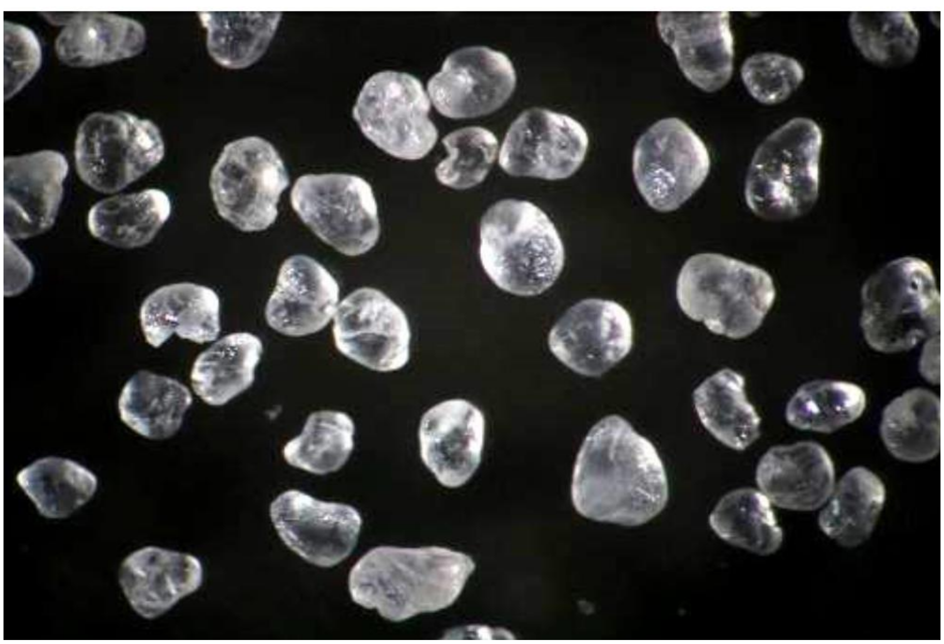
13 Mineral Processing and Metallurgical Testing

13.1 Lower and Upper Black Island Proppant Characterization Summary

CPS has conducted a significant amount of proppant characterization test work that provides important background information within the context of the Wanipigow Glass Sand Project because the assessment of proppant quality is applicable in the initial assessment of glass quality. That is, the proppant characterization studies utilize particle gradation size distributions and assess the general modal abundance of mature, rounded, high crush strength silica sand. These data are suitable for an assessment of glass sand because the input sand must be hard (i.e., high silica), able to resist high temperatures, and maintain a consistent appearance as a finished product.

The proppant test work results show the Lower and Upper Black Island Member silica sand generally satisfies the recommendations set forth in International Standards ISO 13503-2:2006/Amd.1:2009E for sieve size fractions, sphericity, roundness, acid solubility and turbidity and crush classification for hydraulic fracturing operations. Beyond ISO specifications and proppant assessment, a positive attribute of the Wanipigow silica sand is the deposits modal abundance of clear, clean silica grains (Figure 13.1) and LBI/UBI sand with very low turbidity values (<13 Formazin Turbidity Units). This means the sand is less likely to have aggregation issues that could incorporate grains composed of deleterious elements to the glass manufacturing process.

Figure 13.1 Photomicrograph example of the clear silica sand grains in the Wanipigow Lower Black Island. 40/70 fraction from drillhole CPS18-10A. Source: Stim-Lab Inc. Note: No scale bar was provided; the 40/70 fraction sieve size spans 0.210 mm to 0.420 mm.



The bulk gradation and geochemistry of the Wanipigow LBI sand is discussed in the text that follows. CPS conducted a 2021 geochemical study, which is presented in Sections 9.2 and 9.3, and discussed in further detail below in the context of mineral processing test work.

13.2 Bulk Gradation of the Wanipigow Lower Black Island Silica Sand within the Main Glass Sand Resource Area

The grade size distribution curves for the average value of LBI sand within each of the 6 drillholes in the main glass resource area is presented in Figure 13.2. The analyses include a total of 45 samples representing a collective 66.5 vertical metres of LBI sand. The geometric properties that describe the grading curves include percentage of gravel, sand and fines, effective particle size (d10, d30 and d60), uniformity coefficient (Cu), and curvature coefficient (cc). Observations from Figure 13.2 include:

- The average percentage of gravel, sand, and fines for LBI sand from all 6 drillholes is zero, 83%-85% (average (83.4%), and 15%-17% (average 16.1%), respectively.

- The d10, d30, and d60 are used to determine the measures of gradation, in which for example, d60 is the is the particle size at which 60% of the particles are finer and 40% of the particles are coarser than d60 size (Figure 13.2a). The average d10, d30, and d60 for LBI sand from all 6 drillholes is 0.04 mm, 0.13 mm, and 0.23 mm. The d10, d30 and d60 are calculated from an extrapolation of the particle size distribution curve and may be subject to precise analytical error, particularly for d10. However, the RSD% of the effective particle sizes are between 7.1% and 9.3%, which illustrate good reproducibility.

- The Cu is defined as the ratio of d60 to d10. A Cu of greater than 4 to 6 is classified as well graded. When Cu is less than 4, the material is classified as poorly graded or uniformly graded soil. The average Cu of the LBI sand from all 6 drillholes is 8.0, which is consistent with a mature, graded sandstone unit.

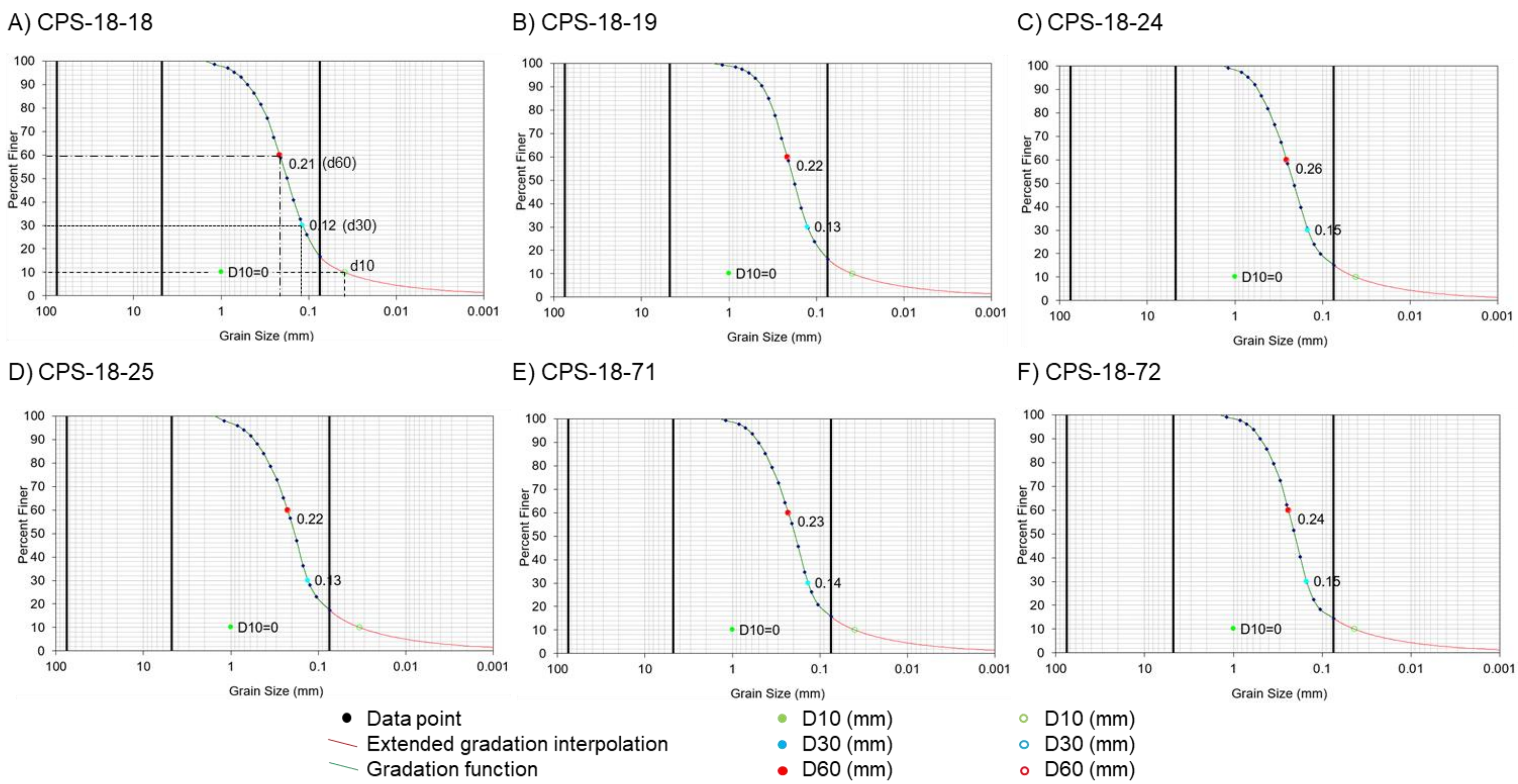
- The Cc is calculated by the formula:

$$\mathrm{Cc} = \frac{(\boldsymbol{D30})^2}{\boldsymbol{D60 \ x \ D10}}$$

  For the soil to be well graded, the value of Cc ranges between 1 and 3. The average Cc of the LBI sand from all 6 drillholes is 2.0, which is consistent with a mature, well-graded sandstone unit.

To end, the Wanipigow LBI sand has >82% sand, 15%-17% fines, and no gravel. The coarseness of the LBI sand grains is such that any future Wanipigow sand product easily could be graded to the specifications of regional glass manufacturers such as the British Standard (1988) included in this evaluation.

Figure 13.2 Particle grain size distribution curves of LBI sand within the Wanipigow main glass sand resource area. The distribution curves represent the average values within each of the 6 drillholes.



Drillhole	Average of n= samples	LBI total depth (m)	Gravel (%)	Sand (%)	Fines (%)	d10 [1]	d30 [1]	d60 [1]	Cu	Cc
CPS18-18	8	12.4	0.00	83.14	16.86	0.039	0.117	0.215	5.49	1.64
CPS18-19	8	12	0.00	83.42	16.58	0.039	0.126	0.216	5.57	1.90
CPS18-24	8	11.45	0.00	84.73	15.27	0.042	0.147	0.258	6.16	1.99
CPS18-25	6	9.1	0.00	82.42	17.58	0.034	0.132	0.225	6.69	2.29
CPS18-71	5	7.15	0.00	84.13	15.87	0.040	0.136	0.230	5.78	2.04
CPS18-72	10	14.35	0.00	85.34	14.66	0.043	0.150	0.241	5.55	2.14
		Mean values	0.00	83.86	16.14	0.04	0.13	0.23	5.87	2.00
		RSD%	0.0	1.3	6.7	8.0	9.3	7.1	8.0	11.1

[1] The d10, d30 and d60 are calculated from an extrapolation of the particle size distribution curve (and are subject to error).

13.3 Geochemistry of the Wanipigow Lower Black Island Silica Sand within the Main Glass Sand Resource Area

The analytical results of CPS's 20121 geochemical study are presented in Section 9.2. The chemical analysis was conducted on bulk composite samples that were sieved with the analytical work completed on the >125 um and <710 um size fraction (20/120 mesh; see Section 11.1). The selected analytical results of the Wanipigow LBI sand are presented in Table 13.1 with respect to the general chemical specifications of silica sand in glassmaking, as summarized in Section 8.3,

The raw LBI sand within the main glass resource area has between 96.10 and 98.90 wt. SiO_2 (average 98.03 wt. % SiO_2) with iron ranging from 0.032 to 0.247 wt. % Fe_2O_3 (average 0.117 wt. % Fe_2O_3). These values are generally too low and too high, respectively, for specialty glass or Grade A-E glass, but is sufficient for coloured container and insulating fibre optical glass (Grades F-G; compare with Table 8.1). The aluminum content is also high with an average of 0.72 wt. % Al_2O_3. Titanium and chromium have low average values of 0.04 wt. % TiO_2 and 5 ppm Cr. Manganese and sodium are generally below the minimum limit of detection. Base-metal minerals fluctuations are like the pattern observed for iron and include Ni (1.4-9.3 ppm Ni), Co (0.3-4.6 ppm Co), Cu (1.7-16.6 ppm Cu), and Cr (3.0-9.0 ppm Cr).

Table 13.1 Selected analytical results of the Wanipigow LBI sand within the main glass sand resource area.

Sample ID	SiO_2 (wt.%)	Fe_2O_3 (wt.%)	Al_2O_3 (wt.%)	CaO (wt.%)	K_2O (wt.%)	MgO (wt.%)	MnO (wt.%)	Na_2O (wt.%)	P_2O_5 (wt.%)	Ni (ppm)	Co (ppm)	Cu (ppm)	TiO_2 (wt.%)	Cr (ppm)
WNG21-001	98.40	0.067	0.58	0.10	0.177	0.026	bmld	0.01	0.009	2.9	0.48	4.1	0.036	4.0
WNG21-002	98.01	0.102	0.83	0.21	0.132	0.046	0.001	0.19	0.013	1.4	0.32	1.7	0.035	4.0
WNG21-003	97.90	0.083	0.69	0.20	0.177	0.056	0.002	0.03	0.006	6.4	0.79	6.5	0.040	4.0
WNG21-004	98.90	0.032	0.3	0.01	0.024	0.009	bmld	bmld	0.010	2.1	1.22	2.8	0.024	3.0
WNG21-005	98.40	0.047	0.46	0.24	0.074	0.029	bmld	bmld	0.007	3.1	0.62	1.9	0.030	5.0
WNG21-006	98.20	0.069	0.52	0.22	0.094	0.036	bmld	bmld	0.006	3.3	0.59	1.9	0.030	4.0
WNG21-007	96.10	0.241	1.79	0.28	0.275	0.104	0.006	0.33	0.017	7.4	4.61	4.2	0.056	9.0
WNG21-008	98.60	0.050	0.66	0.02	0.159	0.024	bmld	bmld	0.007	3.8	1.00	2.3	0.039	5.0
WNG21-009	98.40	0.235	0.66	0.02	0.191	0.029	0.001	0.02	0.011	3.1	1.23	3.8	0.044	7.0
WNG21-010	97.40	0.247	0.74	0.33	0.088	0.051	0.002	bmld	0.020	9.3	3.22	16.6	0.041	5.0
	ICP Whole Rock Assay	ICP Total Digestion	ICP Total Digestion	ICP Total Digestion	ICP Total Digestion	ICP Total Digestion	ICP Total Digestion	ICP Total Digestion	ICP Total Digestion	ICP MS Total Digestion	ICP MS Total Digestion	ICP MS Total Digestion	ICP Total Digestion	ICP MS Total Digestion
Minimum	96.10	0.032	0.30	0.01	0.02	0.01	0.00	0.01	0.01	1.40	0.32	1.70	0.02	3.00
Maximum	98.90	0.247	1.79	0.33	0.28	0.10	0.01	0.33	0.02	9.30	4.61	16.60	0.06	9.00
Average	98.03	0.117	0.72	0.16	0.14	0.04	0.00	0.12	0.01	4.28	1.41	4.58	0.04	5.00
Standard Deviation	0.79	0.09	0.40	0.12	0.07	0.03	0.00	0.14	0.00	2.55	1.39	4.47	0.01	1.76
RSD%	0.8	74.6	55.9	71.6	51.7	63.9	86.4	121.2	45.2	59.5	99.0	97.7	23.7	35.3

blmd - Below the miniumum limit of detection

Typical silica sand deposits require beneficiation to advance the sand to higher levels of silica and lower levels of iron and other detrimental elements. Common beneficiation approaches include both physical (e.g., screening, gravitation-, magnetic-, and electrostatic-separation) and chemical (e.g., acid attrition, hot acid leach, calcination). The next sub-sections discuss the results of beneficiation studies that commissioned by CPS to numerous laboratories including Institut für Glas- und Rohstofftechnologie in Germany; IHC Robbings in Australia; and the Saskatchewan Research Council in Saskatoon, SK.

13.4 Institut für Glas- und Rohstofftechnologie Beneficiation Test Study #1

During 2020, CPS commissioned the Institut für Glas- und Rohstofftechnologie (IGR) to conduct independent beneficiation test work on the Wanipigow LBI sand. This sub-section describes the IGR work as reported by Thies (2020).

IGR received a 13.75 kg samples of LBI sand as a composite sample from CPS. The following analytical work was conducted on the composite sample:

1. The material was sieved with the <0.71 mm fraction (20-mesh) used for the analyses (with the >0.71 mm discarded from additional analytical work).

2. The <0.71 mm fraction was subjected to a magnetic separator, to eliminate magnetic particles. This procedure was performed three times and a mass of 280.9 g was removed from the overall sample.

3. A homogeneous part (4.9 kg) of the sample was enriched using a modified bumping table with a pore size of >40 µm. Highly porous aluminium oxide floats up and cannot be detected with this method.

4. The resulting fraction was dried and enriched a second time using a gravity separation solution (sodium polytungstate (SPT), $\rho = 2.8$ g/cm^3). The sedimented heavy mineral fraction was washed and dried (0.1943 g) with all heavy minerals being non-magnetic.

5. SEM-EDX analyses on the heavy mineral grains yielded copper, zinc, sulphur, and iron chemical compositions.

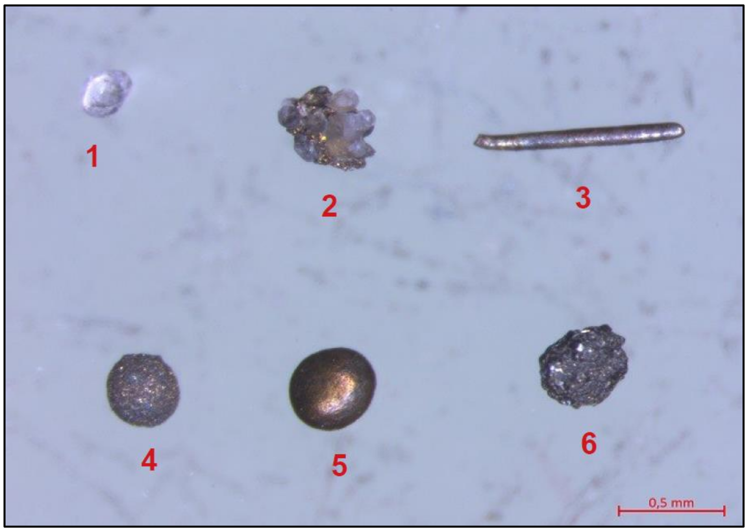
6. A representative sample split was dried according to DIN 52331 at 115 °C, pulverised, and analyzed by ICP-OES. Silica, which was reported as a "balance" value yielded 99.57 wt. % SiO_2. The sample also yielded 0.0185 wt. % Fe_2O_3.

IGR concluded that the chemical analyses showed no unusual chemical compositions, but with beneficiated product of 0.0185 wt. (185 ppm) Fe_2O_3, the resulting product is not suitable for high-quality white glass (with ≤0.012% Fe_2O_3 content) such as speciality glass and photovoltaic glass for solar modules.

A separation of the heavy minerals showed that the sample contained at least 6 different particles (Figure 13.3). Heavy mineral elements include iron and sulphur (often in combination with titanium and adherent areas with the element silicon) or wires with the elements copper and zinc (brass). The brass could possibly have come in through processing.

The test work showed that the heavy minerals could be alleviated by using the bumping table. The isolated particles with a high zirconium and silicon content could possibly lead to inclusions in a glass melt. Sulphur/iron compounds, possibly pyrite, could be removed by a further wet treatment by using a jet scrubber. The magnetic separation method can remove a moderate mass of magnetic particles (in combination with sand) from the sample.

Figure 13.3 Six particle groups of typical heavy minerals magnified at 7.5x.



In addition to preliminary beneficiation test work, the Wanipigow sand was used to create a typical soda-lime flint glass batch for a melting test. To compare the results, a second batch was created using an IGR internal sand (with 0.014 wt. % Fe_2O_3). The melting test was performed with 1250°C for 24 hours. The melting test sample was visually compared at the beginning of the melting process and again at the end of the process as a cold glass.

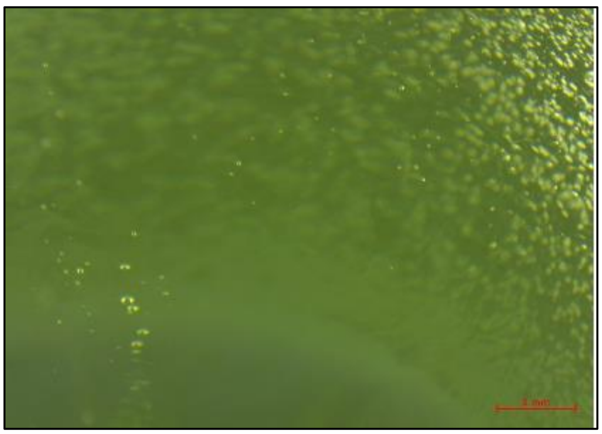
In the first part of the melting process, the Wanipigow sand showed no differences in comparison to the IGR internal sand. The resulting molten glass samples were visually very similar; both showed a comparable number of bubbles on the surface with no inclusions. The colour of both samples was largely identical with the Wanipigow sand having a slightly more yellowish shade.

To conclude, the melting test with a batch with the Wanipigow sand showed no remarkable differences to a typical soda-lime flint glass batch. Slight differences in the shading of the molten glass could be detected, as well as an increased number of seeds and cords in the glass (Figure 13.4). These differences were only very weakly pronounced and can be seen as typical differences for different sands used in soda-lime batches.

Figure 13.4 Microscopic examination of the melting test results of an IGR internal sand (A) in comparison to the Wanipigow sand (B), according to ISO 8039 (AB).

A) Seeds in the IGR internal sand, magnified 7.5x.

B) Seeds in the Wanipigow sand, magnified 7.5x.



13.5 Institut für Glas- und Rohstofftechnologie Beneficiation Test Study #2

A second test study was performed at IGR using Wanipigow LBI sand from 3 drillholes that were drilled within the main glass sand resource area. The information in this sub-section is from an IGR report prepared by Günther (2020). The 3 sand samples include:

- A 13.80 kg composite sample of LBI sand from drillhole CPS 18-18 collected between depths of 10.5 m and 19.5 m.

- A 14.00 kg composite sample of LBI sand from drillhole CPS-18-19 collected between depths of 10.5 m and 18 m.

- A 13.85 kg composite sample of LBI sand from drillhole CPS 18-24 collected between depths of 10.5 m to 15 m and 16.5 m to 19.5m.

The 3 sand samples were analyzed for their grain size particle distribution (sieve analysis) and chemical composition by ICP-OES at several steps, in which each step was performed separately on all 3 samples. The sieve analysis was performed according to DIN 66165. The ICP-OES analysis was performed DIN 51086-2. The analytical measurements were conducted after each of the following steps:

1. The original sample, which was thoroughly mixed prior to analysis.

2. After the bumping table – conducted on the remaining thoroughly mixed sample from step 1. The bumping table has a similar mode of operation, and a similar result, as a spiral separator.

3. After the magnetic separator – conducted on the remaining thoroughly mixed sample from step 2 (post bumping table). The sand was dried and the >0.71 mm fraction was separated by sieving. The <0.71 mm fraction was then subjected to 3 runs over the magnetic separator. Only the <0.71 mm fraction (20-mesh) was analyzed.

4. Sample fraction 0.125 mm to 0.71 mm (120-mesh to 20-mesh) - from the remaining material the <0.125 fraction was separated and the fraction between 0.125 mm and 0.71 mm was used for the final analyses.

An example of the sieve analysis for LBI sand from drillhole CPS-18-024 is presented in Figure 13.5. The geochemical results of all samples, and for all test steps, is presented in Table 13.2.

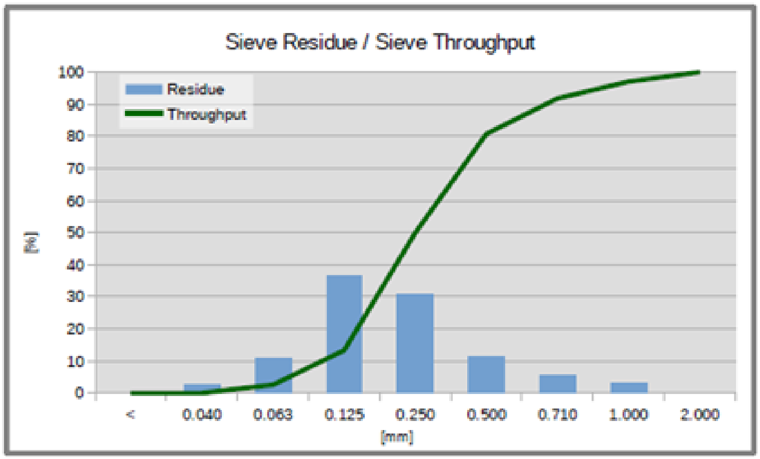
The sieve analyses showed that the step taken to separate the <0.125 fraction (10-mesh) was not totally successful. Subsequently, sample CPS-18-024 was further processed; this sample was selected because it had the lowest value of the element iron via the normal stepped approach.

Further test work included 1) removal of the complete <0.125 mm fraction, and 2) treating the fraction between 0.125 mm and 0.71 mm (120-mesh to 20-mesh) in 3 additional passes with the magnetic separator. Using this methodology, the iron content of the CPS-18-024 sample was reduced to a value of 0.0130 wt. %, or 130 ppm Fe_2O_3.

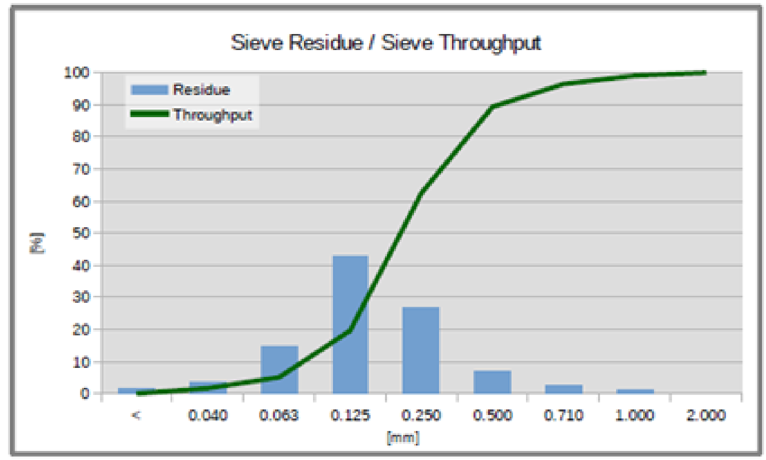
It is assumed that a similar approach for samples CPS-18-018 and CPS-18-019 could achieve similar low iron contents of <130 ppm. The senior author has reviewed the data and agrees with this assumption because the per cent difference between the 'original' analyses and 'after the magnet separation and >125 µm fraction' analyses is very similar in all 3 samples (-86% to -88%). Sample CPS-18-024, which underwent additional magnet separation, further reduced the iron to -91% and similar percentage differences should be achieved for the other 2 samples.

Figure 13.5 Sieve analysis for LBI sand from drillhole CPS-18-024 after each process step.

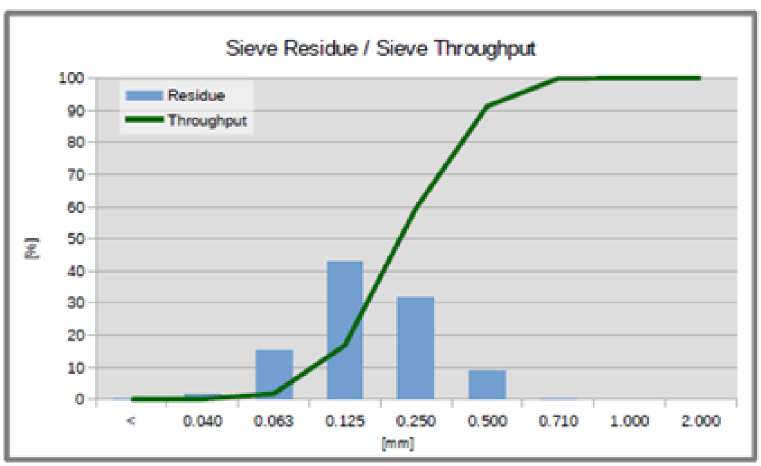
A) Original sample



B) After bumbling table



C) After magnet separator



D) After magnet separator and the sand fraction from 0.125 mm to 0.71 mm

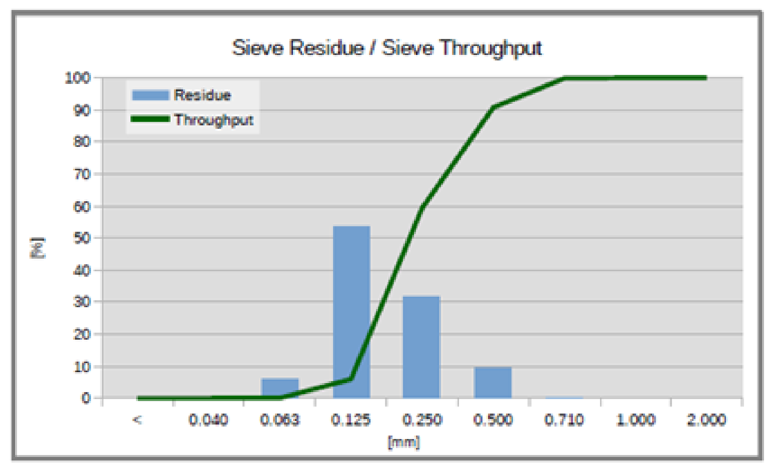


Table 13.2 Analytical results after each step of the beneficiation test work. The values represent the average of 2 ICP-OES analyses for each step.

A) Analytical results of LBI sand from drillhole CPS 18-018 after each beneficiation step.

	Original (wt. %)	After bumping table (wt. %)	After magnetic separator (wt. %)	After magnetic separator and >125 µm (wt. %)	% difference between 'original' analysis and 'after mag sep and >125 µm'
Balance (silica) [1]	96.7	98.8	99.1	99.6	3%
Al_2O_3	1.35	0.30	0.22	0.19	-86%
Fe_2O_3	0.1286	0.0506	0.0292	0.0192	-85%
CaO	0.39	0.26	0.21	0.17	-55%
MgO	0.065	0.020	0.006	0.007	-89%
Na_2O	0.01	0.00	0.00	0.00	-85%
K_2O	0.22	0.14	0.09	0.05	-77%
BaO	0.002	0.001	0.000	0.001	-34%
PbO	0.0004	0.0004	0.0005	0.0004	2%
CdO	0.0000	0.0000	0.0000	0.0000	-71%
TiO_2	0.078	0.018	0.014	0.014	-82%
Cr_2O_3	0.0010	0.0001	0.0001	0.0001	-93%
NiO	0.0007	0.0002	0.0000	0.0001	-85%
ZnO	0.000	0.000	0.000	0.000	600%
SO_3	0.078	0.033	0.025	0.010	-87%
LOI 1050 °C	0.94	0.36	0.27	n.d.	/

B) Analytical results of LBI sand from drillhole CPS 18-019 after each beneficiation step.

	Original (wt. %)	After bumping table (wt. %)	After magnetic separator (wt. %)	After magnetic separator and >125 µm (wt. %)	% difference between 'original' analysis and 'after mag sep and >125 µm'
Balance (silica) [1]	94.1	97.7	98.6	99.3	5%
Al_2O_3	2.67	0.77	0.57	0.40	-85%
Fe_2O_3	0.2149	0.1083	0.0338	0.0248	-88%
CaO	0.63	0.35	0.16	0.12	-82%
MgO	0.136	0.074	0.018	0.015	-89%
Na_2O	0.05	0.05	0.04	0.01	-79%
K_2O	0.44	0.34	0.23	0.13	-71%
BaO	0.003	0.002	0.000	0.001	-55%
PbO	0.0002	0.0002	0.0003	0.0003	43%
CdO	0.0000	0.0000	0.0000	0.0000	-100%
TiO_2	0.132	0.036	0.019	0.017	-87%
Cr_2O_3	0.0016	0.0004	0.0001	0.0001	-93%
NiO	0.0023	0.0007	0.0002	0.0002	-90%
ZnO	0.000	0.000	0.000	0.000	-33%
SO_3	0.076	0.041	0.018	0.010	-87%
LOI 1050 °C	1.53	0.53	0.31	n.d.	/

C) Analytical results of LBI sand from drillhole CPS 18-024 after each beneficiation step.

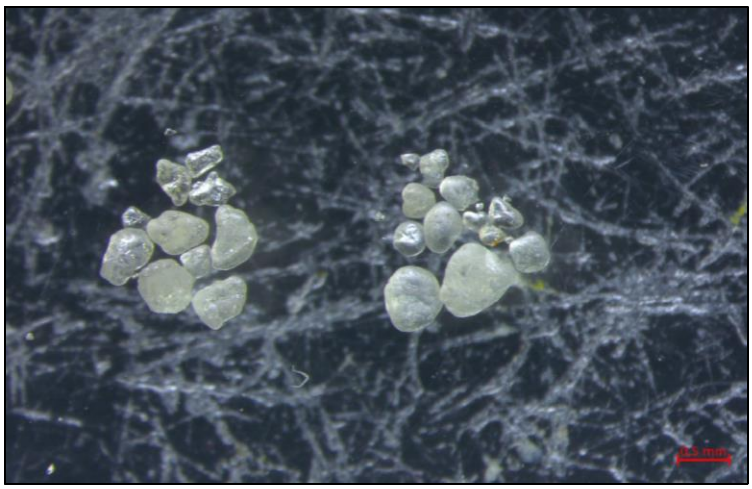
	Original (wt. %)	After bumping table (wt. %)	After magnetic separator (wt. %)	After magnetic separator and >125 µm (wt. %)	After magnetic separator, >125 µm, and 2nd magnetic separator (wt. %)	1 σ	% difference between 'original' analysis and 'after mag sep and >125 µm'	% difference between 'original' analysis and 'after mag sep and >125 µm and 2nd mag sep'
Balance (silica) [1]	97.2	99.2	99.5	99.5	99.5	/	2%	2%
Al_2O_3	0.97	0.17	0.13	0.13	0.12	0.01	-87%	-87%
Fe_2O_3	0.1408	0.0540	0.0217	0.0166	$\boxed{0.0130}$	0.0003	-88%	-91%
CaO	0.46	0.16	0.08	0.08	0.08	0.01	-83%	-83%
MgO	0.094	0.026	0.005	0.009	0.010	0.001	-90%	-89%
Na_2O	0.01	0.01	0.01	0.01	0.01	0.01	-43%	-9%
K_2O	0.08	0.02	0.03	0.01	0.02	0.01	-88%	-75%
BaO	0.001	0.001	0.000	0.001	0.001	0.001	4%	-8%
PbO	0.0003	0.0003	0.0003	0.0004	0.0003	0.0001	17%	-10%
CdO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	-67%	167%
TiO_2	0.066	0.018	0.012	0.013	0.011	0.001	-80%	-83%
Cr_2O_3	0.0010	0.0003	0.0001	0.0001	0.0000	0.0001	-87%	-100%
NiO	0.0008	0.0002	0.0000	0.0002	0.0002	0.0001	-81%	-75%
ZnO	0.000	0.000	0.000	0.001	0.001	0.001	44%	122%
SO_3	0.060	0.037	0.018	0.010	0.008	0.001	-83%	-87%
LOI 1050 °C	0.93	0.28	0.20	n.d.	n.d.	/	/	/

[1] In general the value of "balance" in the table represents - based on the experience of the IGR (e.g. participation in round robin tests) - the amount of SiO_2.
Exceptions are samples, that contain more elements than listed in the table above (e.g. boron, chlorine, fluorine or organic material).

IGR quantified the mass reduction of the 3 Wanipigow LBI sand samples in consideration of reducing the bulk sand to the fraction between 0.125 mm and 0.71 mm (120-mesh to 20-mesh). The mass reduction of samples CPS-18-018, CPS-18-19, and CPS-18-024, in this experiment, is 17.7, 24.0, and 20.1 wt. %, respectively.

A second melting test was conducted by IGR using 0.01 g of the original grains from all 3 samples. A typical soda-lime-white glass mixture was used as the base and an internal IGR reference sand was used in each test for comparison. The test was carried out for 6 hours at 1300 °C. When the results were examined under the microscope, no relics of un-melted grains were observed (Figure 13.6).

Figure 13.6 Melting test results of sand grains from the IGR reference material (left side) and from sample CPS-18-024 (right side), 12x magnified.



13.6 IHC Robbins Beneficiation Test Study

CPS commissioned IHC Robbins to complete metallurgical development test work on a representative bulk sample derived from the Wanipigow silica sand deposit. This sub-section includes data and analytical results of this work as prepared by Verburg (2020).

CPS provided IHC Robbins with a 200 kg bulk composite sample deemed to be representative of the Wanipigow silica sand deposit. The sample was collected near drillhole CPS-18-072 (within 35 m), which is within the main glass sand resource area, at depth of approximately 2.7 m. The sand sample was extracted by CPS using a backhoe, and is therefore, not derived or duplicated from drill core.

The metallurgical test work was completed at scoping level inclusive of a conceptual process methodology development; confirmation of ore process-ability; production of potential products; determination of indicative metallurgical recoveries and the identification of any potential risks and or opportunities.

Head sample analyses completed on representative sub-samples show the Wanipigow sample contains 19% +11 mm; 1.9% +2 mm; 0.2% +1 mm and 6.9% -63 µm respectively. The XRF analyses completed on the float fraction (+63 µm, -1.0mm) indicate the -2.85 specific gravity material to contain 98.91% SiO_2, 0.49% Al_2O_3, 0.041% Fe_2O_3 and 0.038% CaO+MgO. Particle size analyses was completed on the -1mm +63µm material and the D50 and D80 were calculated at 217 µm and 297 µm respectively.

A size-by-size XRF analyses of the cyclone underflow material showed that the SiO_2 grade dips below 98% in the +500 µm and -150 µm size fractions. (Table 13.3).

Table 13.3 Size by size analyses of cyclone underflow sand. The grey highlights show size fractions that yield >98% SiO_2.

Fraction (µm)	US Mesh size	Weight (%)	SiO_2 (%)	Fe_2O_3 (%)	Al_2O_3 (%)	Cao (%)	K_2O (%)	MgO (%)	TiO_2 (%)
+500	+35	1.9	96.82	0.266	1.603	0.157	0.643	0.028	0.025
+425	+40	2.4	98.68	0.094	0.594	0.048	0.295	0.012	0.015
+300	+50	12.2	98.98	0.046	0.407	0.031	0.229	0.008	0.059
+150	+100	69.5	99.33	0.031	0.319	0.021	0.185	0.005	0.019
+106	+140	8.7	98.13	0.1	0.88	0.063	0.489	0.011	0.177
-106	-140	5.3	91.04	0.207	4.609	0.241	3	0.054	0.102
Check analyses									
-425+150	40/100	81.7	99.28	0.332	0.022	0.033	0.19	0.01	0.02
-425	-40	95.7	98.71	0.62	0.04	0.05	0.37	0.01	0.04

IHC conducted gravity separation and magnetic separation test work and concluded that the contaminants (Fe_2O_3, Al_2O_3, CaO+MgO) are probably chemically bound to SiO_2.

Small scale Acid Attrition (AA) and Hot Acid Leach (HAL) tests were conducted to determine if a sand product with lower Fe_2O_3 contamination was achievable. The AA was conducted at 75 kg/t H_2SO_4 at 75% solids with a 10-minute retention time. The HAL was conducted at 30 kg/t H_2SO_4 at 75% solids and a 90-minute retention time at 180°C.

The small-scale AA and HAL analytical results are presented in Table 13.4. The AA and HAL methods effectively removed Fe_2O_3 along with some Al_2O_3:

- The AA method increased silica to 99.31% SiO_2 and decreased iron and aluminum to 0.0295% (295 ppm) Fe_2O_3 and 0.3125% (3,125 ppm) Al_2O_3.
- The AA method increased silica to 99.43% SiO_2 and decreased iron and aluminum to 0.0167% (167 ppm) Fe_2O_3 and 0.2733% (2,733 ppm) Al_2O_3 (Table 13.4).

Table 13.4 Small-scale chemical beneficiation test work.

A) Chemical beneficiation by Acid Attrition

SiO_2 (%)	Fe_2O_3 (%)	Al_2O_3 (%)	Cao (%)	K_2O (%)	MgO (%)	TiO_2 (%)
99.305	0.0295	0.3125	0.0205	0.188	0.0055	0.016

B) Chemical beneficiation by Hot Acid Leach

SiO_2 (%)	Fe_2O_3 (%)	Al_2O_3 (%)	Cao (%)	K_2O (%)	MgO (%)	TiO_2 (%)
99.43	0.0167	0.2733	0.02	0.1837	0.004	0.013

To conclude, the IHC test work showed:

- An SiO_2 grade of >99.0% is achieved readily by physical separation methodologies.
- Iron contaminant reduction value objectives of <0.01% to 0.008% (<100 ppm to <80 ppm) Fe_2O_3 were not achieved using physical separation methodologies. Chemical beneficiation test work did yield lower iron values of 0.0295% (295 ppm) Fe_2O_3 and 0.0167% (167 ppm) Fe_2O_3 by Acid Attrition and Hot Acid Leach methods, respectively.
- Based on the silica and iron content of the physical and chemically treated sand, the Wanipigow LBI sand does not meet the typical specifications for photovoltaic or specialty glass. The sand is better suited for other types of glass such as flat glass, which is more tolerant toward iron contaminants (with accepted iron level of 0.03% Fe_2O_3; see Section 8.2).
- Based on microscopic analyses, the contaminants are interpreted to be part of the mineral lattice or are defined as inclusions within the sand grains.
- The lowest level of aluminum was achieved using the chemical beneficiation techniques: 0.3125% (3,125 ppm) Al_2O_3 by Acid Attrition and 0.2733% (2,733 ppm) by Hot Acid Leach.
- The CaO+MgO target for the specialty glass is <0.5%, and this specification was achieved at 0.026% (260 ppm) after the physical separation test work (and without chemical processing).
- TiO_2 is within specialty glass specifications with 0.016% (160 ppm) in the -425 µm to +180 µm stream after physical separation. The Hot Acid Leach further reduced TiO_2 to 0.013% (130 ppm).

- Size fractions +425 µm and -180 µm were removed in the Wet Concentration Process, as such the silica sand product is on specification with respect to size fractions +710 µm, +600 µm, +500 µm and -106 µm (25 to 140 mesh).

13.7 Saskatchewan Research Council Beneficiation Test Study

Following up on the 2021 geochemical study conducted at the SRC (see Section 9.2), CPS created 2 composite split samples for further metallurgical beneficiation test work as conducted by Xia (2021). The 2 composite splits included:

1. A low iron Composite 1 sample was created that is comprised of 8 samples with average silica and iron values of 98.06 wt. % SiO_2 and 0.086 wt. % Fe_2O_3.

2. A high-iron Composite 2 sample was created that is comprised of 6 samples with average silica and iron values of 97.40 wt. % SiO_2 and 0.230 wt. % Fe_2O_3 (Table 13.5).

Table 13.5 Formation of low and high iron composite samples based on CPS's 2021 geochemical evaluation of the LBI unit at the main glass resource area (see Section 9.2).

Composite 1 (Low Iron)	Composite 2 (High Iron)
WNG21-001	WNG21-009
WNG21-002	WNG21-010
WNG21-003	WNG21-012
WNG21-004	WNG21-014
WNG21-005	WNG21-015
WNG21-006	WNG21-016
WNG21-007	
WNG21-008	

The two composite samples were homogenized separately and prepared for: 1) magnetic separation on the 25-120 mesh fraction, and 2) heavy-liquid separation on the 25-75 mesh fraction. Both analyses were completed on the raw composite samples (and not iteratively with each test). With respect to the magnetic separation, the head feed of the Composite 1 and Composite 2 samples (at 25-120 mesh) comprised 0.131 and 0.242 wt. % Fe_2O_3 (Table 13.6a). The composite samples were subjected to a high intensity magnetic separator (9-10 kilogauss) in 3 separate passes. The magnetic and non-magnetic sub-samples were collected and re-analyzed using Total Digestion ICP. The magnetic separation test rejected 1.2% to 2.6% of total weight of the composite sample. The magnetic separation purified the Composite 1 low iron sample to 0.0561% (561 ppm) Fe_2O_3, and the Composite 2 high iron sample to 0.119% (1,190 ppm) Fe_2O_3.

With respect to heavy-liquid separation, a raw sand sample was screened using a 70-mesh (0.425 mm) screen. The float material was collected, air dried and tested by heavy-liquid separation. The <70 mesh fraction is not suitable for the float and sink separation test.

Table 13.6 Original head feed assays with the results of the magnetic separation and heavy-liquid separation tests.

A) Magnetic separation on raw composite samples.

	Head feed, 120-25 mesh fraction							Mass - removed magnetic fraction (%)	Post magnetic separation, non-mag sub-sample						
Sample ID	Al_2O_3 (wt. %)	CaO (wt. %)	Fe_2O_3 (wt. %)	K_2O (wt. %)	MgO (wt. %)	Na_2O (wt. %)	TiO_2 (wt. %)		Al_2O_3 (wt. %)	CaO (wt. %)	Fe_2O_3 (wt. %)	K_2O (wt. %)	MgO (wt. %)	Na_2O (wt. %)	TiO_2 (wt. %)
Composite 1 (Low Iron)	0.75	0.22	0.131	0.13	0.08	0.07	0.04	1.2	0.75	0.19	0.056	0.15	0.03	0.08	0.03
Composite 2 (High Iron)	0.92	0.23	0.242	0.19	0.07	0.09	0.04	2.6	0.65	0.14	0.119	0.14	0.03	0.07	0.03

B) Heavy-liquid separation on raw composite samples.

	Head feed, 70-25 mesh fraction								Post heavy-liquid separation, float sub-sample						
Sample ID	Al_2O_3 (wt. %)	CaO (wt. %)	Fe_2O_3 (wt. %)	K_2O (wt. %)	MgO (wt. %)	Na_2O (wt. %)	TiO_2 (wt. %)	Mass - sink fraction (%)	Al_2O_3 (wt. %)	CaO (wt. %)	Fe_2O_3 (wt. %)	K_2O (wt. %)	MgO (wt. %)	Na_2O (wt. %)	TiO_2 (wt. %)
Composite 1 (Low Iron)	0.31	0.09	0.0759	0.06	0.02	0.05	0.01	0.6	0.33	0.08	0.0215	0.07	0.01	0.05	0.01
Composite 2 (High Iron)	0.28	0.07	0.0828	0.07	0.02	0.03	0.02	7.5	0.28	0.05	0.0523	0.07	0.01	0.04	0.01

The head feed of the Composite 1 and Composite 2 samples, which was reduced to 25-70 mesh, had 0.759 and 0.828 wt. % Fe_2O_3 (Table 13.6b). The gravity separation liberated heavy particles that totaled 0.6% and 7.5% of the mass fraction of the Composite 1 and Composite 2 samples, respectively. The resulting float sub-sample of Composite 1 low iron composite yielded 0.0215% (215 ppm) Fe_2O_3, while the Composite 2 high iron sample had 0.0523% (523 ppm) Fe_2O_3.

13.8 CM.Project.Ing GmbH and Industrial Minerals International Beneficiation Test Study

During July-August 2021, CPS commissioned CM.Project.Ing GmbH (CMP) and Industrial Mineral international (I.M.I.) in Aachen, Germany to conduct further beneficiation testing (cm.project.ing GmbH, 2021). The test work was conducted on LBI sand collected from archive samples from 5 drillholes within the glass sand resource area, which included CPS18-018, CPS18-019, CPS18-024, CPS18-025, and CPS18-071.

Analysis of the representative feed sand showed that the Wanipigow sand does not contain significant amounts of Na_2O; MgO, CaO and BaO. The SiO_2-content was 96.3%. The TiO_2 content is high at 0.1%. The Fe_2O_3 content is 0.130%. The objective of the program was to reduce the Fe_2O_3 content to ≤0.012% (≤120 ppm) to increase the quality of the feed sand for specialty glass products like solar glass.

The test work process included: 1) treating the feed with an attrition machine to clean the quartz surfaces, 2) removal of the oversize +630 µm and the fines -125 µm fractions, such that the 125 µm to 500 µm (i.e., 35 to 120 mesh) fraction was used in the CMP and I.M.I. test work 3) density separation to separate heavy mineral particles (like Fe_2O_3, TiO_2 etc), and 4) magnetic separation(s) to reduce the iron content.

Attrition involved the continuous flow of suspended sand (1,200-1,300 g/l) into tanks with stirrers that subject the sand to strong shear stresses. After attrition and desliming, the analytical results presented in Table 13.7 shows that iron reduction from 0.130% to 0.020% Fe_2O_3 is possible via intensive scrubbing and desliming. This can be also seen on the reduction of TiO_2 from 0.10% to 0.01% TiO_2 resulting from the attrition process.

Density separation, which utilized a shaking table, resulted in further iron reduction from 0.02% to 0.016% Fe_2O_3 and it was concluded that spiral concentrators are necessary. Following density separation, 2 steps of magnetic separation were performed:

- In the first magnetic separation step, the iron content was reduced from 0.016% to 0.011% Fe_2O_3.

- In the second magnetic separation step, the Fe_2O_3 iron content was further reduced from 0.011% to 0.010% Fe_2O_3.

The mechanical beneficiation results performed by CMP and I.M.I. show that the Wanipigow sand can be reduced to 0.010% Fe_2O_3 and increased to 99.5% SiO_2 through the simulation of a continuous beneficiation process using attrition, grain size classification, density separation, and magnetic separation (Table 13.7).

Table 13.7 Summary of analytical results through the continuous mechanical test program.

Element	Feed sand (Ma. %)	After attrition 125-500 µm (Ma. %)	After density separation (Ma. %)	After magnetic separation 1st step (Ma. %)	After magnetic separation 2nd step (Ma. %)
SiO_2	96.3	99.4	99.5	99.5	99.5
Al_2O_3	1.44	0.13	0.1	0.11	0.09
Fe_2O_3	0.130	0.020	0.016	0.011	0.010
TiO_2	0.1	0.01	<0.01	<0.01	<0.01
K_2O	0.19	0.03	0.03	0.02	0.02
Na_2O	0.01	<0.01	<0.01	<0.01	<0.01
CaO	0.45	0.05	0.05	0.04	0.03
MgO	0.07	<0.01	<0.01	<0.01	<0.01
BaO	<0.01	<0.01	<0.01	<0.01	<0.01
P_2O_5	<0.01	<0.01	<0.01	<0.01	<0.01
L.O.I. 1025°C	1.2	0.2	0.2	0.2	0.2

The Al_2O_3 content was reduced by attrition with consecutive washing and desliming. The TiO_2 content was reduced through attrition, but all processing steps helped to reduce titaniferous particles. The K_2O content is well below critical values for quality glass, as are Na_2O, MgO, CaO and BaO, which were below the detection limit in all sand analyses.

The mechanically treated sand sample was further subjected to chemical treatment using numerous chemical reagents (oxalic, phosphoric, hydrochloric, sulfuric, and hydrofluoric acids). The sand-acid suspension was at a constant mixing rate of 800 rpm. All experiments, except for Test 10, were conducted at atmospheric pressure and a temperature of 85 °C. Test 10 was conducted at 25 °C with hydrofluoric acid. After leaching, the leach solution was decanted from the leach residues (the purified quartz product). The quartz product was washed multiple times, dried overnight at 80° C, weighed, and analyzed.

The analytical results of the mechanical plus chemical test programs are presented in Table 13.8. The content of Fe_2O_3 was reduced to 0.006% (60 ppm) with an extraction efficiency of 40% in the oxalic (0.1M; 0.3M), sulfuric (0.5M; 2.5M), phosphoric (0.5M; 2.5M), hydrochloric (2.5M) and hydrofluoric acids (0.5M) test. Hence, the oxalic, sulfuric, and phosphoric acid at the concentration of 0.5M could be selected for the further leaching experiments that involve further study of leaching temperature, acid concentration, mixing rate and L/S ratio.

A maximum silica content of 99.7% SiO_2 was attained using phosphoric (0.5M; 2.5M) and oxalic acids (0.3M). Potassium remains constant (0.02% K_2O), except in test 10 with the hydrofluoric acid (possibly due to K-feldspar dissolution). Potassium and aluminum were reduced to below 0.01% K_2O and to 0.03% Al_2O_3. The content of calcium was reduced to below 0.01% CaO, except the test with the oxalic and hydrofluoric acids.

CMP and I.M.I. concluded that chemical treatment of the Wanipigow sand is recommended to ensure an iron content ≤0.012% (≤120 ppm), which would beneficiate the sand to high-quality and for potential use in the solar glass industry.

Note: Depending on market conditions and buyer needs, it is possible that mechanical beneficiation will suffice for the glass manufacturing process, solar glass included.

Table 13.8 Summary of analytical results (Ma. %): Final mechanical result feed with additional chemical testing.

Test	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Acid	Oxalic	Oxalic	Sulfuric	Sulfuric	Phosphoric	Phosphoric	Hydro-chloric	Hydro-chloric	Sulfuric and Oxalic	Hydro-fluoric
Concentration [M]	0.1	0.3	0.5	2.5	0.5	2.5	0.5	2.5	2.5	0.5
Consumption [kg/t]	40.8	122.4	204.2	1,020.8	230.6	1,152.9	197.1	985.4	1,020.8	50.0
SiO_2	99.6	99.7	99.6	99.6	99.7	99.7	99.6	99.5	99.5	99.4
Al_2O_3	0.07	0.1	0.11	0.09	0.08	0.07	0.07	0.07	0.07	0.03
Fe_2O_3	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.006	0.007	0.006
TiO_2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
K_2O	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	<0.01
Na_2O	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CaO	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
MgO	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BaO	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
P_2O_5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
L.O.I. 1025°c	0.2	<0.1	0.1	0.2	0.1	<0.1	0.2	0.3	0.3	0.4

13.9 CM.Project.Ing GmbH Theoretical Batch Calculations

During October 2021, CMP completed a batch calculation to simulate a solar glass melting furnace (Polishchuk, 2021). The calculation utilized:

- A furnace batch mixture that included a 60% portion of Wanipigow Lower Black Island Formation silica sand. The chemical composition of the sand was derived from the mechanical, and the mechanical plus chemical, analytical results presented in Section 13.8. Hence the silica sand used in the batch calculation is representative of the beneficiated silica sand within the glass sand resource area.

- Additional furnace batch raw materials included dolomite, limestone, and aragonite as varying sources of oxides (e.g., dolomite for MgO). The chemical composition of these materials was derived from third-party suppliers known to CMP. Several separate batch calculations were conducted utilizing the Wanipigow sand together with the furnace batch feed materials.

The theoretical and proprietary calculation method assumed that all other raw materials required for the glass batch mixture have qualities and chemical compositions that are equal to, or better, in comparison to the values that were used for dolomite, limestone, and aragonite. This assumption is particularly necessary for the iron oxide content and other coloring oxides like TiO_2.

CMP reported that a theoretical calculation using 1) the mechanically treated Wanipigow Lower Black Island sand from within the glass sand resource area (i.e., 0.010% Fe_2O_3 or 100 ppm Fe_2O_3), in conjunction with 2) aragonite, which is used as a substitute of limestone due to its clean Fe_2O_3 resulted in a theoretically calculated glass composition that comprised 0.0098% Fe_2O_3 (98 ppm Fe_2O_3).

Deviations within the calculation are subject to:

- The percentage of materials within the batch, which may vary ±1%, or 100-200 kg, per batch, and

- Tolerances applied to each oxide, which vary from ±0.001% to ±1.0% and are generally proportional to the oxide amount and/or the impact the oxide has on the glass properties and (V. Polishchuk, CMP, pers. comm., 2021).

Consequently, CMP concluded that the mechanical treatment of the Wanipigow Lower Black Island Formation silica sand from within the glass sand resource area will fulfil the specifications required to manufacture specialty solar glass products based on a sand glass feed iron market value of ≤0.012% Fe_2O_3 (120 ppm Fe_2O_3).

CMP noted that the batch calculation result is 1) preliminary, 2) based on the chemical composition of theoretical materials being added to the Wanipigow feed sand, and 3) describes expected oxide concentration levels in the final glass product. Additional, detailed test sets are required on a bulk sand sample (e.g., 500 kg) with the actual raw materials. These tests will include sand analyses after the industrial treatment tests, glass melting tests that include optimization phases, and chemical composition analyses of the final glass product.

13.10 Mineral Processing and Metallurgical Summary

Based on the geochemical analyses of 45 samples from within the main glass sand resource area averages 98.03 wt. % SiO_2 and 0.117 wt. % Fe_2O_3. While the silica is sufficient for specialty glass, the iron content is too high; acceptable levels of iron for low iron solar glass specifications is ≤0.012% Fe_2O_3, or ≤120 ppm Fe_2O_3 (see Section 8.3). The aluminum content is also high with an average of 0.72 wt. % Al_2O_3. Base metals such as Ni, Co, Cu and Cr fluctuate between the individual sand samples in a similar fashion as iron.

Consequently, CPS conducted numerous beneficiation tests to determine if the Wanipigow Lower Black Island Formation silica sand within the Main Glass Sand Resource area can be beneficiated to meet the general solar glass specification low-iron s and requirements ≤0.012% Fe_2O_3, or ≤120 ppm Fe_2O_3). General results of this test work are summarized in Table 13.9 and discussed in the text that follows:

- Test work conducted by the SRC showed that magnetic separation purified the Composite 1 low iron sample to 0.0561% (561 ppm) Fe_2O_3, and the Composite 2 high iron sample to 0.119% (1,190 ppm) Fe_2O_3. The gravity separation technique liberated heavy particles that totaled 0.6% and 7.5% of the mass fraction of the Composite 1 and Composite 2 samples, respectively. The resulting float sub-sample of Composite 1 low iron composite yielded 0.0215% (215 ppm) Fe_2O_3, while the Composite 2 high iron sample had 0.0523% (523 ppm) Fe_2O_3.

- Gravity separation and magnetic separation test work conducted by IHC showed that an SiO_2 grade of >99.0% is achieved readily by physical separation methodologies. Chemical beneficiation yielded iron values of 0.0295% (295 ppm) and 0.0167% (167 ppm) Fe_2O_3 by Acid Attrition and Hot Acid Leach methods, respectively. The lowest level of aluminum was achieved using the chemical beneficiation techniques: 0.3125% (3,125 ppm) Al_2O_3 by Acid Attrition and 0.2733% (2,733 ppm) Al_2O_3 by Hot Acid Leach. The CaO+MgO target for specialty glass is <0.5%, and this specification was achieved at 0.026% (260 ppm) after the physical separation test work (without chemical processing). TiO_2 is within specialty glass specifications with 0.016% (160 ppm) in the -425 μm to +180 μm stream after physical separation. The Hot Acid Leach further reduced TiO_2 to 0.013% (130 ppm).

- After sieving, bumping table, and magnetic separation, IGR concluded that the chemical analyses showed no unusual chemical compositions, but the iron content of the beneficiated product was reduced to only 0.0185 wt. % (185 ppm) Fe_2O_3. Follow-up test work conducted magnetic separator work on only the 0.125 mm and 0.71 mm fraction (120-mesh to 20-mesh), and the iron content of the Wanipigow sand (sample CPS-18-024) was reduced to 0.0130 wt. %, or 130 ppm Fe_2O_3.

- Melting tests conducted by IGR showed no remarkable differences between the Wanipigow LBI sand and a typical, comparative soda-lime flint glass batch. Shading of the molten glass, and seeds and cords in the glass, were only very weakly pronounced in the Wanipigow LBI glass test produce, which is typical within other sand soda -lime batches. No relics of un-melted grains were observed.

- The mechanical beneficiation results performed by CMP and I.M.I. show that the 125 μm to 500 μm (i.e., 35 to 120 mesh) fraction Wanipigow feed sand can be reduced to 0.010% Fe_2O_3 and increased to 99.5% SiO_2 through the simulation of a continuous beneficiation process using attrition, grain size classification, density separation, and magnetic separation. The Al_2O_3 was reduced by attrition with consecutive washing and desliming and the TiO_2 content was reduced through the continuous beneficiation steps. The K_2O, Na_2O, MgO, CaO and BaO contents are far below critical values for quality glass.

- CMP and I.M.I. further concluded that chemical treatment of the Wanipigow sand is recommended to ensure an iron content ≤0.012% (≤120 ppm). The maximal content of SiO_2 (99.7%) was achieved using phosphoric (0.5M; 2.5M) and oxalic acids (0.3M). The content of Fe_2O_3 was reduced to 0.006 mass-% (60 ppm) with an extraction efficiency of 40% in the oxalic (0.1M; 0.3M), sulfuric (0.5M; 2.5M), phosphoric (0.5M; 2.5M), hydrochloric (2.5M) and hydrofluoric acids (0.5M) test. Potassium and aluminum were reduced to below 0.01% K_2O and to 0.03% Al_2O_3. Calcium was reduced to below 0.01% CaO, except the test with the oxalic and hydrofluoric acids.

- Hence, the oxalic, sulfuric, and phosphoric acid at the concentration of 0.5M could be selected for the further leaching experiments that involve further study of leaching temperature, acid concentration, mixing rate, and the liquid-to-solid (L/S) ratio.

Table 13.9 Summary of beneficiation test work conducted by CPS. Iron values within the general solar glass specification of ≤0.012% Fe_2O_3 are highlighted in grey.

Lab	Test No.	Size fraction tested in mm (mesh size)	Tests conducted	SiO_2 (%)	Fe_2O_3 (%)	Al_2O_3 (%)	TiO_2 (%)	CaO+MgO (%)
SRC	1	0.71-0.125 (20-120 mesh)	Heavy-liquid separation	/	0.0215	0.330	0.010	0.090
SRC	2	0.71-0.125 (20-120 mesh)	Magnetic separation	/	0.0560	0.750	0.030	0.220
IHC	1	0.71-0.106 (20-140 mesh)	Gravity separation Magnetic separation Acid attrition	99.30	0.0295	0.313	0.016	0.026
IHC	2	0.71-0.106 (20-140 mesh)	Gravity separation Magnetic separation Hot Acid Leach	99.40	0.0167	0.273	0.013	0.024
IGR	1	<0.71 (20-mesh)	Bumping table Magnetic separation	99.57	0.0185	0.090	0.010	0.087
IGR	2	0.71-0.106 (20-140 mesh)	Bumping table Magnetic separation (process repeated)	99.50	0.0130	0.120	0.011	0.090
CM.Project	1	0.5-0.125 (35-120 mesh)	After attrition 125-500 µm (Ma. %)	99.4	0.020	0.13	0.01	<0.06
CM.Project	2	0.5-0.125 (35-120 mesh)	After density separation (Ma. %)	99.5	0.016	0.1	<0.01	<0.06
CM.Project	3	0.5-0.125 (35-120 mesh)	After magnetic separation 1st step (Ma. %)	99.5	0.011	0.11	<0.01	<0.05
CM.Project	4	0.5-0.125 (35-120 mesh)	After magnetic separation 2nd step (Ma. %)	99.5	0.010	0.09	<0.01	<0.04
CM.Project	5	0.5-0.125 (35-120 mesh)	oxalic acids (0.3M)	99.7	0.006	0.1	<0.01	<0.02
CM.Project	6	0.5-0.125 (35-120 mesh)	phosphoric (0.5M; 2.5M)	99.7	0.006	0.07	<0.01	<0.01

Based on the silica, iron, and other elemental contents of the mechanically and chemically treated sand in these beneficiation tests – and depending on market and manufacturing conditions – the Wanipigow LBI sand can be used to manufacture standard glass products such as flat glass, coloured container glass, and insulating fibers.

In addition, the initial mineral processing test work conducted by CMP and I.M.I., which included enhanced attrition scrubbing and desliming followed by grain size classification (35-120 mesh fraction), density separation, and magnetic separations (x2) – has shown the Wanipigow LBI sand can be mechanically-treated to yield an iron content of 0.010% Fe_2O_3 (100 ppm Fe_2O_3) with further chemical treatment yielding 0.006% to 0.007% Fe_2O_3 (60 ppm to 70 ppm Fe_2O_3). Hence, the initial trials conducted by CMP showed that the Lower Black Island Formation sand from the Wanipigow Glass Sand Resource Area satisfies the general specification for use in specialty glasses such as solar glass manufacturing.

Accordingly, and with respect to reporting a resource estimate that abides by NI 43-101, it is the opinion of the QP that the Wanipigow LBI sand within the glass sand resource area demonstrates reasonable prospects of potential extraction.

With respect to limitations, the author reiterates that there is no current standard, or industry-wide specifications, for the quality of silica sand with respect to glass manufacturing (see Section 8.3). Hence, the quality of the raw sand feed is dependent on several factors that can include, for example, 1) market conditions, 2) buyer need, and 3) chemical composition of materials other than silica sand that are used in the batch glass manufacturing process.

With respect to the latter point, silica sand comprises 60% to 70% of the furnace batch. Other materials typically include, for example, calcium carbonate, sodium carbonate, and waste recycled glass. Hence the silica and iron composition of co-flux materials other than silica sand (e.g., limestone, or lime) can also influence the final glass product type.

A theoretical furnace batch calculation conducted by CMP used the mechanically treated Wanipigow Lower Black Island sand from within the glass sand resource area (i.e., 0.010% Fe_2O_3 or 100 ppm Fe_2O_3), together with aragonite, which is used as a substitute of limestone due to its clean Fe_2O_3. This combination resulted in a theoretically calculated glass composition with 0.0098% Fe_2O_3 (98 ppm Fe_2O_3).

CMP noted that the batch calculation result is 1) preliminary, 2) based on the chemical composition of theoretical materials being added to the Wanipigow feed sand, 3) describes expected oxide concentration levels in the final glass product, and 4) noted that additional, detailed tests are required using bulk sand samples (e.g., 500 kg) together with the other raw batch materials.

14 Mineral Resource Estimates

14.1 Introduction

Resource analysis, 3-D geological modeling, and resource estimation as part of this Wanipigow glass sand resource estimate was prepared by Mr. Black, M.Sc. P. Geo. of APEX (under the direct supervision of Mr. Eccles, M.Sc. P. Geol.). Mr. Black estimated the 3-D block model, conducted statistical analysis, and calculated the resource estimations. The workflow implemented for the calculation of the Wanipigow glass sand resource estimate was completed using the commercial mine planning software MICROMINE (v 21.0). Supplementary data analysis was completed using the Anaconda Python distribution (Continuum Analytics, 2017) and a custom Python package developed by APEX. Mr. Eccles coordinated the 3-D geological model and resource estimation, reviewed all information, and takes overall responsibility for the resource estimate presented in this Technical Report.

Figure 14.1 shows the main glass sand mineral resource area in relation to a secondary future exploration target that was also assessed in this study. The main glass sand mineral resource area reported in this Technical Report occurs within a smaller subset of 6 contiguous Quarry Leases (3.64 km^2) within the 41-lease Wanipigow Property (Figure 4.1 and Table 4.1). The 3-D geological model in the main glass sand resource area is defined by 5 out of 93 vertical drillholes drilled by CPS in 2018 (see Section 10). The 5 drillholes include CPS18-018, CPS18-019, CPS18-024, CPS18-025, and CPS18-071.

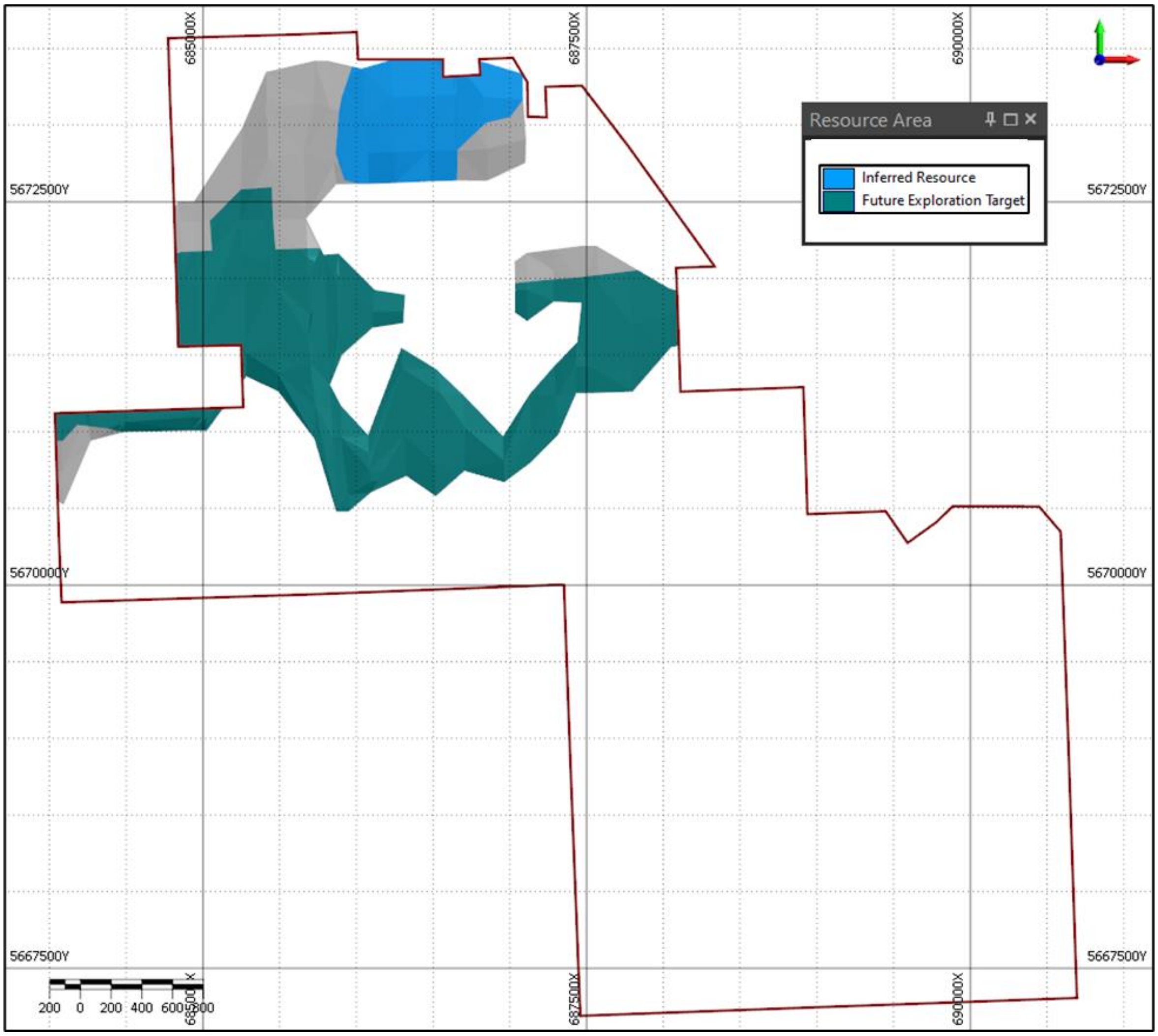
Additionally, a conceptual exploration target area has been delineated based on those drill defined LBI intersections that occur outside of the main glass sand mineral resource area.

A cutoff that utilizes the 125 µm to 500 µm (i.e., 120 to 35 mesh) fraction of Wanipigow LBI sand was used in the resource work. This cutoff correlates with the size fraction used in the CMP beneficiation test work, which mechanically reduced the iron content of the sand to 0.010% Fe_2O_3 and increased the silica content to 99.5% SiO_2 through the simulation of a continuous beneficiation process using attrition, grain size classification, density separation, and magnetic separation.

The Wanipigow glass sand resource estimate is reported in accordance with NI 43-101 and has been estimated using the CIM "Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines" dated November 29th, 2019, and CIM "Definition Standards for Mineral Resources and Mineral Reserves" amended and adopted May 10th, 2014. Mineral resources are not mineral reserves and do not have demonstrated economic viability.

Finally, CPS acknowledges that a former 2020 resource/reserve assessment of the Wanipigow Property – which discloses the Wanipigow sand for use in the hydraulic fracturing oil and gas industry as a frac sand – is still material to the company.

Figure 14.1 Plan view of the LBI sand unit highlighting the main glass sand resource area (teal) and the future exploration target area (green).



Accordingly, and because this report represents CPS's current Technical Report, the frac sand mineral resource and reserve estimations and economic overview from the 2020 Preliminary Feasibility Study are summarily reiterated at the end of this section and in Sections 15, 16, and 22.

14.2 Data

14.2.1 Drilling Data Summary and Processing

The authors reviewed all historical data associated with the Wanipigow silica sand deposit, which has been explored and studied since the 1980s (formerly the Seymourville

Project). The historical data included a series of vertical drillholes that were drilled within the Wanipigow Property limits, as described in Section 6.2.

In 2018, CPS completed a 93 sonic drillhole program that was logged and sampled as described in Section 10. Collected samples were submitted for particle distribution gradation analysis at TPS and Stim-Lab (see Section 11). As described in Section 7.2 and Section 14.2.1, stratigraphic log data from CPS 2018 drill program were used to define the following four geological units (Section 7.2) with the LBI unit the focus of the resource work conducted in this technical report:

- Paleocene glacial fluvial (Pgf) – Ground moraine glaciofluvial, glaciolacustrine and till locally composed of sand intervals that are intercalated with sand and gravel and clay till.
- Upper Black Island (UBI) – An upper Winnipeg Formation subunit characterized by a white to rust-coloured/stained silica sand.
- Black Shale (BS) – Divides the UBI and LBI silica sand subunits and is characterized by a thin layer of black shale that periodically comprises ooidal pyrite.
- Lower Black Island (LBI) – The basal subunit of the Winnipeg Formation is characterized by grey-white silica sand with minor kaolinite cement.

The particle size/gradation analysis completed during CPS's 2018 drill program were used to estimate the 3D block model as described in Section 14.4. The following text describes the dataset pertinent to the calculation of the Wanipigow glass sand resource estimate.

Grain size particle distribution analyses were conducted throughout intersections with adequate sample recovery from 90 of the 93 vertical sonic holes drilled by CPS in 2018. Samples were taken approximately every 1.5 m, which correlates to the length of the core barrel. A summary of the number of samples collected from each of the formations of interest is detailed in Table 14.1.

Table 14.1 Summary of interval types from the CPS 2018 drill program.

FM	Samples Collected	No Recovery	No Sample (Clay)	No Sample (Gravel)
LBI	230	3	1	0

A total of 230 samples were collected within the LBI, including 48 LBI samples in the main glass sand resource area, were used to calculate the Wanipigow glass sand resource estimate.

A total of 3 sample intervals within the LBI in the main glass sand resource area had poor auger return material rates that did not allow sampling. One sample interval identified as >30 % clay occurred within the main glass sand resource area. As these missing sample intervals were within the resource domains, a reasonable value was assigned to the intervals prior to compositing rather than assigning values of zero. The assigned missing sample values are detailed in Table 14.2. To devise the missing sample values, the authors first considered the geological material that was not collected:

1. Horizons that contained a high modal abundance of clay, mudstone. or shale.

2. Weathered and/or altered Precambrian basement.

3. Gravel units dominated by pebbles, cobbles, and boulders.

In addition, the review revealed that the non-sample units were generally sporadic and therefore difficult to wireframe as continuous independent units that could be omitted from the resource estimation process. Accordingly, the authors developed two conservative samples that included:

1. A 'clay' sample that was devised manually by demoting or elevating the coarse and fine fractions, respectively, of the Wanipigow dataset sample that had the highest 200 plus Pan fraction (i.e., increased the fines content in the highest clay sample in the dataset); and

2. A 'gravel' that was devised manually by using the reverse process (i.e., elevating or demoting the coarse and fine fractions, respectively), in the Wanipigow dataset sample that had the highest +20 fraction.

In other words, a conservative clay and gravel sample was developed that ensures there is no over-estimation in the resource based on the non-sample value. The decision on which value to use in the non-sample blocks were decided by reviewing the surrounding lithology; hence, the clay value, for example, was implemented in areas where the local geology necessitated the clay value. This methodology was used for 1 sample (or 0.4% of the overall samples used in the resource).

It is recommended that future core sampling programs collect core sample material from the entire drillhole interval to avoid non-sample areas within the resource domains for future resource estimations.

Table 14.2. Assigned 'clay' and 'gravel' sieve percentages applied to missing samples intervals that were not sampled due to >30% gravel or clay.

No Sample Type	30	120	PAN
Clay	0.50	9.18	90.32
Gravel	75.58	13.01	11.41

The mesh-size (U.S. Standard) fractions measured include 16-, 20-, 25-, 30-, 35-, 40, 45-, 50-, 60-, 67.5-, 70-, 80-, 100-, 120-, 137.5-, 140-, 200-mesh, and Pan.

The 35/120-mesh fraction is reported in Wanipigow glass sand resource estimate because this size fraction has been assessed, and beneficiated, to glass quality sand. Size fractions between the reported size fractions were combined so that the number of variables requiring estimation is reduced. For example, the size fractions 137.5 is merged with 140, 200, and Pan.

While the 30 and Pan size fractions are not required to calculate the size fractions of economic importance, they were modeled to ensure all material is accounted for in the final block model. Figure 14.2 and Table 14.3 details the raw distribution and statistics of the size fractions that were used during the estimation of the Wanipigow glass sand resource estimate.

The Wanipigow glass sand resource estimate focuses on the LBI geo unit. While the frac sand resource estimate examined interstitial BS and overlying UBI to calculate an estimate of the overall volume/tonnage of waste material within the resource area, LBI is represents the primary geounit within the glass sand resource area. The Pgf unit is ubiquitous throughout the Wanipigow Property; within the glass sand resource area, the Pgf extends from the surface to depths of between 4.4 and 9.0 m.

Figure 14.2. Histograms of raw size fractions analyses completed on samples collected from the LBI.

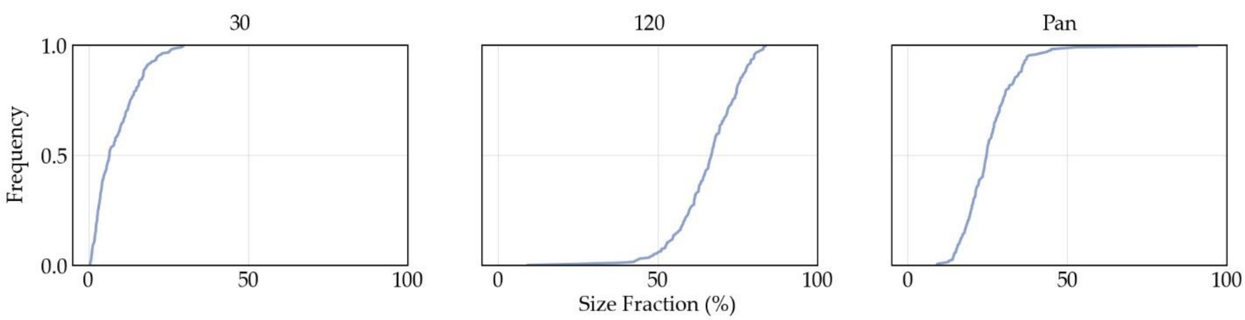


Table 14.3 Summary statistics of raw size fractions analyses completed on samples collected from the LBI. (Abbreviations: std – standard deviation, var – variance, CV – coefficient of variation, 25% – 25-percentile, 50% – 50-perceitnile or median, 75% – 75-percentile).

Unit	Size Fraction	count	mean	std	var	CV	min	25%	50%	75%	max
	30	207	8.70	6.56	6.80	46.27	0.78	0.40	3.04	6.56	13.07
LBI	120	207	65.74	66.70	10.39	107.86	0.16	9.20	59.86	66.70	73.40
	Pan	207	25.56	24.63	8.78	77.15	0.34	9.17	19.83	24.63	29.72

14.2.2 Data QA/QC

With respect to quality assurance-quality control, the reader is referred to Section 12 Data Verification.

APEX was commissioned by CPS to oversee the geology aspects of the 2018 drill program at the Wanipigow Property, including collar surveying, geological logging, sample collection (at nominal 1.5 m sample lengths), sample collection for density and proppant characterization test work, chain of custody, and laboratory coordination. This work was overseen by Ms. Hough P. Geo. under the direction of the Mr. Eccles, P. Geol.

The QP's conducted a site inspection at the Wanipigow Property on March 4-6, 2019, in which the authors visited select drill sites and participated in an active backhoe trench site. This enabled Mr. Eccles to verify – in the field setting -- the Pgf and UBI geological units. Archived drill samples were reviewed enabling the senior author to verify the BS and LBI units (which were not obtainable using a backhoe). The samples reviewed were duplicates of samples sent for gradation analysis and proppant characterization test work. To reiterate, the LBI represents the dominate geounit within the glass sand resource area.

The analytical and beneficiation methods carried out by the independent laboratories are standard and routine in the field of silica sand, proppant, and glass characterization test work.

14.2.3 MICROMINE Database and Validation

All data related to the resource model and estimation were initially prepared in Microsoft Excel spreadsheets and as ArcGIS spatial and attribute data prior to importing the data into MICROMINE. The following datasets were imported into MICROMINE:

- Drillholes – the drillhole collar and down hole survey file.
- Assay file – the estimation file comprising all particle size/gradation analyses.
- Geology file – logged position of the individual litho-units/geological units.
- LiDar survey – the bare-earth surface topography survey at 1 m resolution.

A drillhole database is created within MICROMINE and the data are validated to identify any omissions and discrepancies in the data. No validation errors were encountered.

As part of this Technical Report, the authors used high-resolution bare-earth LiDar as the most reliable surface model and, accordingly, to fine-tune the collar elevations (see Section 10, Drilling for changes to original non-surveyed collar elevations). No major collar elevation concerns were identified.

14.3 Estimation Domain Definition

14.3.1 Geological Interpretation and Modeling

All 93 sonic drillholes completed by CPS in 2018 have geological information such as litho-stratigraphic formation contacts and were used to model the geology at the Wanipigow Property. Stratigraphic formation tops were used to create a 3-D geological model within MICROMINE. Stratigraphic horizons modelled and wireframed in the interpretation process include the:

- The LBI unit being the focus of this resource estimate.
- Pgf, UBI, and BS units that are considered waste material overlying LBI.

There is unequivocal distinction in all drillholes at the upper LBI contact and the BS shale contact (i.e., grey-white silica sand versus black shale).

With respect to flagging the non-recovery interval within a geological unit, there are rare drillhole intervals within the Pgf and LBI that had poor to no core recovery (see Table 14.1). If the areas of no core return are bounded by intervals logged as Pgf or LBI, our modeling assumes the missing interval is within the respective sandstone unit (this was also confirmed by the logging geologist). This method is acceptable, especially in these instances, because of the general lateral and vertical stratigraphic consistency of the sandstone units.

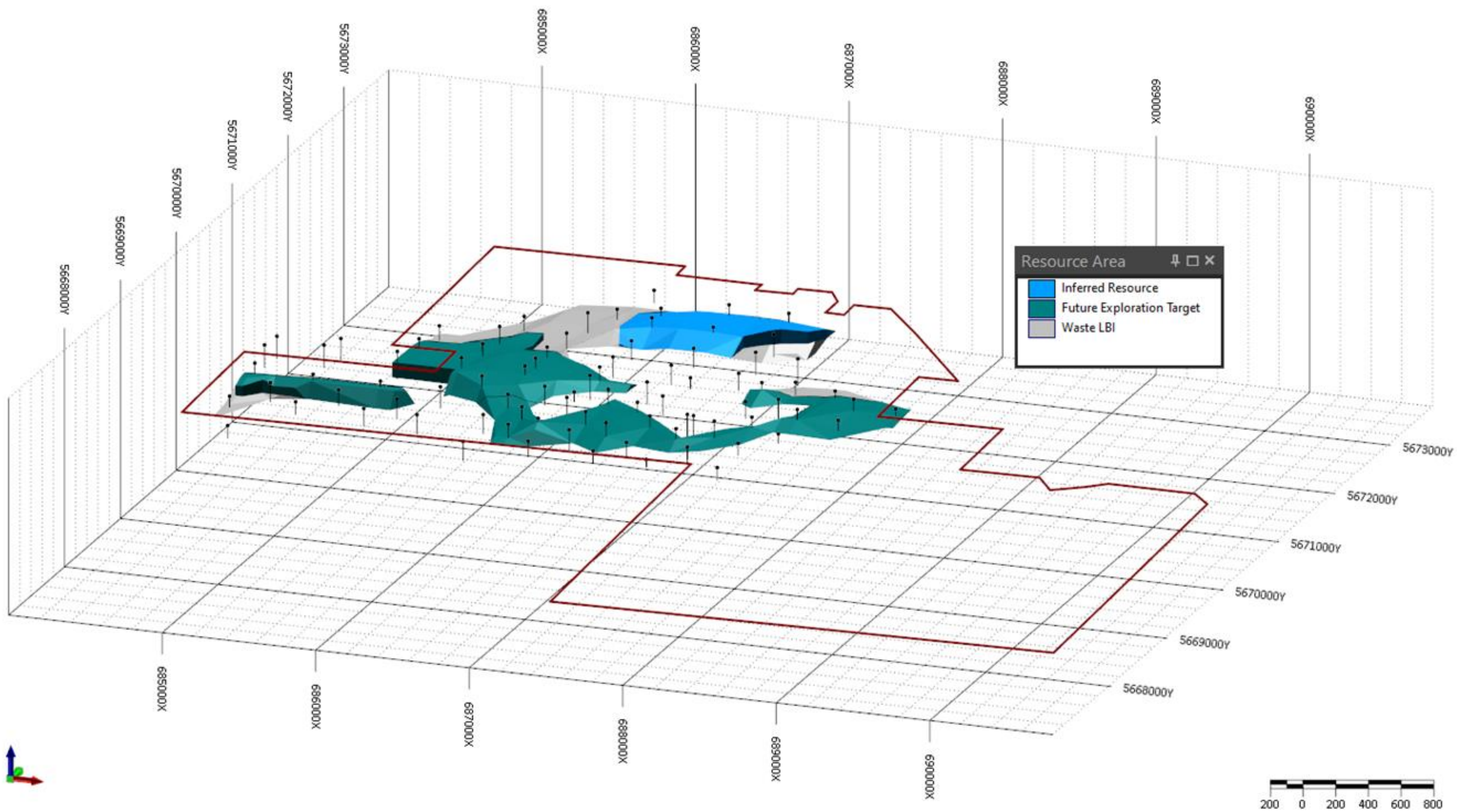
The 3-D geological wireframes of the Pgf, UBI, BS and LBI units were created by modeling 3-D sectional interpretations along drillhole fences running west-east that are used to generate solids. All drillholes except for 5 (5% of the total drillholes), penetrated the top of the underlying Precambrian basement which defines the base of the units of interest. The 3-D geological model limited to areas with drillhole control, reducing concerns of overextending the geological interpretation. The 3-D geological model is clipped to the LiDar DEM surface (Figure 14.3).

The main glass sand resource area is fully contained within the LBI sand unit defined in 5 drillholes and is spatially constrained within a known clean LBI sand area at the Property. The clipped main glass sand resource surface area is 3.49 km^2 or 862-acres. Additional regions within the Wanipigow Property with distinct LBI sand is assessed as a future exploration target.

14.3.2 Block Model Parameters

The block model used for the calculation of the Wanipigow glass sand resource estimate fully encapsulates the LBI unit. When determining block model parameters, data spacing is the primary consideration in addition to ensuring the volume of the 3-D geological models are adequately captured.

Figure 14.3 Oblique view of modelled formations (vertical exaggeration of 7:1). The main glass sand resource area is in teal and occurs within the LBI sand unit (grey). The future exploration target is presented in green. The location of the 2018 drillholes are shown as pins.



Drill spacing within the main glass sand resource area varies from 150 to 429 m (median drillhole spacing is 278 m). The data spacing of irregularly spaced drilling can be approximated using a block model and calculating the 90-percentile of the distance from each block's centroid to the nearest sample. Estimation errors are introduced when kriging is used to estimate grade for blocks with a size greater than 25% of the data spacing.

As illustrated in Figure 14.4, the 90-percentile distance from each block's centroid to the nearest composite sample is 212 m for the Wanipigow Glass Sand Project. The block model is validated in Section 14.4.

Based on the data spacing and the detail of the 3-D geological models, a block model with a block size of 20 m x 20 m in the horizontal directions and 2 m in the vertical direction is generated. The final block model is 4,300 m long in the east-west direction, 3,580 m long in the north-south direction and 84 m deep (Table 14.4).

A block factor (BF) is calculated for each of the formations that represents the percentage of the block volume that lies within each formation.

Figure 14.4 Histogram illustrating the distance from each block's centroid to the nearest composite sample (NN, red line) and the distance between each drillholes nearest neighbour (collars, blue line). Abbreviations: n – number of observations; m – mean; σ – standard deviation; CV – coefficient of variation; x_{max} – maximum value; x_{75} – 75-percentile; x_{50} – 50-percentile or median; x_{25} – 25-percentile; x_{min} – minimum value; NN – nearest neighbour; x_{90} – 90-percentile.

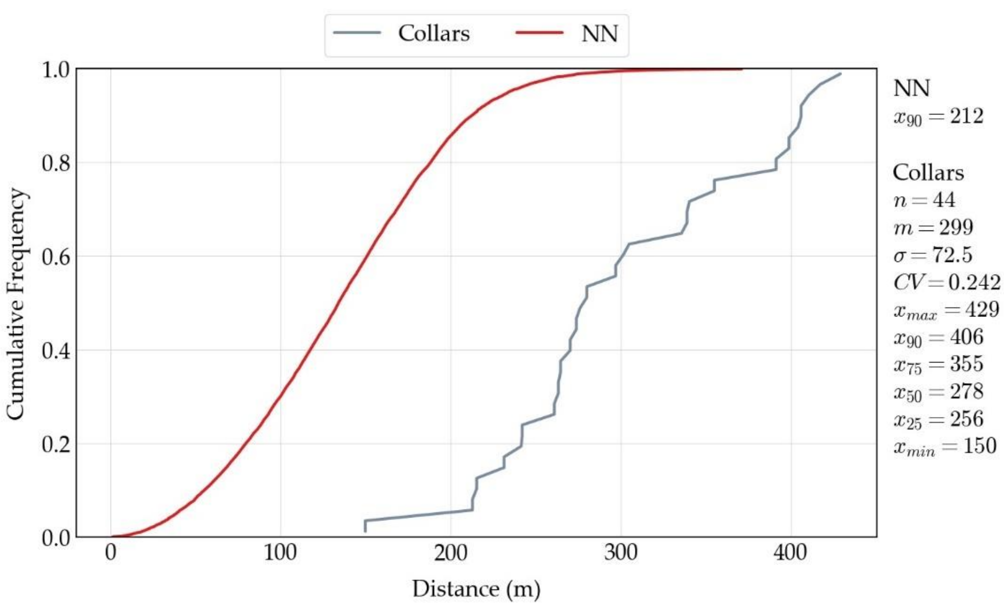


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Table 14.4 Wanipigow Property block model size and extent.

Axis	Number of Blocks	Parent Block Size (m)	Minimum Extent (m)	Maximum Extent (m)
X (Easting)	214	20	683990	688270
Y (Northing)	178	20	5670070	5673630
Z (Elevation)	41	2	199	281

14.3.3 Volumetric Checks

A comparison of wireframe volume versus block model volume is performed to ensure there is no considerable over- or under-stating of tonnage (Table 14.5). The calculated block factor for each block is used to scale its volume when calculating the total volume of the block model. The volume difference is insignificant (total of -0.04%).

Table 14.5 Wireframe versus block-model volume comparison.

Unit	Wireframe Volume (m^3)	Block Model Volume (m^3)	Volume Difference (%)
LBI	23,075,941	23,067,613	-0.04%

14.4 Grade Estimation

14.4.1 Introduction

The block model was used to calculate the Wanipigow glass sand resource estimate of the different percentages of silica sand retained on the various screen sizes. The mineral resources were estimated using the ordinary kriging technique. Only the composites located within the LBI wireframe was used to condition the grade estimate of each block located within each respective wireframe.

14.4.2 Compositing

Downhole sample length analysis shows that the drillhole samples range from 0.4 m to 2.2 m with a dominant sample length of 1.5 m. Note: the largest sample interval including non-sample intervals described in Section 14.1.1 was 0.96 m. Subsequently, a composite length of 2.0 m was selected as it provides adequate resolution for mining purposes and is equal to, or larger in length than 97.84% of the drillhole samples (Figure 14.5).

Length-weighted composites are calculated for all samples within the LBI unit. The compositing process starts from the first point of intersection between the drillhole and the LBI wireframe and is stopped upon intersection with the bottom of LBI wireframe. No composites are calculated that straddle the contacts between the LBI and adjoining units.

Instead of enforcing a maximum composite length of 2 m, compositing is completed in a manner that redistributes the composite interval to minimize the number of composites that are less than 1 m in length, also known as orphans. This compositing method does cause some composites with lengths greater than 2 m. However, it is believed that maximizing the number of composites that are approximately 2 m, in favour of maintaining a strict maximum composite length of 2 m, mitigates error introduced to the model.

The final lengths of the calculated composites are illustrated in Figure 14.6. It is common practice to use only composites with lengths equal to or greater than half of the selected composite length (2 m) for resource estimation. There are 2 composites with lengths less than 1 m; however, as there are so few and that they represent the units in areas where they pinch out, they are not removed.

Figure 14.7 and Table 14.6 detail the composted distribution and statistics of each size fraction used during the estimation of the Wanipigow glass sand resource estimate. The composited samples were used for all sample statistics, capping, estimation input file and validation comparisons.

Figure 14.5 Histogram of raw drillhole sample lengths within the Pgf, UBI, and LBI units. Abbreviations: n – number of observations; m – mean; σ – standard deviation; CV – coefficient of variation; x_{max} – maximum value; x_{75} – 75-percentile; x_{50} – 50-percentile or median; x_{25} – 25-percentile; x_{min} – minimum value.

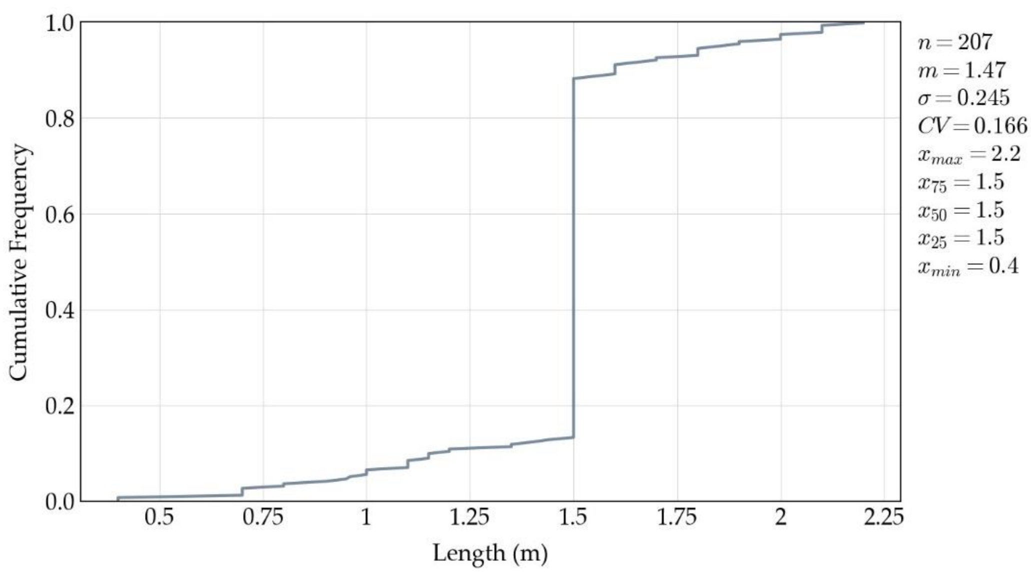


Figure 14.6 Histogram of composite sample lengths within the Pgf, UBI, and LBI units. Abbreviations: n – number of observations; m – mean; σ – standard deviation; CV – coefficient of variation; x_{max} – maximum value; x_{75} – 75-percentile; x_{50} – 50-percentile or median; x_{25} – 25-percentile; x_{min} – minimum value.

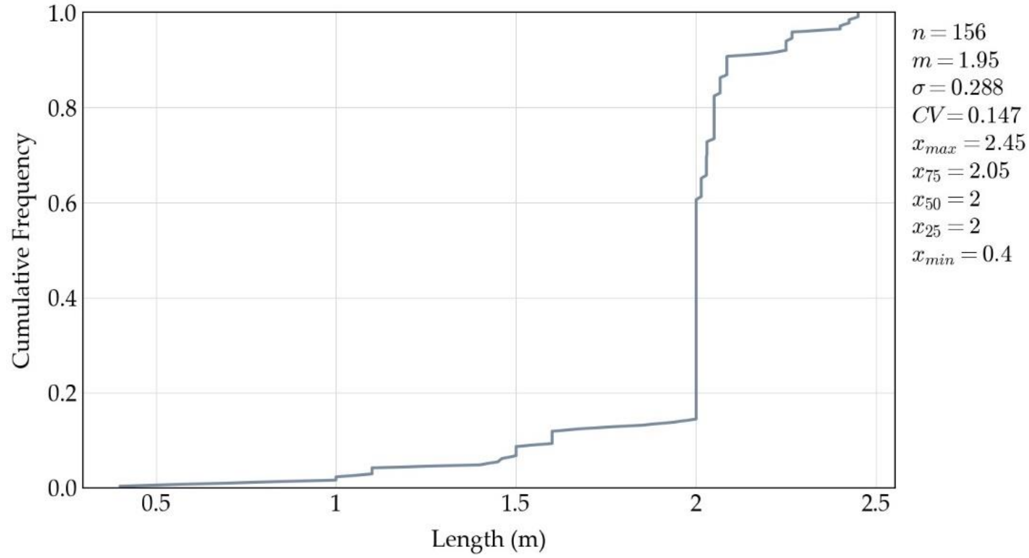


Figure 14.7 Histograms of the composited size fractions analyses completed on samples collected from the LBI unit.

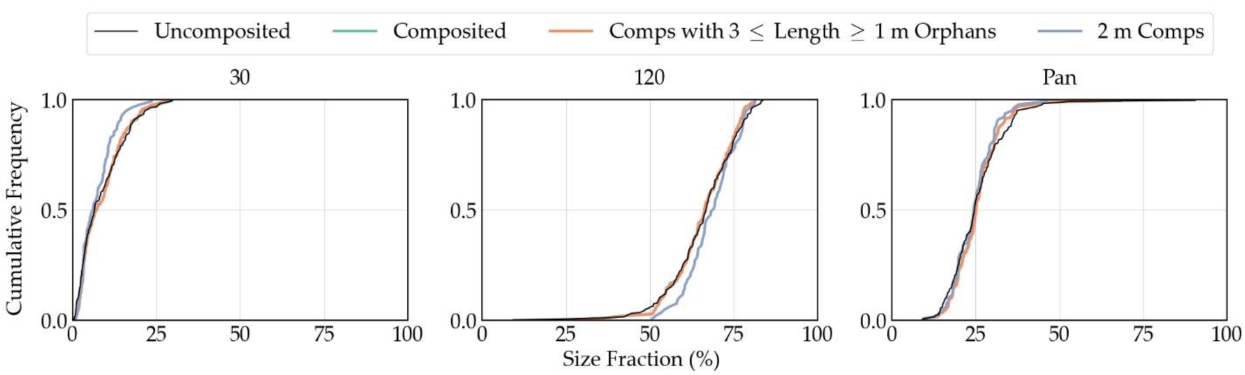


Table 14.6 Summary statistics of composited size fractions analyses completed on samples collected from the Pgf, UBI, and LBI units. Abbreviations: std – standard deviation, var – variance, CV – coefficient of variation, 25% – 25-percentile, 50% – 50-perceitnile or median, 75% – 75-percentile.

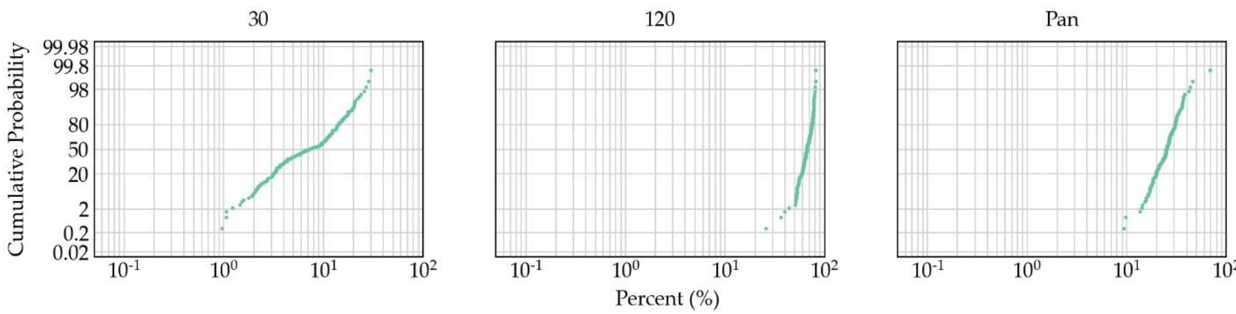
Unit	Size Fraction	count	mean	std	var	CV	min	25%	50%	75%	max
	30	156	8.90	7.21	6.43	41.38	0.72	0.95	3.38	7.21	13.29
LBI	120	156	65.65	66.32	9.25	85.56	0.14	25.86	60.31	66.32	72.73
	Pan	156	25.45	25.10	7.18	51.62	0.28	9.25	20.59	25.10	29.18

14.4.3 Capping

To ensure the size fractions are not overestimated, outlier values that appear higher than expected, relative to the global population, are replaced with a maximum cap value. Extreme outlier values are valid measurements; however, their spatial continuity is limited compared to the global population, and without treatment, they unreasonably influence the calculated average value.

A probability plot illustrating all raw sieve measurements is used to identify outlier values. Figure 14.8 illustrates a probability plot for each of the size fractions being estimated. Each sample is displayed as a single point with outliers being those that breakaway at the high end of the distribution from the low angle (toward higher values) relative to the denser points. No extreme values that require treatment were identified; therefore, no capping was applied.

Figure 14.8 Probability plots of all composited size fractions analyses completed on samples collected from the Pgf (green dots), UBI (orange dots), and LBI (blue dots) units.



14.4.4 Variography

The authors calculated and modelled semi-variograms for selected size fractions using the 2 m composites flagged within the LBI wireframe. Given the flat lying nature each unit and the lack of horizontal anisotropy, the variograms for all size fractions are modeled using an omnidirectional horizontal semi-variogram and a vertical semi-variogram. Experimental semi-variograms were calculated along the horizonal plane and vertical principal directions of continuity as defined by three Euler angles.

Euler angles describe the orientation of anisotropy as a series of rotations (using a left-hand rule) that are as follows:

1. A rotation about the Z-axis (azimuth) with positive angles being clockwise rotation and negative representing counterclockwise rotation.

2. A rotation about the X-axis (dip) with positive angles being counterclockwise rotation and negative representing clockwise rotation.

3. A rotation about the Y-axis (tilt) with positive angles being clockwise rotation and negative representing counterclockwise rotation.

Parameters of the modeled variograms are documented in Table 14.7 and the calculated semi-variogram and models for each size fraction are illustrated in Figure 14.9.

The LBI variograms are well defined, the only exception being the horizontal model for the 50-mesh. However, the Pgf is not as continuous reducing the confidence in the horizontal variograms for all size fractions within the unit. As the UBI is closest geologically to the LBI, the LBI variogram is used when estimating size fractions within the UBI unit.

Table 14.7 Variogram model parameters of each size fraction estimated within the LBI unit.

						Structure 1				Structure 2			
								Ranges				Ranges	
Variable	Az m	Di p	Ti lt	Nugget Effect	Sill	Type	Covariance Contribution	Omni Horizontal	Vertical	Type	Covariance Contribution	Omni Horizontal	Vertical
30	0	0	0	3.93	39.33	Exponential	19.66	1800	11	Spherical	15.73	1800	11
120	0	0	0	8.54	85.39	Exponential	42.70	1500	7	Spherical	34.16	1700	7
Pan	0	0	0	5.16	51.60	Exponential	25.80	800	5	Spherical	20.64	1200	6

14.4.5 Bulk Density

A total of 58 bulk density samples were collected to determine the loose bulk density of the Pgf (n=13 samples), UBI (n=3 samples), BS (n=6 samples), and LBI (n=36 samples). The loose bulk densities were converted to an *in-situ* bulk sand density by utilizing a bulking factor of 30% (see section 11.4). This was done to best replicate the *in-situ* resource of the Winnipeg Formation and overlying Pleistocene surficial material. The bulk density correlates with any potential future mining process that would sample entire sections of bedrock material.

The average *in-situ* density of the bulk sand at the Wanipigow Property was determined to be 1.897 g/cm^3, 1.911 g/cm^3, and 1.878 g/cm^3 the Pgf, UBI, and LBI units respectively (Table 14.8). These density values were used in the resource calculation to estimate the tonnage of sand in the units of interest. The *in-situ* bulk density of the interstitial BS unit is 1.814 g/cm^3.

Figure 14.9 Calculated and modeled semi-variograms (horizontal omnidirectional and vertical) for each sand fraction of interest within the LBI unit.

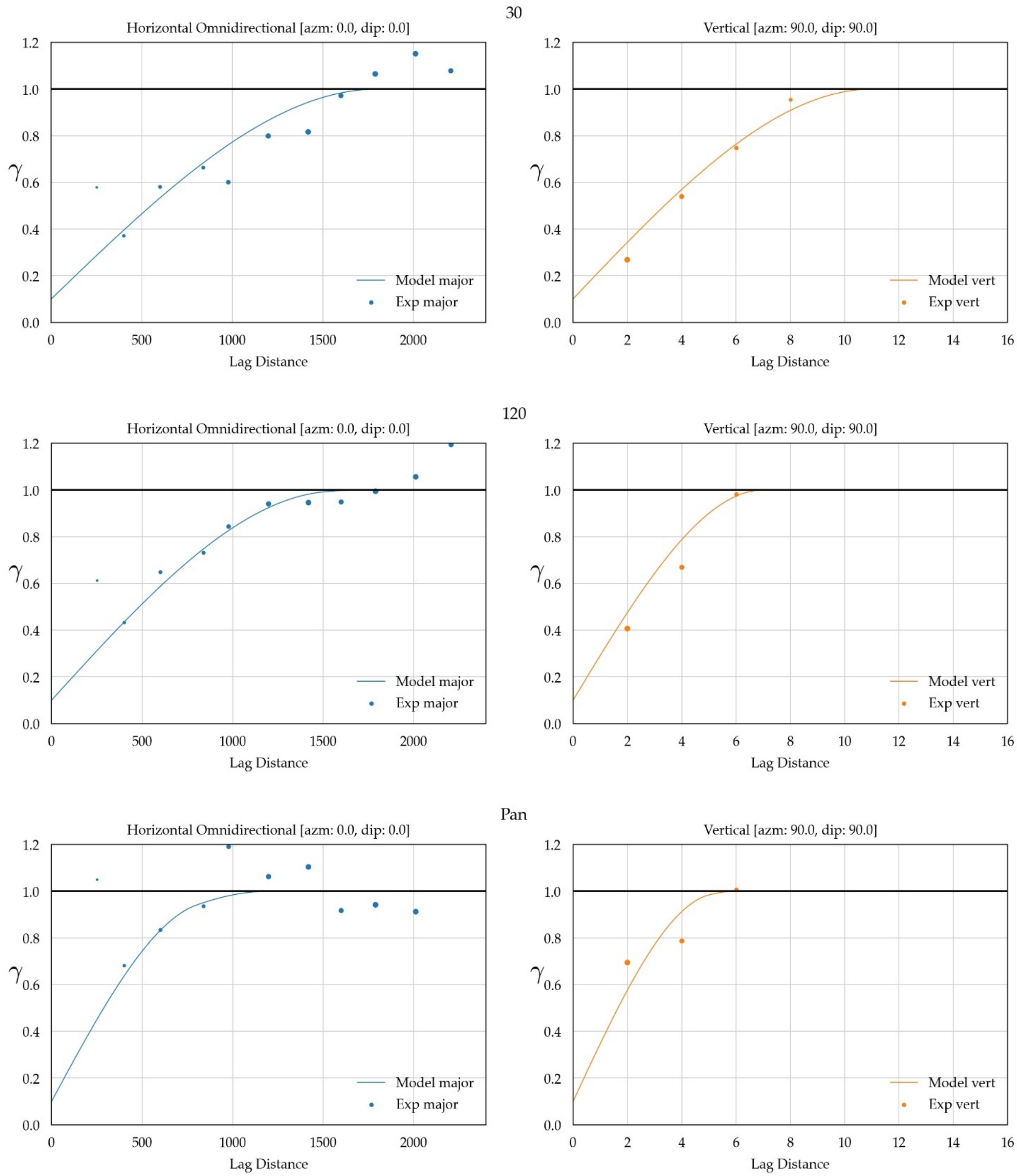


Table 14.8 Summary of density analysis from samples collected during CPS' 2018 drillhole program. The grey-shaded average compacted densities were used in the resource estimations presented in this Technical Report.

Lithology	Count	Average loose bulk density (g/cm^3)	Average compacted bulk density (g/cm^3) [1]
Pleistocene glaciofluvial	13	1.459	1.897
Black Shale	6	1.395	1.814
Upper Black Island	3	1.470	1.911
Lower Black Island	36	1.444	1.878

[1] Utilizing a 30% bulking factor (Mr. R. Farmer, pers. comm., 2019).

14.4.6 Estimation Methodology

Ordinary Kriging (OK) was used to estimate the size fraction values at each parent block that lies within the LBI wireframe. Blocks within the formation are conditioned using only composites within the same formation. The search ellipse orientation and ranges are defined by the variography described in Section 14.3.4.

Volume-variance corrections are enforced by 1) restricting the maximum number of conditioning values to 15; and 2) restricting the maximum number of conditioning values from each drill hole by 3 (for all size fractions). These restrictions are implemented to ensure the estimated models are not over-smoothed, which would lead to inaccurate estimation of global tonnage and grade.

These corrections can cause local conditional bias, but the technique is implemented to ensure that the global estimate of grade and tonnes in the Wanipigow Resource Estimate is accurate.

14.5 Block Model Validation

14.5.1 Visual Validation

The blocks are visually validated in plan view and in cross-section to compare the estimated block size fractions versus the sample composite size fractions. Example cross-sections of this visual validation process – for both the geological wireframing (Pgf, UBI, and LBI and BS waste rock) and composited and estimated size fractions – is presented in Figures 14.10 and 14.11.

Overall, the estimated block size fractions compare well with the composite size fractions.

Figure 14.10 Cross-section along 5673150 m North between selected drillholes to show an example of the 3-D geological and block model. The image illustrates the Pgf (tan), UBI (pink), BS (grey) and LBI (yellow), and the interstitial BS wireframe. Vertical exaggeration of 7:1.

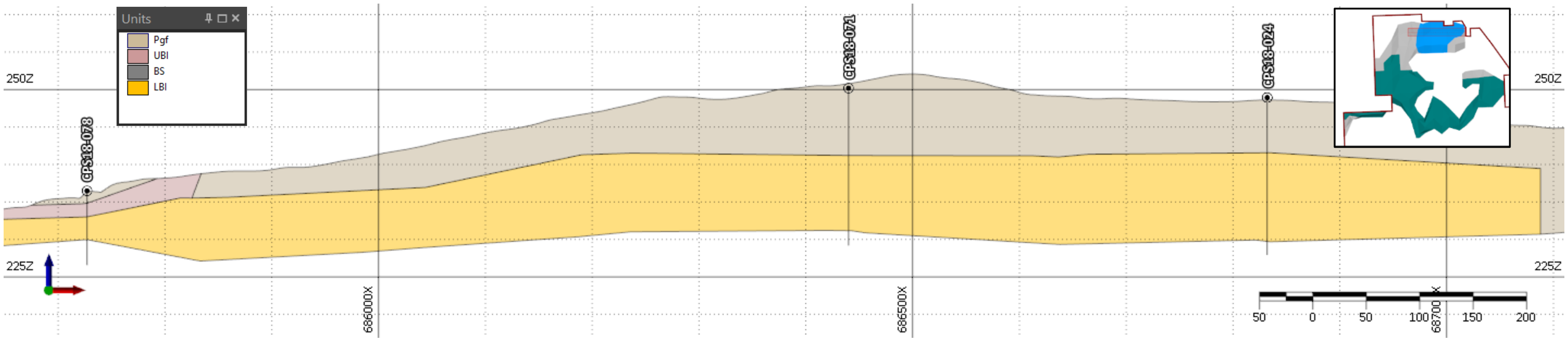
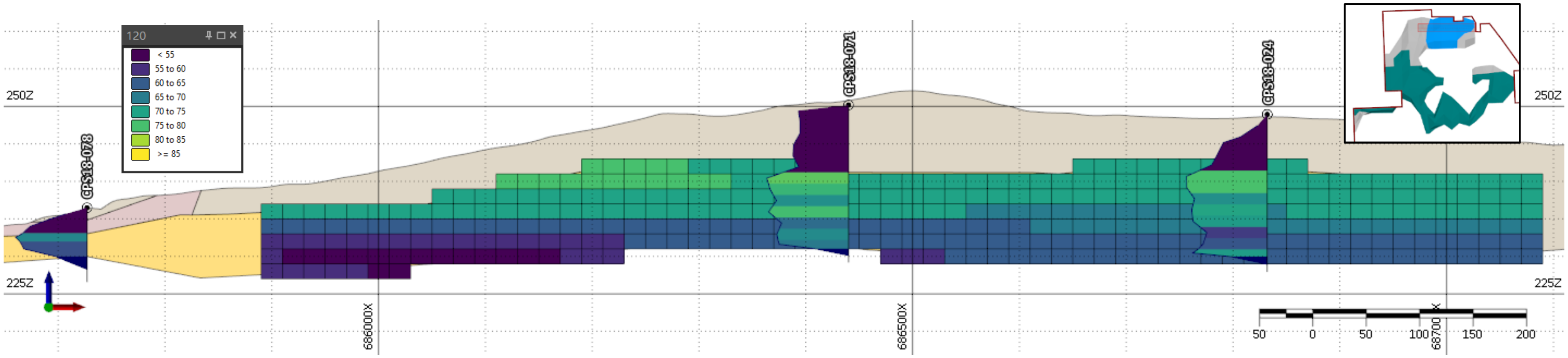


Figure 14.11 Cross-section along 5672800 m North between selected drillholes to show an example of the 3-D geological and block model. The below image illustrates the estimated 70-mesh values compared to composited data. Vertical exaggeration of 7:1.



14.5.2 Statistical Validation

Swath plots are used to verify that directional trends are honoured in the estimated model and identify potential areas of over- or under-estimation. They are generated by calculating the average size fraction between the composites and estimated models within east-west, north-south and vertical slices. The averages are calculated within directional slices: a window of 20 m is used in the east-west and north-south, and 2 m for the vertical slices. Each swath slice is presented in Figure 14.12.

Overall, the trend observed in the composite data LBI unit is reasonably reproduced – particularly in the vertical direction. While the block model trend in the east-west and north-south is relatively flat, the authors suspect variation in the vertical trend essentially models cyclicity within the depositional environment.

Histograms of the size fractions from the composites and the estimated block model are plotted to ensure the final model is not over- or under-smoothed and to check that the histogram of the block model compares well to the input data. All size fractions show good correlation between the block model and the input data (Figure 14.13). Some smoothing, as designated by the slope of the curve, is associated with, for example, the LBI Pan.

Figure 14.12 Swath plots comparing composite versus estimated size fractions within the LBI unit in the east, west, and vertical directions.

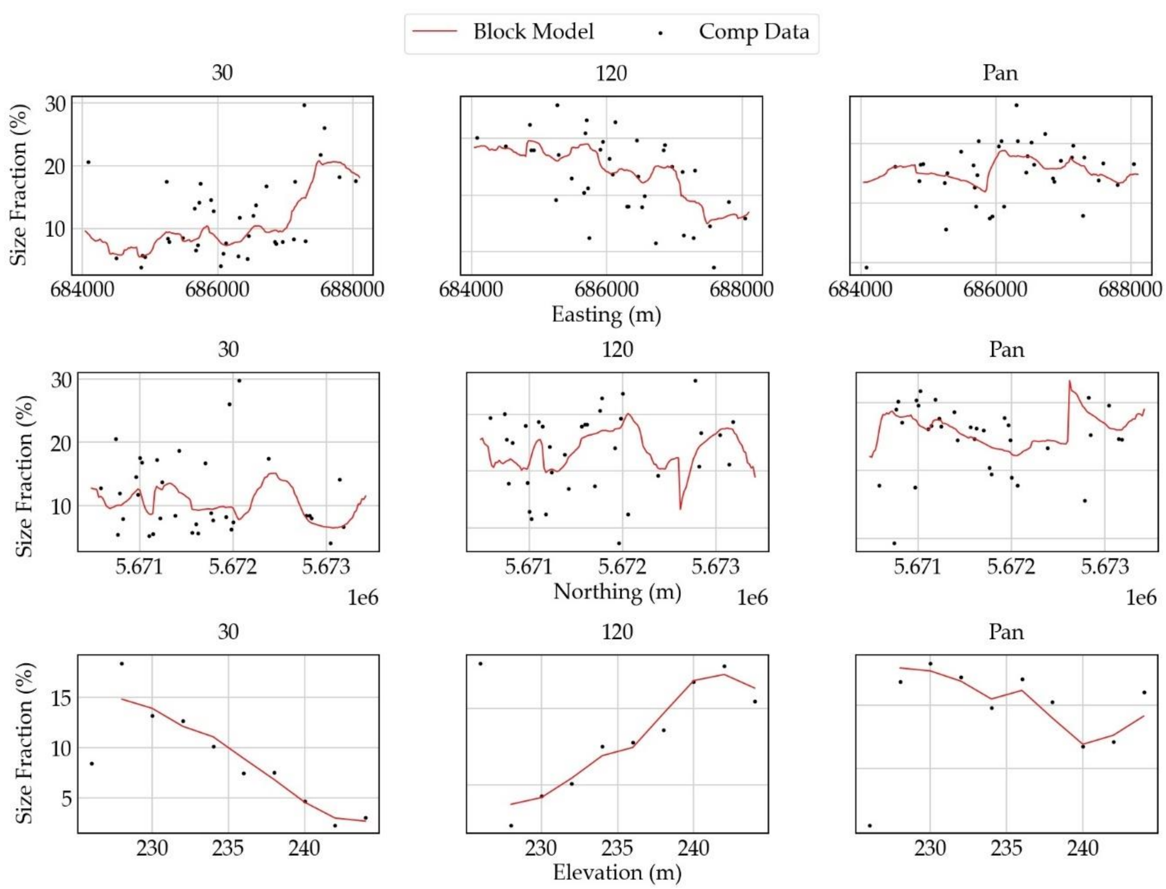
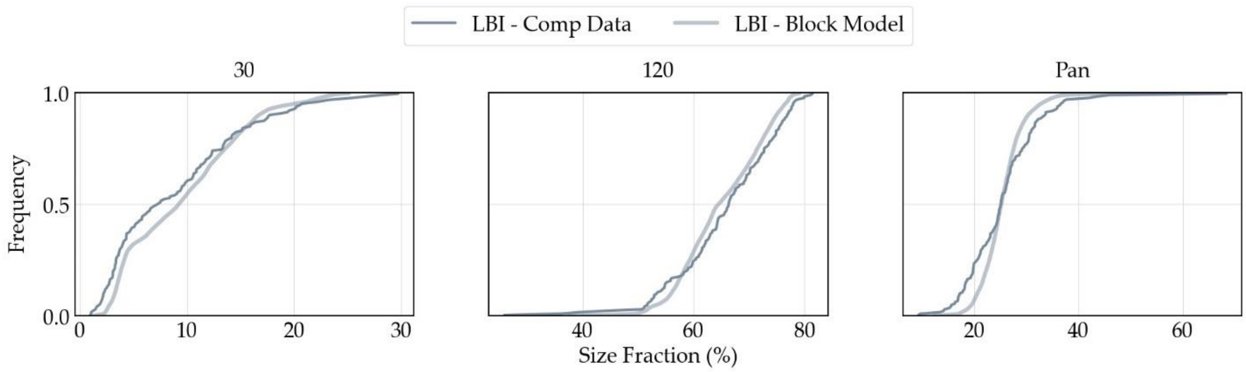


Figure 14.13 Histograms of each size fraction comparing composite versus block model distributions within the LBI unit.



14.6 Mineral Resource Estimate

14.6.1 Definition of Mineral Resource

The Wanipigow glass sand resource estimate has been classified by the senior author and QP in accordance with guidelines established by the CIM "Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines" dated November 29th, 2019, and the CIM "Definition Standards for Mineral Resources and Mineral Reserves" amended and adopted May 10th, 2014. The authors considered all resource classification levels, which in order of increasing geological confidence, are defined as:

> *"**Inferred Mineral Resource** is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity.*
>
> *An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.*

14.6.2 Resource Classification Methodology

The Wanipigow *glass sand resource estimate* is classified according to the CIM definition standards. The authors have considered several factors that include but are not limited to the following factors: drillhole spacing; nature of the geological contacts; the degree of testing; proppant quality, and lateral and vertical continuity. These factors serve as a proxy for geological confidence and the level of uncertainty of the individual units.

Drill spacing is more-or-less consistent throughout the Wanipigow Property and for all assessed geo-units. Nevertheless, focussing on CPS's 2018 exploration campaign and as discussed in Section 14.2.2, the drill spacing 90-percentile distance from each block's centroid to the nearest composite sample is 212 m for the Wanipigow Glass Sand Project. It is the senior author's opinion that this level of drill spacing is adequate to take a non-structurally altered, laterally consistent WCSB rock stratigraphy such as the Ordovician Black Island Member to any level of resource classification. The final level of classification must, therefore, consider the other geological confidence and uncertainty factors for silica sand resource classification.

In accordance with this introduction and assessment by the authors and QP's, the LBI unit within the main glass sand resource area has been classified as an Inferred Resource because:

- Geologically, the upper and lower contacts of the LBI are very well-defined using data from CPS's 2018 drill program. There is an unequivocal distinction in all drillholes as to the specific location the upper and lower LBI contacts. The overlying contact is sharply defined by LBI grey-white silica sand in contrast to black shale of the BS. The basal contact is LBI sitting unconformably on to equally contrasting Precambrian crystalline basement rocks.

- The upper and lower LBI contact confidence levels are such that it is reasonable to confidently predict the LBI contacts with future infill drilling within the CPS 2018 drill and resource estimation area.

- The LBI unit is the best sampled and analytically tested bedrock geo-unit in this study. A total of 230 LBI samples were collected and analyzed for particle size distributions, of which 48 samples reside within the main glass sand resource area.

- The particle size distribution of the LBI sand, and the Krumbein and crush quality of the LBI sand, is very uniform both laterally and vertically in the Wanipigow Glass Sand Project area.

- A potential uncertainty in assigning a higher level of resource classification is the knowledge that the LBI within the glass resource area has not been tested by geochemistry or metallurgical control on a sample-by-sample basis (i.e., every 1.5 m). Rather, only a portion of the LBI in the main glass sand resource area has been assessed for hits chemical composition and subject to metallurgical testing.

The authors therefore have a high level of confidence in, and understanding of, the geology and controls of the LBI geo-unit, but a lower level of confidence in the applicability of the sand unit – on a consistent basis – for higher quality levels of glass manufacturing. Based on these criteria, the resource estimate for the LBI geo-unit is classified as an Inferred Resource.

14.6.3 Evaluation of Reasonable Prospects for Economic Extraction

A Mineral Resource is a concentration or occurrence of a material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The phrase 'reasonable prospects for eventual economic extraction' implies a judgment by the QP in respect of the technical and economic factors likely to influence the prospect of economic extraction. In the following text, the QP and senior author of this Technical Report provides rationale for why the Wanipigow Glass Sand Project has demonstrated and defined criteria for reasonable prospects for economic extraction for a flat glass sand.

- Sand from Black Island near the Wanipigow Glass Sand Project has historically been recognized as the Province of Manitoba's best source of silica sand (Watson, 1985). The island, which is adjacent to the Wanipigow Property, has been mined on and off between 1929 and 2003 for silica sand; mainly for glass manufacturing (Purtich et al., 2014). Note: the authors have been unable to verify this information and therefore the information is not necessarily indicative to the mineralization on the Wanipigow Property.

- The gradation and geochemistry of the LBI silica sand is consistent laterally and vertically over a drill- and geological model-defined main glass sand resource area of 3.49 km^2. The thickness of the LBI geo-unit averages 6.07 m.

- CPS's exploration program and analytical and metallurgical test work has enabled the QP's to develop a high level of confidence in the project via drill and data density, and the positive results of the analytical-metallurgical test work satisfy the specifications of glass product.

- CPS has the potential to manufacture high quality sand feed (ultra high SiO_2 and <0.012% Fe_2O_3) for use in specialty glass products such as solar panels or ultra-clear energy efficient architectural float glass for energy efficient buildings/homes.

- Solar panels and windows are becoming a large part of the Canadian energy solution as evidenced by solar rebate and incentive being implemented by Canada's federal government. This identifies as a significant factor that can influence the specialty glass market demand and the potential success of marketing the Wanipigow LBI sand from within the glass sand resource area.

- The project is situated in southern, central Canada where product distribution could meet demands in eastern and western Canada. The deposit is road accessible and is approximately 160 km northeast of the City of Winnipeg, MB.

To conclude, it is the senior author's opinion that the Wanipigow Glass Sand Project has reasonable prospects for potential economic extraction and utilization in the glass manufacturing market.

14.6.4 Cutoff

A lower cutoff of greater than or equal to 35-mesh (>500 µm) and less than or equal to 120-mesh (<125 µm) fraction is used in the Wanipigow glass sand resource estimate. This cutoff is believed to represent the fraction of mineralized material that qualifies as being economically mineable and is justified by the results of the individual fraction chemical evaluation and metallurgical test work discussed in Section 13.

14.6.5 Mineral Resources Reporting: Wanipigow Glass Sand Resource Estimates

The mineral resource within the Wanipigow Property has been classified as an Inferred Resources in accordance with NI 43-101 and has been estimated in compliance with the CIM "Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines" dated November 29th, 2019, and the CIM "Definition Standards for Mineral Resources and Mineral Reserves" amended and adopted May 10th, 2014.

The main glass sand resource area is fully contained within the LBI sand unit defined in 5 drillholes and is spatially constrained within a known clean LBI sand area at the Property. The clipped main glass sand resource surface area is 3.49 km^2 or 862-acres. The 5 drillholes include CPS18-018, CPS18-019, CPS18-024, CPS18-025, and CPS18-071.

The geological model consists of the following stratigraphic units from surface to depth: Pleistocene glaciofluvial (Pgf); Upper Black Island (UBI); Black Shale (BS); and Lower Black Island (LBI). The uppermost topographic surface is defined by 1 m resolution LiDar data. The resource is estimated within a 3-D geological model of the LBI unit within the glass resource area. In the 3-D geological model, the thickness of the LBI unit is varied from 9.1 m to 15.85 m and averaged 7.9 m.

During CPS's 2018 drill program, a total of 744 samples were collected approximately every 5 feet (1.52 m) within the Pgf, UBI, and LBI geo-units (an additional 17 samples of BS were not included in the resource estimation assay file). Grain size particle distribution analyses was conducted throughout intersections with adequate recovery of the Pgf, UBI, and LBI geo-units for all 93 vertical sonic holes drilled by CPS in 2018. This 'assay' file of gradation data was used to calculate the Wanipigow glass sand resource estimate. A total of 230 samples out of the 744-gradation analyses were collected within the LBI sand sub-member, including 48 LBI samples in the main glass sand resource area.

The resource is calculated using a block model with a size of 20 by 20 m in the horizontal directions and 2 m in the vertical direction. A block factor is calculated for each of the units that represents the percentage of the block volume that lies within each unit. The size fractions of interest are estimated at each parent block using ordinary kriging. The mineral resources were estimated using the ordinary kriging technique for the Pgf, UBI, and LBI units. Only those composites located within the Pgf, UBI, and LBI wireframes are used to condition the grade estimate of each block located with that wireframe.

Nominal *in-situ* sand bulk densities of 1.897 g/cm^3, 1.911 g/cm^3, and 1.878 g/cm^3 were applied to Pgf, UBI, and LBI, respectively. The density values are based on 58 representative bulk density samples collected during the 2018 drill program and include 13 Pgf samples, 3 UBI samples, 6 BS samples, and 36 LBI samples.

The Wanipigow Property estimation of the individual size fractions is completed and reported using a lower cutoff of mesh-sizes that are greater than or equal to 35-mesh and less than or equal to 120-mesh fraction (i.e., the +35 and -120 size fractions are discarded from the estimation process).

Mineral resources are not mineral reserves and do not have demonstrated economic viability. This Inferred Wanipigow Glass Sand Resource Estimate predicts the following total (i.e., global) Lower Black Island Inferred Resources of 7.25 million tonnes (Table 14.9).

With respect to unequivocal waste rock, the overburden and/or the Pgf geo-unit overlying the LBI resource has an estimated volume of 6,180,900 m^3 for a total weight of 11.73 million metric tonnes. The density of the Pgf was taken from compacted *in-situ* material bulk density tests on 13 samples that average 1.897 g/cm^3.

Table 14.9 The Wanipigow Glass Silica Sand Inferred Resource Estimate reported for the LBI sandstone geo-unit as a total (global) volume and tonnage.

	Volume (m^3)	**Metric tonnes**
Inferred Resource	**3,861,000**	**7,250,000**

Note 1: Mineral resources are not mineral reserves and do not have demonstrated economic viability. The estimate of mineral resources may be materially affected by geology, environment, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.
Note 2: The weights are reported in metric tonnes (1,000 kg or 2,204.6 lbs).
Note 3: The 'Total' (global) volume and weights are estimated on a global basis and represent the main Inferred Wanipigow Glass Sand Resource Estimate.
Note 4: The Wanipigow estimation of the individual sieve size fractions was completed and reported using a lower cutoff of mesh-sizes that are greater than or equal to 35-mesh and less than or equal to 120-mesh fraction.
Note 5: *In-situ* compacted bulk densities used include: Pgf: 1.897 g/cm^3; UBI: 1.911 g/cm^3; LBI: 1.878 g/cm^3. Bulk densities are utilized to convert volume (cubic metres) to tonnage.

14.6.6 Sensitivity Analysis

The resource model was iterated and tested at progressively higher block values – comparable to using the SUMIF function – to determine the commensurate tonnages by way of sensitivity analysis. Incrementally higher block values are increased in increments of 5% and applied to the resources in the 35/120 size fraction for LBI. The analysis is intended to show how the resource, and its respective size fractions, dissipate at higher simulated block values.

The 35/120 fraction has resources continuing in the LBI unit to final block cutoff value of 75% (Table 14.10).

Table 14.10. Sensitivity analysis using incrementally higher block cutoff percentages until the inferred resource runs out within the LBI geo-unit.

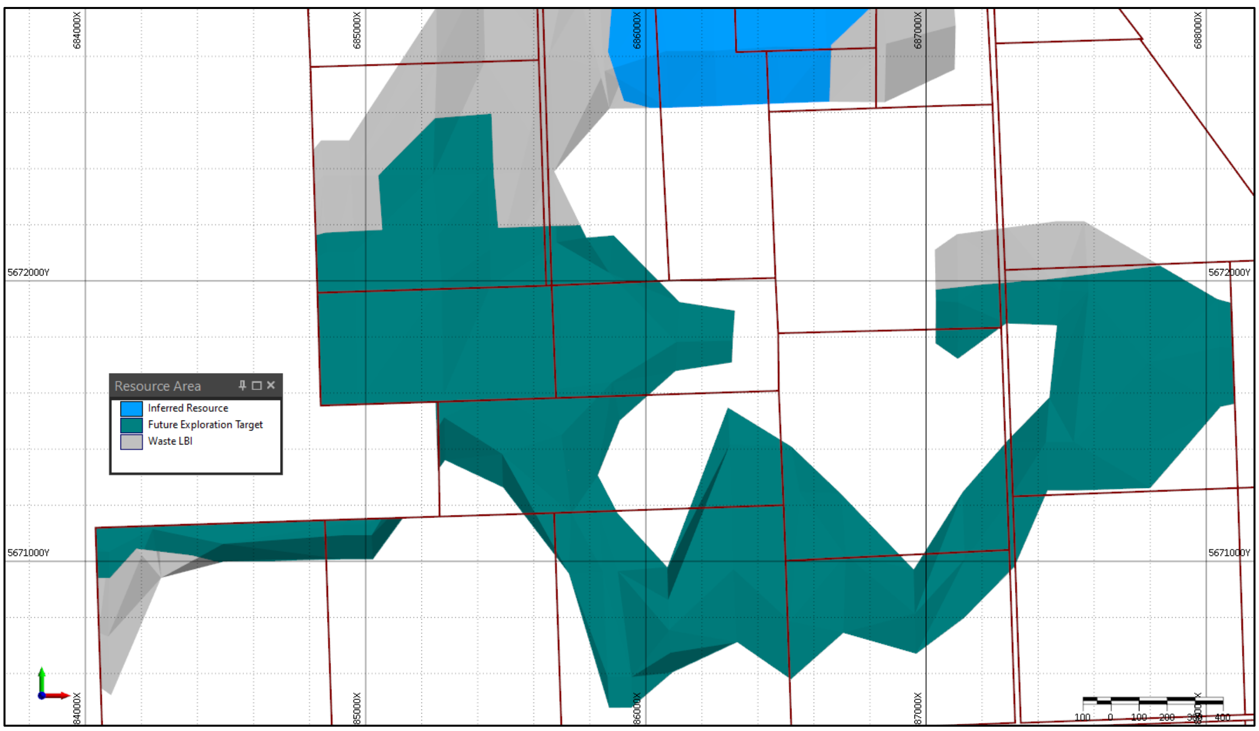
Cutoff	Volume	Tonnes
0	3,861,000	7,250,000
5	3,861,000	7,250,000
10	3,861,000	7,250,000
15	3,861,000	7,250,000
20	3,861,000	7,250,000
25	3,861,000	7,250,000
30	3,861,000	7,250,000
35	3,861,000	7,250,000
40	3,861,000	7,250,000
45	3,861,000	7,250,000
50	3,861,000	7,250,000
55	3,666,000	6,885,000
60	3,202,000	6,012,000
65	2,138,000	4,016,000
70	1,438,000	2,700,000
75	170,000	319,000
80	0	0

14.6.7 Future Exploration Target

In addition to the main glass sand resource area, a future exploration target has been evaluated at the Wanipigow Property by depicting clean sand LBI units in other parts of the Wanipigow Property (Figure 14.14). The exploration target was calculated in the same way the inferred resource was and by applying a plus or minus percentage of 10% to define an exploration target of between 19.06 million tonnes and 23.30 million tonnes.

The potential quantity is conceptual in nature as there has been insufficient exploration to define a mineral resource and it is uncertain if further test work and/or marketing will result in the exploration target being delineated as a 'mineral resource'.

Figure 14.14 Outline of the future exploration target area (in green).



APEX Geoscience Ltd.

14.7 Reiteration of CPS's Proppant, or Frac Sand, 2020 Mineral Resource Estimates

This sub-section reiterates mineral resource information from a previous Preliminary Feasibility Study effectively dated March 19, 2020. It is included into CPS's current Technical Report because the frac sand resource is still material to the Company. CPS completed the Preliminary Feasibility Study technical report – for silica sand used for proppant, or frac sand – in a significantly larger area that the glass sand resource area. The frac sand resource estimate encompassed an area defined by 22 Quarry Leases within the Wanipigow Property.

Based on the drillhole logs and resulting gradation analyses, a 3-D geological model was used to define the following geological units, from base to top 1) Lower Black Island, 2) Upper Black Island, 3) black shale, and 4) Pleistocene glacial fluvial surficial material. The resource was calculated using a block model with a size of 20 by 20 m in the horizontal directions and 2 m in the vertical direction. Ordinary Kriging (OK) was used to estimate the size fraction values at each parent block that lies within the Lower Black Island, Upper Black Island, and Pleistocene glacial wireframes. Nominal *in-situ* sand bulk densities of 1.897 g/cm^3, 1.911 g/cm^3, and 1.878 g/cm^3 were applied, respectively, to the individual geological units.

The Wanipigow Property Silica Sand Resource Estimate has been classified by the senior author and QP in accordance with guidelines established by the CIM "Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines" dated November 29th, 2019, and the CIM "Definition Standards for Mineral Resources and Mineral Reserves" amended and adopted May 10th, 2014.

The Wanipigow Property estimation of the individual size fractions is completed and reported using a lower cutoff of mesh-sizes that are greater than or equal to 20-mesh and less than or equal to 140-mesh fraction (i.e., the +20 and -140 size fractions are discarded from the estimation process).

Mineral resources are not mineral reserves and do not have demonstrated economic viability. This Wanipigow Frac Sand Resource Estimate predicts the following total (i.e., global) resources:

- Lower Black Island Measured & Indicated Resources of 39.2 million tonnes (Table 14.11).
- Upper Black Island Indicated Resource of 3.1 million tonnes and Inferred Resource of 1.7 million tonnes (Table 14.11)
- Pleistocene glaciofluvial Inferred Resource of 93.0 million tonnes (Table 14.12).

The 2020 Preliminary Feasibility Study and Wanipigow silica sand resource estimations as they pertain to proppant, or frac sand, remains a materially current resource/reserve to CPS.

Table 14.11 The Wanipigow Silica Sand Measured and Indicated Resource Estimates reported for the UBI and LBI sandstone geo-units as a total (global) volume and tonnage (the total Measured & Indicated resources are presented in the grey highlighted bold text). Selected proppant size fraction distributions of 20/40, 30/50, 40/70, 50/140 and 70/140 mesh are also shown.

		Volume (m^3)			Tonnes (1000 kg)			Tons (907.2 kg)		
Classification	**Size Fraction**	**Pgf**	**UBI**	**LBI**	**Pgf**	**UBI**	**LBI**	**Pgf**	**UBI**	**LBI**
Measured	**20/40**	/	/	3,600,000	/	/	6,800,000	/	/	7,500,000
	30/50	/	/	5,600,000	/	/	10,500,000	/	/	11,600,000
	40/70	/	/	7,700,000	/	/	14,500,000	/	/	16,000,000
	50/140	/	/	12,000,000	/	/	22,500,000	/	/	24,900,000
	70/140	/	/	7,500,000	/	/	14,200,000	/	/	15,600,000
Measured Total		/	/	18,900,000	/	/	35,500,000	/	/	39,100,000
Indicated	**20/40**	/	100,000	400,000	/	300,000	700,000	/	300,000	800,000
	30/50	/	300,000	600,000	/	600,000	1,100,000	/	700,000	1,200,000
	40/70	/	700,000	800,000	/	1,300,000	1,500,000	/	1,400,000	1,600,000
	50/140	/	1,200,000	1,200,000	/	2,400,000	2,300,000	/	2,600,000	2,500,000
	70/140	/	800,000	800,000	/	1,500,000	1,400,000	/	1,700,000	1,600,000
Indicated Total		/	1,600,000	1,900,000	/	3,100,000	3,700,000	/	3,400,000	4,000,000
M&I Total		**/**	**1,600,000**	**20,900,000**	**/**	**3,100,000**	**39,200,000**	**/**	**3,400,000**	**43,200,000**

Note 1: Mineral resources are not mineral reserves and do not have demonstrated economic viability. The estimate of mineral resources may be materially affected by geology, environment, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.

Note 2: The weights are reported in metric tonnes (1,000 kg or 2,204.6 lbs) and United States short tons (2,000 lbs or 907.2 kg).

Note 3: Numbers may not add up due to rounding of the resource values percentages (rounded to the nearest 100,000 unit).

Note 4: The product size fractions overlap and are not cumulative.

Note 5: The 'Total' (global) volume and weights are estimated on a global basis and represent the main Measured & Indicated LBI and UBI Silica Sand Resource.

Note 6: The Wanipigow estimation of the individual sieve size fractions was completed and reported using a lower cutoff of mesh-sizes that are greater to or equal to 20-mesh and less than or equal to 140-mesh fraction.

Note 7: *In-situ* compacted bulk densities used include: Pgf: 1.90 g/cm^3; UBI: 1.91 g/cm^3; LBI: 1.88 g/cm^3. Bulk densities are utilized to convert volume (cubic metres) to tonnages.

Table 14.12 The Wanipigow Property Silica Sand Inferred Resource Estimates reported for the Pgf and UBI sandstone geo-units as a total (global) volume and tonnage (grey highlighted bold text). Selected proppant size fraction distributions of 20/40, 30/50, 40/70, 50/140 and 70/140 mesh are also shown.

		Volume (m^3)			Tonnes (1000 kg)			Tons (907.2 kg)		
Classification	**Size Fraction**	**Pgf**	**UBI**	**LBI**	**Pgf**	**UBI**	**LBI**	**Pgf**	**UBI**	**LBI**
Inferred	**20/40**	9,800,000	100,000	/	18,700,000	200,000	/	20,600,000	300,000	/
	30/50	12,400,000	200,000	/	23,400,000	400,000	/	25,800,000	400,000	/
	40/70	15,700,000	300,000	/	29,800,000	600,000	/	32,800,000	700,000	/
	50/140	32,300,000	700,000	/	61,300,000	1,300,000	/	67,600,000	1,400,000	/
	70/140	23,500,000	400,000	/	44,600,000	900,000	/	49,200,000	900,000	/
Inferred Total		**49,000,000**	**900,000**	**/**	**93,000,000**	**1,700,000**	**/**	**102,600,000**	**1,900,000**	**/**

Note 1: Mineral resources are not mineral reserves and do not have demonstrated economic viability. The estimate of mineral resources may be materially affected by geology, environment, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.
Note 2: The weights are reported in metric tonnes (1,000 kg or 2,204.6 lbs) and United States short tons (2,000 lbs or 907.2 kg).
Note 3: Numbers may not add up due to rounding of the resource values percentages (rounded to the nearest 100,000 unit).
Note 4: The product size fractions overlap and are not cumulative.
Note 5: The 'Total' (global) volume and weights are estimated on a global basis and represent the main Inferred Pgf and UBI Silica Sand Resource.
Note 6: The Wanipigow estimation of the individual sieve size fractions was completed and reported using a lower cutoff of mesh-sizes that are greater to or equal to 20-mesh and less than or equal to 140-mesh fraction.
Note 7: *In-situ* compacted bulk densities used include: Pgf: 1.90 g/cm^3; UBI: 1.91 g/cm^3; LBI: 1.88 g/cm^3. Bulk densities are utilized to convert volume (cubic metres) to tonnages.

15 Reiteration of CPS's Proppant, or Frac Sand, 2020 Mineral Reserve Estimates

This section does not pertain to the Inferred Wanipigow Glass Sand Resource Estimate presented in this Technical Report. Rather it reiterates information from a previous and outdated Preliminary Feasibility Study effectively dated March 19, 2020, into CPS's current Technical Report.

The Mineral Reserve was derived from the Measured and Indicated Mineral Resource estimates and represents the portion of the Mineral Resource that has been converted to a Mineral Reserve through the application of appropriate Modifying Factors to potential mining volumes created during the mine design and planning process. The estimation was performed using industry-accepted practices and is reported in accordance with the 2014 CIM Definition Standards.

A Mineral Reserve is defined as the Measured and Indicated Mineral Resource that would be extracted by the mine design and which can then be processed and sold at a profit. The Measured resources meeting that standard are herein classified as Proven mineral reserves, while the Indicated resources meeting that standard are classified as Probable mineral reserves.

The Mineral Reserve was derived from the Measured and Indicated Mineral Resource estimates and represents the portion of the Mineral Resource that has been converted to a Mineral Reserve through the application of appropriate Modifying Factors to potential mining volumes created during the mine design and planning process.

The mineral reserve expressed as saleable product tonnages estimates Proven & Probable reserves of:

- 21.3 million tonnes of LBI; and
- 2.8 million tonnes of UBI (see Table 15.1).

The Mineral Reserves estimated for the Wanipigow Silica Sand Project are subject to the types of risks common to most silica sand quarry operations that exist in Canada. These risks include but are not limited to site-specific mining and geological conditions, management and personnel capabilities, availability of funding to properly operate and capitalise the operation, variations in cost elements and market conditions, developing and operating the mine in an efficient manner, unforeseen changes in legislation and new industry developments.

Given the data available at the time the Preliminary Feasibility Study was prepared, the estimate presented herein is considered reasonable. However, the Mineral Reserve estimate should be accepted with the understanding that additional data and analysis available subsequent to the effective date of the estimate may necessitate revision. These revisions may be material. There is no guarantee that all or any part of the estimated Mineral Resource or Mineral Reserve will be recoverable.

Table 15.1 Wanipigow Mineral Reserve Estimates.

		Tonnes (1000 kg)			Tons (907.2 kg)		
Classification	Size fraction	UBI	LBI	UBI + LBI	UBI	LBI	UBI + LBI
Proven	20/40	/	3,444,000	3,444,000	/	3,796,000	3,796,000
	40/70	/	8,300,000	8,300,000	/	9,149,000	9,149,000
	70/140	/	8,166,000	8,166,000	/	9,001,000	9,001,000
	Proven Total	**/**	**19,910,000**	**19,910,000**	**/**	**21,946,000**	**21,946,000**
Probable	20/40	261,000	282,000	543,000	288,000	311,000	599,000
	40/70	1,173,000	525,000	1,698,000	1,293,000	579,000	1,872,000
	70/140	1,354,000	595,000	1,949,000	1,493,000	656,000	2,149,000
	Probable Total	**2,788,000**	**1,402,000**	**4,190,000**	**3,074,000**	**1,546,000**	**4,620,000**
	Proven + Probable	**2,788,000**	**21,312,000**	**24,100,000**	**3,074,000**	**23,492,000**	**26,566,000**

Note 1: The Mineral Reserve is expressed as saleable product tonnages.
Note 2: The Qualified Persons (QP) responsible for the Mineral Reserve estimate is Mr. Robert J. Farmer, P.Eng., and Mr. Michael F Wick PE., Vice President's of John T. Boyd Company
Note 3: The Effective Date of the Mineral Reserve estimates is 19 March 2020.
Note 4: The Mineral Reserve has been estimated in accordance with Canadian Institute of Mining and Metallurgy and Petroleum (CIM) definitions, as required under NI 43-101.
Note 5: The Mineral Reserve is a subset of, not additive to, the Mineral Resource and is quoted on a 100% project basis.
Note 6: The Mineral Reserve may be materially affected by geology, environment, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.
Note 7: Tonnages are reported in metric tonnes (1,000 kg or 2,204.6 lbs) and United States short tons (2,000 lbs or 907.2 kg).

16 Reiteration of CPS's Proppant, or Frac Sand, 2020 Mining Methods

This section does not pertain to the Inferred Wanipigow Glass Sand Resource Estimate presented in this Technical Report. Rather it reiterates information from a Preliminary Feasibility Study effectively dated March 19, 2020, into CPS's current Technical Report.

The planned Wanipigow Silica Sand Project is projected to include a conventional, open pit quarry employing typical truck-and-excavator mining operations. The quarry and wet process plant are planned to operate 20 hours per day, 7 days per week, 212 days per year (weather permitting) and is expected to extract approximately 1.8 million tonnes of raw sand per year at full production. The dry process plant and rail loadout will operate continuously 365 days per year.

At this mining rate, the operation will produce an average of 1.3 million product tonnes per year after processing losses. The quarrying and processing operations are planned to be in full production one year after start-up. The mine life is projected to be at least 20 years after which an estimated 33.9 million tonnes of raw sand and 9.9 million bank cubic metres (bcm) of waste materials will have been mined. Development of the quarry was scheduled to begin in 2022. In commercial mining terms, the planned quantities of overburden waste and sand to be mined each year for the Wanipigow Silica Sand Project are considered modest.

22 Reiteration of CPS's Proppant, or Frac Sand, 2020 Economic Analysis

This section does not pertain to the Inferred Wanipigow Glass Sand Resource Estimate presented in this Technical Report. Rather it reiterates information from a Preliminary Feasibility Study effectively dated March 19, 2020, into CPS's current Technical Report.

The capital expenditure estimate for the CPS fully enclosed wet and dry plant, loadout and related infrastructure is approximately CDN$124 million, with a contingency of approximately CDN$10 million. The total capital expenditure and lease-related costs are estimated at CDN$250 to CDN$255 million for life-of-mine plan. Operating costs are discussed for the first five years and are found to be reasonable and appropriate within the context of the 2020 Preliminary Feasibility Study.

The Canadian Premium Sand project has an after-tax Net Present Value (NPV) of CDN$290.7 million, discounted at an 8% discount rate (Table 22.1). The after-tax Internal Rate of Return (IRR) is 46.0%. Taxes include federal (15%) and provincial (12%; Manitoba) and assume capital loss carry forward and a tax loss carry forward related to capital expenditures from development of the mine previously incurred and treated as sunk capital for modeling purposes.

Pre-tax and after-tax sensitivity analyses for the cash flow were prepared considering changes in sales pricing and operating costs and are summarized in Table 22.2.

Table 22.1 Cash flow analyses.

Category	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6-10	Years 11-20	Total
					$C '000			
Net Revenues at Loadout (RM of St. Andrews)	46,627.8	94,323.5	94,694.3	99,298.8	99,912.1	462,601.8	1,019,505.4	1,916,963.8
Cost of Goods Sold	20,373.8	40,236.8	39,333.5	40,203.0	39,980.2	187,121.8	397,251.0	764,500.1
Capital Expenditures	133,696.8	0.0	0.0	943.6	937.2	4,336.1	7,612.0	147,525.7
Pre-Tax Net Cash Flow	-107,442.8	54,086.7	55,360.9	58,152.1	58,994.8	271,143.9	614,642.4	1,004,938.0
Taxes	0.0	0.0	0.0	11,491.2	15,928.6	73,208.9	165,953.4	266,582.1
After-Tax Net Cash Flow	**-107,442.8**	**54,086.7**	**55,360.9**	**46,660.9**	**43,066.2**	**197,935.0**	**448,688.9**	**738,355.9**

Table 22.2 Pre-tax and after-tax sensitivity tables (CDN$'000).

Pre Tax NPV		Revenue Sensitivity								
		-30.0%	-20.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	20.0%	30.0%
Cost Sensitivity	-30.0%	$59,943	$211,165	$362,386	$437,997	$513,607	$589,218	$664,828	$816,050	$967,271
	-20.0%	$22,376	$173,597	$324,818	$400,429	$476,039	$551,650	$627,261	$778,482	$929,703
	-10.0%	($16,338)	$134,883	$286,104	$361,715	$437,326	$512,936	$588,547	$739,768	$890,989
	-5.0%	($36,125)	$115,097	$266,318	$341,928	$417,539	$493,150	$568,760	$719,982	$871,203
	0.0%	($56,198)	$95,024	$246,245	$321,855	$397,466	$473,077	$548,687	$699,909	$851,130
	5.0%	($76,557)	$74,664	$225,885	$301,496	$377,107	$452,717	$528,328	$679,549	$830,770
	10.0%	($97,203)	$54,018	$205,239	$280,850	$356,460	$432,071	$507,682	$658,903	$810,124
	20.0%	($139,355)	$11,866	$163,088	$238,698	$314,309	$389,920	$465,530	$616,752	$767,973
	30.0%	($182,652)	($31,431)	$119,790	$195,401	$271,012	$346,622	$422,233	$573,454	$724,675

Pre Tax IRR		Revenue Sensitivity								
		-30.0%	-20.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	20.0%	30.0%
Cost Sensitivity	-30.0%	14.6%	30.6%	48.2%	57.9%	68.4%	79.8%	92.1%	120.2%	154.2%
	-20.0%	10.5%	26.5%	43.5%	52.9%	63.0%	73.8%	85.6%	112.5%	144.7%
	-10.0%	6.1%	22.4%	38.9%	47.9%	57.6%	68.0%	79.3%	104.9%	135.5%
	-5.0%	3.6%	20.3%	36.5%	45.4%	54.9%	65.1%	76.2%	101.1%	131.0%
	0.0%	0.9%	18.2%	34.2%	42.9%	52.2%	62.2%	73.0%	97.4%	126.5%
	5.0%	-2.3%	16.0%	32.0%	40.5%	49.6%	59.4%	70.0%	93.8%	122.1%
	10.0%	-6.4%	13.9%	29.7%	38.1%	47.0%	56.6%	66.9%	90.2%	117.7%
	20.0%	NA	9.3%	25.1%	33.2%	41.8%	51.0%	60.9%	83.0%	109.2%
	30.0%	NA	4.3%	20.6%	28.5%	36.7%	45.5%	55.0%	76.1%	100.9%

After Tax NPV		Revenues								
		-30.0%	-20.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	20.0%	30.0%
Costs	-30.0%	$28,360	$151,050	$264,901	$320,686	$376,213	$431,683	$487,154	$597,839	$708,665
	-20.0%	($2,204)	$120,502	$237,173	$292,957	$348,645	$404,115	$459,586	$570,376	$681,202
	-10.0%	($33,744)	$89,020	$208,599	$264,383	$320,167	$375,706	$431,176	$542,075	$652,901
	-5.0%	($49,864)	$72,929	$193,884	$249,778	$305,563	$361,186	$416,656	$527,597	$638,436
	0.0%	($66,235)	$56,604	$178,956	$234,962	$290,746	$346,455	$401,926	$512,867	$623,762
	5.0%	($82,884)	$40,047	$162,737	$219,934	$275,719	$331,503	$386,985	$497,926	$608,588
	10.0%	($100,026)	$23,256	$145,946	$204,657	$260,479	$316,263	$371,834	$482,775	$593,495
	20.0%	($139,355)	($11,057)	$111,664	$173,009	$229,366	$285,150	$340,900	$451,841	$562,680
	30.0%	($182,652)	($46,337)	$76,449	$137,794	$197,304	$253,190	$308,974	$420,067	$531,008

After Tax IRR		Revenues								
		-30.0%	-20.0%	-10.0%	-5.0%	0.0%	5.0%	10.0%	20.0%	30.0%
Costs	-30.0%	11.6%	26.9%	42.5%	51.0%	60.0%	69.6%	80.1%	103.0%	131.7%
	-20.0%	7.7%	22.9%	38.4%	46.6%	55.4%	64.6%	74.6%	96.9%	124.2%
	-10.0%	3.6%	18.9%	34.4%	42.2%	50.7%	59.6%	69.2%	90.9%	116.8%
	-5.0%	1.2%	16.9%	32.4%	40.1%	48.4%	57.2%	66.5%	87.9%	113.2%
	0.0%	-1.3%	14.9%	30.3%	38.0%	46.0%	54.8%	63.9%	84.7%	109.6%
	5.0%	-4.3%	12.9%	28.2%	35.8%	43.7%	52.3%	61.3%	81.5%	104.5%
	10.0%	-8.0%	10.9%	26.0%	33.7%	41.5%	49.9%	58.7%	78.4%	101.1%
	20.0%	NA	6.6%	21.6%	29.4%	37.0%	45.0%	53.6%	72.4%	94.3%
	30.0%	NA	1.9%	17.2%	24.8%	32.5%	40.2%	48.4%	66.5%	87.7%

23 Adjacent Properties

An adjacent property means a property: 1) in which the issuer does not have an interest; 2) that has a boundary reasonably proximate to the property being reported on; and 3) that has geological characteristics like those of the property being reported on. This section contains references to silica sand and silica sand mining that has taken place off the Wanipigow Property. The authors have been unable to verify this information and therefore the information is not necessarily indicative to the mineralization on the Wanipigow Property. To follow discussion in this section, the reader is referred to Figure 23.1.

23.1 Black Island

Historically, numerous silica sand quarry operations were located on Black Island, which is approximately 5 km west of the Property. The island and historical quarry operations are presently with a Provincial Park and quarrying is no longer permitted.

The silica sand operations on Black Island had been intermittently active from 1910-2003 and are described by Spiece (1980), Pearson (1984) and Watson (1985) as summarized below:

- 1929-1932: Lakeshore Sand and Gravel, quarried and barged silica sand from both the north and south shores of the island to Mid-West Glass in Winnipeg. The operation was concentrated on the south shore until 1930 where the company constructed a 365 m pier to better facilitate barge loading. The operation was shut down in 1930 due to problems maintaining the pier.

- 1950: Dyson Limited quarried sand from the north shore and shipped it to their plant in Selkirk.

- 1962: The Selkirk Silica Division of The Winnipeg Supply and Fuel Company renewed quarrying on the southern shore.

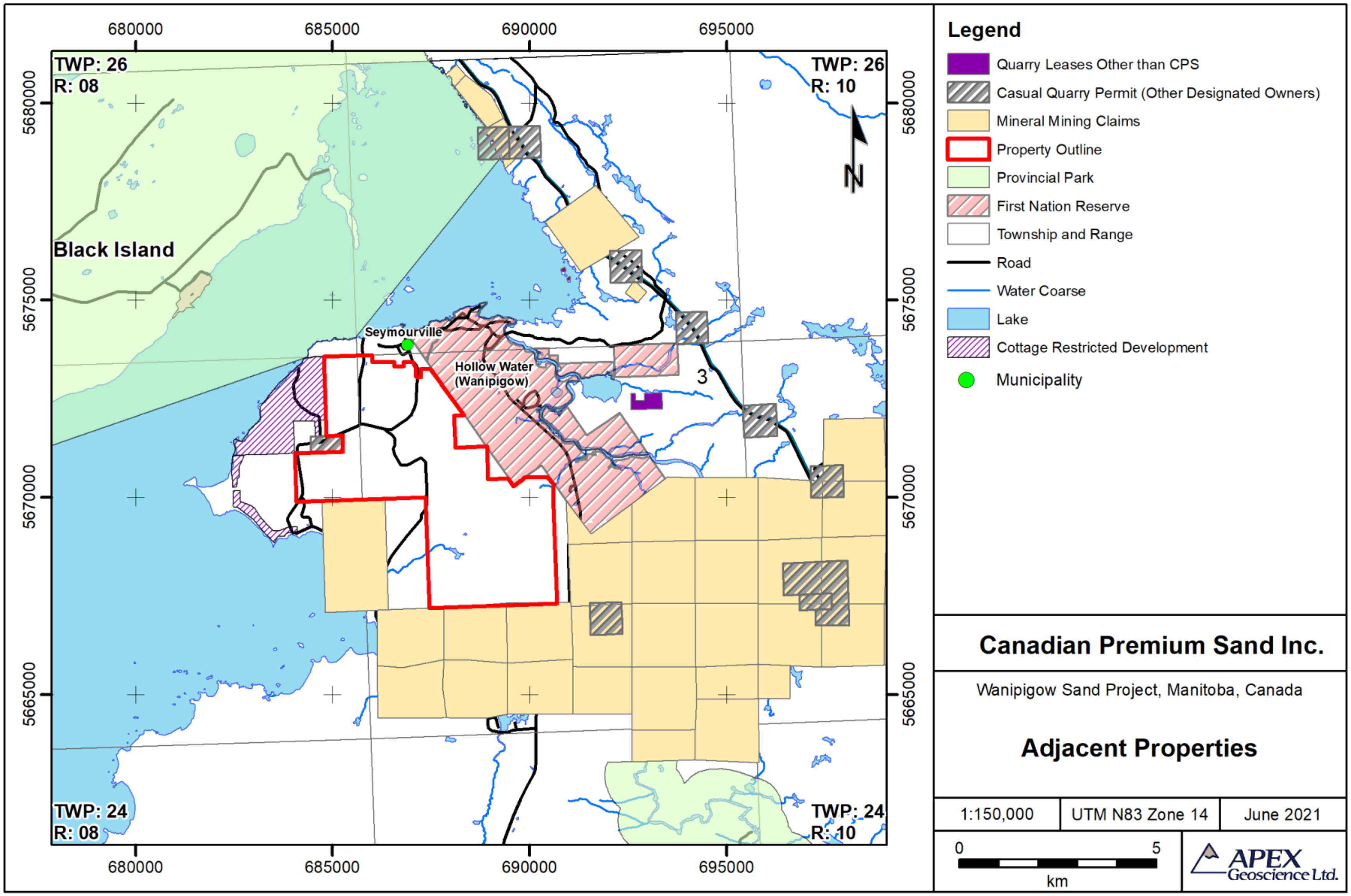
- 1969-2003 Steel Brothers acquired the Black Island operation from Selkirk Silica Division and quarried up to 100,000 tons per year from the LBI unit of the Winnipeg formation. The sand was processed on site by a wash plant, stockpiled and barged to Selkirk. Quarrying operated all year, but sand was shipped during the summer.

23.2 Other Quarry Interests

23.2.1 Casual Quarry Permits

There are several active Casual Quarry Permits in property area. A casual Quarry permit on designated land survey NE/NW-25-025-008-E1 are surrounded by CPS Quarry leases (1693, 1682, 1680 and1679).

Figure 23.1 Adjacent properties to the Wanipigow Glass Sand Project.



APEX Geoscience Ltd.

Casual quarry permits as described in the Quarry Minerals Regulation, 1992 of the *Mines and Mineral Act*, authorizes the holder to produce a specified quantity of the quarry mineral as listed in their permit for a selected duration of time. A permit may be issued to multiple parties for the same quarry mineral and the same area of land at the same time. Causal Quarry permits adjacent to the property are presently for aggregate sand and gravel only.

23.2.2 Quarry Withdrawals

Several areas adjacent to the property have been withdrawn from quarry staking by the Crown and are currently reserved for use by Manitoba Infrastructure.

23.2.3 Other Quarry Leases

There are additional active Quarry Leases in the Property area. Articulate Enterprises holds the Rock and Stone rights to QL-579 and QL-580 located on Storey and Lewis islands approximately 4 km northeast of the Property. Ray-Anne Transport Ltd. holds the Rock/stone and Shale rights to QL-2685 which is located approximately 5 km east of the property.

23.3 Mineral Mining claims

There are active Mineral Mining Claims held by Ruben Twoheart (MB13734 and MB13735) and 1911 Gold Corporation (MB13647-13655, MB13657-13682, MB13687-13688), which are adjacent to the southern border of the Wanipigow Glass Sand Project. Mineral Mining Claims grant the owner the exclusive right to explore for and develop the Crown minerals located on or underneath the claim apart from Quarry minerals.

23.4 Private Property

The western side of the property borders the private cottage divisions of Ayers Cove and Pelican Harbour. It is a cottage restricted development area. The village of Seymourville and the First Nations community of Hollow Water are the two larger private communities to the east of the property.

24 Other Relevant Data and Information

As of the Effective Date of this Technical Report, there is no other relevant data or information to be communicated to the reader.

25 Interpretation and Conclusions

25.1 CPS Exploration Programs

In 2018, CPS completed a 93-drillhole (1,574 m) program over an area of approximately 10 km^2. The program achieved a 94% core recovery rate in which 763 core samples were collected at 1.5 m intervals. Based on drill logs, lithological observations and grain size particle distributions, this study subdivided the Winnipeg Formation into four distinguishable subunits that include from bottom to top (along with their average thicknesses): Lower Black Island (LBI; average 7.9 m thick); Black Shale (BS; average 2.0 m thick); Upper Black Island (UBI; average 4.6 m thick); and Pleistocene glaciofluvial (Pgf; average 10.7 m thick).

Subsequent proppant test work showed the Wanipigow silica sand generally satisfies the recommendations set forth in International Standards ISO 13503-2:2006/Amd.1:2009E for sieve size fractions, sphericity, roundness, acid solubility and turbidity and crush classification. Accordingly, the Wanipigow 'proppant' or 'frac sand' was assessed as a resource and reserve as part of a Preliminary Feasibility Study effectively dated March 19, 2020. The frac sand resource/reserve, which pertains to 'hydraulic fracturing in the energy industry', is still material to CPS.

Presently, CPS has assessed a portion of the Wanipigow LBI sub-member silica sand for use in the glass manufacturing industry. CPS collected a series of 18 composite samples of LBI sand using the archival material. The >125 um and <710 um size fraction (20-120 mesh) were analyzed for whole-rock analysis by ICP Total Digestion, SiO_2 by ICP whole rock assay, and trace-elements by ICP-MS Total Digestion. Conclusions of this work include:

- The LBI sand samples collected in the main glass sand resource area have silica values of between 96.1 and 98.9 wt. % SiO_2 with an average 98.0 wt. % SiO_2. Iron values range considerably from 0.032 to 0.247 wt. % Fe_2O_3 with an average 0.117 wt. % Fe_2O_3.

- The silica and iron values are generally too low and too high, respectively, for specialty glass or Grade A-E glass, but is sufficient for coloured container and insulating fibre optical glass (Grades F-G).

- The aluminum content is also high for glass specifications with an average of 0.72 wt. % Al_2O_3. Titanium and chromium have low average values of 0.04 wt. % TiO_2 and 5 ppm Cr.

- Manganese and sodium are generally below the minimum limit of detection and negligible in the glass making process.

- Base-metal minerals fluctuations are like the pattern observed for iron and include Ni (1.4-9.3 ppm Ni), Co (0.3-4.6 ppm Co), Cu (1.7-16.6 ppm Cu), and Cr (3.0-9.0 ppm Cr), and may need to be further assessed in accordance with the glass product being manufactured.

Consequently, CPS initiated beneficiation test work to advance the sand to higher levels of silica and lower levels of iron and other detrimental elements. Testing physical (e.g., screening, gravitation- and magnetic-separation) and chemical (e.g., acid attrition, hot acid leach, calcination) beneficiation tests, the beneficiation of the Wanipigow LBI sand succeeded in increasing the silica to 99.7% SiO_2 and decreasing the iron to 0.006% Fe_2O_3.

Based on the silica, iron, and other elemental contents of the mechanically and chemically treated sand in these beneficiation tests – and depending on market and manufacturing conditions – the Wanipigow LBI sand can be used to manufacture standard glass products such as flat glass, coloured container glass, and insulating fibers.

In addition, the initial mineral processing test work conducted by CMP and I.M.I., which included enhanced attrition scrubbing and desliming followed by grain size classification (35-120 mesh fraction), density separation, and magnetic separations (x2) – has shown the Wanipigow LBI sand can be mechanically-treated to yield an iron content of 0.010% Fe_2O_3 (100 ppm Fe_2O_3) with further chemical treatment yielding 0.006% to 0.007% Fe_2O_3 (60 ppm to 70 ppm Fe_2O_3).

Hence, the initial trials conducted by CMP showed that the mechanical treatment of the Wanipigow Lower Black Island Formation silica sand from within the glass sand resource area will fulfil the specifications required to manufacture specialty solar glass products based on a sand glass feed iron market value of ≤0.012% Fe_2O_3 (120 ppm Fe_2O_3).

Accordingly, and with respect to reporting a resource estimate that abides by NI 43-101, it is the opinion of the QP that the Wanipigow LBI sand within the glass sand resource area demonstrates reasonable prospects of potential extraction.

The senior author has reviewed the adequacy of the exploration work, including sample collection, preparation, and security, and found no significant issues or inconsistencies that would cause one to question the validity of the data. The beneficiation test work was conducted on representative samples of LBI sand from within the main glass sand resource area and at accredited, independent laboratories.

In the opinion of the senior author, exploration techniques and beneficiation procedures employed by CPS at the Wanipigow Glass Sand Project are consistent with industry standards and are appropriate both with respect to the type of mineral deposit(s) being explored and with respect to ensuring overall data quality and integrity. Accordingly, the senior author and QP is satisfied to include the data summarized and discussed in this Technical Report into the resource modelling, evaluation, and estimations that form the Wanipigow Glass Sand Inferred Resource Estimate.

25.2 Mineral Resource Estimations

The Inferred Wanipigow Glass Sand Resource Estimate is fully contained within the LBI sand sub-member that occurs within 6 contiguous Quarry Leases on the east part of the 41-lease Wanipigow Property. The clipped main glass sand resource surface area is 3.49 km^2 or 862-acres. The 3-D geological model in the main glass sand resource area is defined by 5 out of 93 vertical drillholes. The 5 drillholes include CPS18-018, CPS18-019, CPS18-024, CPS18-025, and CPS18-071. Additional regions within the Wanipigow Property with distinct LBI sand is assessed as a future exploration target.

The calculation of the Inferred Wanipigow Glass Sand Resource Estimate was completed using the commercial mine planning software MICROMINE (v 21.0). The 3-D geological model utilized information from 93 vertical drillholes, 6 of which occur in the main glass sand resource area, and 744 gradation analyses, 230 of which define the LBI sand sub-member (48 LBI samples in the main glass sand resource area). In the 3-D geological model, the thickness of the Lower Black Island unit varies from 9.1 m to 15.85 m and averaged 7.9 m.

The resource is calculated using a block model with a size of 20 by 20 m in the horizontal directions and 2 m in the vertical direction. The block model was used to calculate the Inferred Wanipigow Glass Sand Resource Estimate of the different percentages of silica sand retained on the various screen sizes. Ordinary Kriging (OK) was used to estimate the size fraction values at each parent block that lies within the LBI wireframe.

A nominal *in-situ* sand bulk density of 1.878 g/cm^3 was applied to the LBI sand unit. The density is based on 36 representative loose bulk LBI density samples collected during the 2018 drill program. The loose bulk densities were converted to an *in-situ* bulk density by using a bulking factor of 30%.

The Inferred Wanipigow Glass Sand Resource Estimate has been classified by the QP in accordance with guidelines established by the CIM “Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines” dated November 29th, 2019, and the CIM “Definition Standards for Mineral Resources and Mineral Reserves” amended and adopted May 10th, 2014. The QP has a satisfactory level of confidence in, and understanding of, the geology and controls of the LBI geo-unit, but a lower level of confidence in the applicability of the sand unit – on a consistent basis – for higher quality levels of glass manufacturing. Based on these criteria, the resource estimate for the LBI geo-unit in the main glass sand resource area is classified as an Inferred Resource.

The resource estimation of the individual Lower Black Island size fractions was completed and reported using a lower cutoff of mesh-sizes that are greater than or equal to 35-mesh (<500 µm) and less than or equal to 120-mesh (<125 µm). I.e., the +35 and the -120 mesh size fractions are discarded from the estimation process.

Mineral resources are not mineral reserves and do not have demonstrated economic viability. This Wanipigow Inferred Glass Sand Resource Estimate predicts the following total (i.e., global) LBI Resources within the main glass sand resource area has an estimated global (total) estimate of 7.25 million tonnes (Table 14.9).

With respect to unequivocal waste rock, the overburden and/or the Pgf geo-unit overlying the LBI resource has an estimated volume of 6,180,900 m^3 for a total weight of

11.73 million metric tonnes. The density of the Pgf was taken from compacted *in-situ* material bulk density tests on 13 samples that average 1.897 g/cm^3.

In addition to the main glass sand resource area, a future exploration target was evaluated at the Wanipigow Property by depicting clean sand Lower Black Island units in other parts of the Wanipigow Property. The exploration target was calculated in the same way the Wanipigow Glass Sand Inferred Resource Estimate was and by applying a plus or minus percentage of 10% to define an exploration target of between 19.06 million tonnes and 23.30 million tonnes.

The potential quantity of the exploration target is conceptual in nature as there has been insufficient exploration to define a mineral resource and it is uncertain if further test work and/or marketing will result in the exploration target being delineated as a 'mineral resource'.

Lastly, the resources, reserves, and economics stemming from a March 19, 2020, Preliminary Feasibility Study are reiterated as the proppant, or frac sand, information is still material to CPS as stated in this Technical Report.

25.3 Risks and Uncertainties

The business of exploration for, and development of, silica sand involves a high degree of risk and there can be no assurance that the current program will result in profitable operations. Any future sale of silica sand product for glass manufacturing is largely dependent on the economy and conditions of the glass industry. A downturn in the glass market could result in potential impairment of any silica sand operation.

The ability of CPS, or any industrial sand producer, to achieve operational, quality, and financial targets at their operations is dependent on numerous factors that are beyond the control of, and cannot be fully anticipated by, the authors. These factors include mining and geological conditions, the capabilities of management and employees, variations in market conditions, the level of continued investments in mining operations, the ability to develop and operate in an efficient fashion, etc. Unforeseen changes in legislation and/or new industry developments in drilling/fracking technology could substantially alter the performance of any mining company within the proppant sand industry.

With respect to the Wanipigow Inferred Glass Sand Resource Estimate, mineral resources are not Mineral Reserves and do not have demonstrated economic viability. Silica sand resource estimates are by nature imprecise and depend to some extent on statistical inferences drawn from available data. To the best of the authors ability, the mineral resources presented in this Technical Report have adhered to best geostatistical practices.

With respect to potential economic outcomes, risks and uncertainties that could reasonably be expected to affect the of the Wanipigow Glass Sand Project could include:

- Changes to glass manufacturing technologies that influence the ability to market sand from the Wanipigow Glass Sand Project.

- Assumptions concerning future prices of glass, operating costs, mining technology improvements, development costs, and reclamation costs.

- Assumptions concerning future effects of regulation, including the issuance of required permits such as mining and water rights, and the assessment of taxes by governmental agencies.

- Assumptions that high silica and low iron quality of the silica sand will remain relatively constant and/or amenable to beneficiation to higher grades of glass sand over the life of the Wanipigow resource.

26 Recommendations

The authors of this Technical Report advise that CPS consider the following work recommendations at the Wanipigow Glass Sand Project with the objectives to:

1. Improve the confidence of the current resource area and expand/reclassify the resource and/or exploration target levels through infill and exploratory drilling and additional geochemical and beneficiation test work.

2. Conduct mine planning to assess modifying factors such as detailed mine design, product distribution, marketing studies, groundwater monitoring, environmental management planning, permitting, and social and local community engagement.

The author's perception is that the work objectives are complementary to one another, and therefore, a unified work approach is recommended. The collective estimated cost of the work recommendations, including a 10% contingency, is CDN$1,100,000.

Additional detail on the work recommendations and cost breakdown is provided in the text that follows and Table 26.1.

26.1 Upgrading Current Resource and/or Exploration Target Classification Levels

It is recommended that CPS conduct infill drilling within the current main glass sand resource area and exploratory drilling in the exploration target area to improve geology/resource certainty and delineate the shallow subsurface waste material in preparation of any future mine-plan.

Table 26.1 Future recommendations for the Wanipigow Glass Sand Project.

Objective	Item	Description	Cost Estimate (CDN$)
Improve the confidence of the current resource area and expand/reclassify the resource and/or exploration target level(s)	Infill drilling within the current resource area	Approximate 250 m sonic and auger drill programs to improve geology/resource certainty and to better delineate waste material	$115,000
	Exploratory drilling on future targets for exploration	Approximate 350 m sonic and auger drill programs to better the potential of the exploration target area(s)	$165,000
	Geochemical test work	Ongoing geochemical assaying to further evaluate Winnipeg Formation sand quality. Conduct an orientation survey using a handheld XRF analyzer.	$55,000
	Beneficiation test work	Ongoing beneficiation test work to improve the quality of the LBI sand to higher levels of glass manufacturing	$40,000
Mine-planning design with an assessment of modifying factors	Detailed mine planning	Detailed mine design/plan; dewatering plan; productivity analysis; and operating costs estimates	$250,000
	Product distribution	Study of product storage, transport, and distribution.	
	Marketing studies	Market analyses including an assessment of market size, product demand, market concentration, and market volume.	
	Groundwater monitoring	Ongoing hydrogeological studies and pump tests to assess groundwater conditions	$150,000
	Environmental-planning and continued community consultation	Development of a Closure Plan, environmental plans, permitting, and continued social and local community engagement	$225,000
		Subtotal	**$1,000,000**
		10% Contingency	**$100,000**
		Total	**$1,100,000**

A combination of deeper sonic drillholes and shallower auger holes is recommended as follows:

- The sonic drillhole program should drill and sample through the entire Winnipeg Formation (and LBI sub-member) to the Precambrian basement in those areas of the resource area and/or mine plan area that may require better resource delineation. This program will allow, for example, the mining team to better delineate the upper surface of the LBI for stripping during the mine process.

- The auger drillholes and trenching should be used to map and evaluate the Pleistocene glaciofluvial surficial deposits ahead of mine-planning.

The authors estimate an infill drill program of approximately 250 m. Deeper sonic drilling should be completed through to the Precambrian basement, or a total depth of approximately 15-20 m. Shallower auger holes should penetrate through the entire Pgf geo-unit (up to 24 m thick as shown in CPS's 2018 drill program). The total cost of the infill drill program within the current resource area is estimated at CDN$115,000.

CPS should consider a similar drill strategy of utilizing sonic and auger drills to delineate and evaluate the exploration target to improve geology/resource certainty. The authors estimate an exploratory drill program of approximately 350 m. The total cost of the exploratory drill program within the current exploration target area, or select portions of the target area, is estimated at CDN$165,000.

CPS should continue to evaluate the quality of silica sand at the Wanipigow Glass Sand Project. It is recommended that CPS continue to geochemical assay the sand to further evaluate LBI sand quality.

In addition, it is recommended that CPS conduct an orientation survey using a handheld XRF analyzer. The orientation survey should be completed on core derived from the recommended infill and exploratory drill programs. If the quantitative assay data correlated with the semi-quantitative XRF analyzer results, then CPS can expand the XRF analyzer study to drill cores that were archived from the extensive 2018 drill program. The estimated cost of the geochemical test work as outlined is CDN$55,000.

Ongoing beneficiation, furnace batch, and glass composition test work is required to continue to assess and advance the quality of the LBI sand to higher levels of glass manufacturing standards in concert with CPS's marketing studies. Additional, detailed test sets are required on a bulk sand sample (e.g., 500 kg) with the actual raw materials. The estimated cost of the ongoing beneficiation test work is CDN$40,000.

26.2 Mine-Planning Design with an Assessment of Modifying Factors

The authors recommend that CPS consider mine-related modifying factor work that include detailed mine-design/plan; productivity distribution analysis; marketing studies, groundwater analysis; environmental planning; and continued community consultation. The estimated cost of the combined modifying factor programs is estimated at CDN$625,000 and the activities are described in more detail as follows.

The mine-plan should include overburden removal and placement, run-of-mine sand removal, and ongoing reclamation. Product distribution work should study product storage, transport, and distribution. The Market analyses should include an assessment of the market size, product demand, market concentration, and market volume of a variety of glass products. The cost of these activities is estimated at approximately CDN$250,000.

Groundwater monitoring will include ongoing hydrogeological studies and pump tests to assess groundwater conditions. The groundwater monitoring holes are typically constructed by drilling enlarged (upper) and reduced (lower) hole diameters of 12" and 8" (30 and 20 cm), respectively, and then securing access to the well with 8" (20 cm) steel pipe casing and screens. The monitoring holes are measured regularly (once a month) to record the depth to the groundwater table. The cost of preparing the groundwater monitoring wells and/or continued monitoring of the wells associated with ongoing hydrogeological studies is estimated at CDN$150,000.

Environmental planning should include preparation of a Closure Plan, finalize environmental plans, finalize permitting and licencing, and ongoing continued social and local community engagement. The cost of these ongoing activities is estimated at approximately CDN$225,000.

Lastly, the decision to put an industrial mineral project into production is the responsibility of the issuer. To reduce this risk and uncertainty, the issuer typically makes its production decision based on economic valuation through a Preliminary Feasibility Study or a comprehensive Feasibility Study. Having said this, the ultimate demonstration of economic viability of an industrial mineral deposit may be satisfied by actual profitable production as a function of market conditions such as product specification and demand.

If CPS puts the Wanipigow Glass Sand Project into production, and to avoid making misleading disclosure, it is recommended that the issuer discloses that the Company has not based its production decision on a Preliminary Feasibility Study, or a Feasibility Study of mineral reserves, demonstrating economic and technical viability. In addition, the Company should provide adequate disclosure of the increased uncertainty and the specific economic and technical risks of failure associated with its production decision.

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28 Certificate of Authors

I, D. Roy Eccles, P. Geol., do hereby certify that:

1. I am a Senior Consulting Geologist and Chief Operations Officer of APEX Geoscience Ltd., #100, 11450 – 160th Street, Edmonton, Alberta T5M 3Y7.
2. I graduated with a B.Sc. in Geology from the University of Manitoba in Winnipeg, Manitoba in 1986 and with a M.Sc. in Geology from the University of Alberta in Edmonton, Alberta in 2004.
3. I am and have been registered as a Professional Geologist with the Association of Professional Engineers and Geoscientists of Alberta (APEGA, No. 74150) since 2003, and with the Newfoundland and Labrador Professional Engineers and Geoscientists (PEGNL, No. 08287) since 2017.
4. I have worked as a geologist for more than 35 years since my graduation from university and have been involved in all aspects of mineral exploration, mineral research, and mineral resource estimations for metallic, industrial, specialty and rare-earth element mineral projects and deposits in Canada. I have explored for and prepared mineral resource estimates for silica sand projects in western Canada and northeastern United States.
5. I have read the definition of "Qualified Person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.
6. I am responsible for and have supervised the overall preparation of the "*NI 43-101 Technical Report, Inferred resource estimate on Canadian Premium Sand Inc.'s Wanipigow silica sand glass project in Manitoba, Canada"*, with an effective date of 14 October 2021 (the Technical Report). I performed a site inspection of the Wanipigow Glass Sand Project and Property on March 4-6th 2019 and can verify the Property infrastructure and silica sand mineralization.
7. To the best of my knowledge, information and belief, the Technical Report contains all relevant scientific and technical information that is required to be disclosed, to make the Technical Report not misleading.
8. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
9. I am independent of the issuer and the Property and successfully pass the independency requirements of the Guidance of Independence test in NI 43-101 CP Item 1.5.
1. I have had been involved with the Wanipigow silica sand project as co-author of the following technical reports:
   - Eccles, D.R., Farmer, R.J., Wick, M.F., Hough, R. (2019): Preliminary Feasibility Study on Canadian Premium Sand Inc.'s Wanipigow silica sand deposit in Manitoba, Canada; Report prepared for Canadian Premium Sand Inc., Effective Date: 28 May 2019.
   - Eccles, D.R., Farmer, R.J., Wick, M.F., Hough, R. (2020): Updated 2020 Preliminary Feasibility Study on Canadian Premium Sand Inc.'s Wanipigow silica sand deposit in Manitoba, Canada; Report prepared for Canadian Premium Sand Inc., Effective Date: 19 March 2020.

10. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files or their websites.

Effective date: 14 October 2021
Signing Date: 14 October 2021
Edmonton, Alberta, Canada

PROFESSIONAL GEOLOGIST ALBERTA
D. ROY ECCLES

PERMIT TO PRACTICE
APEX GEOSCIENCE LTD.
RM SIGNATURE:
RM APEGA ID #: 74150
DATE: 14 OCT 2021
PERMIT NUMBER: P005824
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

14 OCT 2021

D. Roy Eccles, M.Sc., P. Geol.

I, Rachelle Hough, P. Geo., do hereby certify that:

2. I am currently employed as a Geologist with APEX Geoscience Ltd., #100, 11450 – 160th Street, Edmonton, Alberta T5M 3Y7.
3. I graduated with a Bachelor of Applied Science (BSc.) in Geology, received from the University of Alberta in 2008.
4. I am and have been registered as a Professional Geologist with the Association of Professional Engineers and Geoscientists (APEGA) of Alberta since 2012.
5. I have worked as a geologist for 13 years since my graduation from university. I have explored for and prepared 3-D geological models for silica sand projects in western Canada.
6. I have read the definition of Qualified Person set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.
7. Under the direction of Mr. Eccles, I contributed to Sections 9-12 of the "*NI 43-101 Technical Report, Inferred resource estimate on Canadian Premium Sand Inc.'s Wanipigow silica sand glass project in Manitoba, Canada"*, with an effective date of 14 October 2021 (the Technical Report). I performed a site inspection at the Wanipigow silica sand project and property on March 4-6th 2019 and can verify the property infrastructure and silica sand mineralization.
8. I am not aware of any scientific or technical information with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.
9. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
10. I am independent of the issuer and the Property and successfully pass the independency requirements of the Guidance of Independence test in NI 43-101 CP Item 1.5.
11. I have had been involved with the Wanipigow silica sand project as co-author of the following technical reports:
    - Eccles, D.R., Farmer, R.J., Wick, M.F., Hough, R. (2019): Preliminary Feasibility Study on Canadian Premium Sand Inc.'s Wanipigow silica sand deposit in Manitoba, Canada; Report prepared for Canadian Premium Sand Inc., Effective Date: 28 May 2019.
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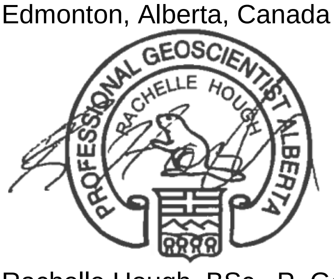

Rachelle Hough, BSc., P. Geo.