PROVINCE OF SASKATCHEWAN

DEPARTMENT OF MINERAL RESOURCES

HON. J. H. BROCKELBANK, MINISTER — C. A. L. HOGG, DEPUTY MINISTER

The Red Deer River Silica Sand Deposit of East Central Saskatchewan

by

W. J. Babey

Industrial Minerals Research Branch

E. Y. Carlson, Director

1955

PRICE: $1.00

REPORT OF INVESTIGATIONS
No. 7

CONTENTS

FIGURES

TABLES

INTRODUCTION

The purpose of this report was to gather and compile all the available information on the work done on the silica sands on the Red Deer River in East Central Saskatchewan.

ACKNOWLEDGEMENTS

The author wishes to express his appreciation to M. F. Goudge for permission to use material from reports of the Department of Mines and Technical Surveys, Ottawa. The Geology Branch of the Saskatchewan Department of Mineral Resources supplied the photomicrographs. A. Sacuta, Research Engineer with the Industrial Minerals Branch, conducted the laboratory work and assisted in the field operations.

LOCATION

The sand outcrops are located on the south banks of the Red Deer River about ten miles north of Armit (Saskatchewan) siding, a point on the Canadian National Railway between Hudson Bay, Saskatchewan, and Swan River, Manitoba. The upstream deposit is believed to be in Sec. 21, while the downstream deposit is in Sec. 22 of Tp. 46, Rge. 30, W1st. and about three miles from the Saskatchewan-Manitoba boundary. This being unsurveyed territory it is not possible to give a closer legal description of the deposits.

The general area is flat with many muskegs and jackpine ridges. The banks of the river are covered with bush much of which has been burned out in recent years. The river flows in a north-easterly direction and in places has cut a channel as deep as seventy-five feet.

GEOLOGY

The geology on the Red Deer River region was taken from the Canada Department of Mines and Resources, Geological Survey, Memoir 239, entitled "Mesozoic Stratigraphy of the Eastern Plains, Manitoba and Saskatchewan" by R.T.D. Wickenden and is as follows:

"Overlying the beds identified as Jurassic and underlying the Ashville formation, in the southern part of the area (Mafeking sheet), are shales, sands and sandstones collectively referred to as the Swan River group. North of Swan River and possibly to a little south of the river, where no marine Jurassic has been identified, the Swan River beds occupy the interval between Devonian strata and beds of the Ashville formation. In the south these intervening beds are probably all of Lower Cretaceous age, but in the north they may include non-marine equivalents of the Jurassic of the south. For convenience in description this assemblage of strata, which varies both in age and lithology, will be referred to as the Swan River group from their typical occurrence in Swan River Valley.

"In most previous publications the Swan River group is referred to as the Dakota sands. The Dakota is, however, of Upper Cretaceous age and should not be confused with the Swan River.

"The beds beneath the Ashville and above the Devonian formations in the Swan River district and north to the limits of the area mapped are composed predominantly of unconsolidated sand and soft sandstone with a few harder indurated layers. Grey shale, plastic clay, green sand, and carbonaceous shale and coal constitute a smaller part of the formation.

"The highest exposure on Red Deer River is also the upper part of the beds and comprises much the same type of rocks as another, measured by Landes, in the north bank of the river in Sec. 15, Tp. 46, Rge. 31, W1st.

Sand, glauconitic	1.0 foot
Sandstone, hard, calcareous, light grey, weathering brown, with Lingula and Brachiopodes	1.0 foot
Total	2.0 feet

"Lower down the Red Deer River are several outcrops of the unconsolidated quartzose sands that form the bulk of the formation. Below the glauconitic phase are beds that resemble the sand and dark clays of the Swan River section. In this part of the section indurated layers of red weathering sandstone with ripple-marked surfaces are fairly common, and one such layer paves the bed of the river for several hundred square feet. Below this the fine-grained quartzose sands appear in several good outcrops, one of which, located on the northeast bank where the river makes a fairly sharp turn in Sec. 24, Tp. 46, Rge. 31, W1st, gives the following section:

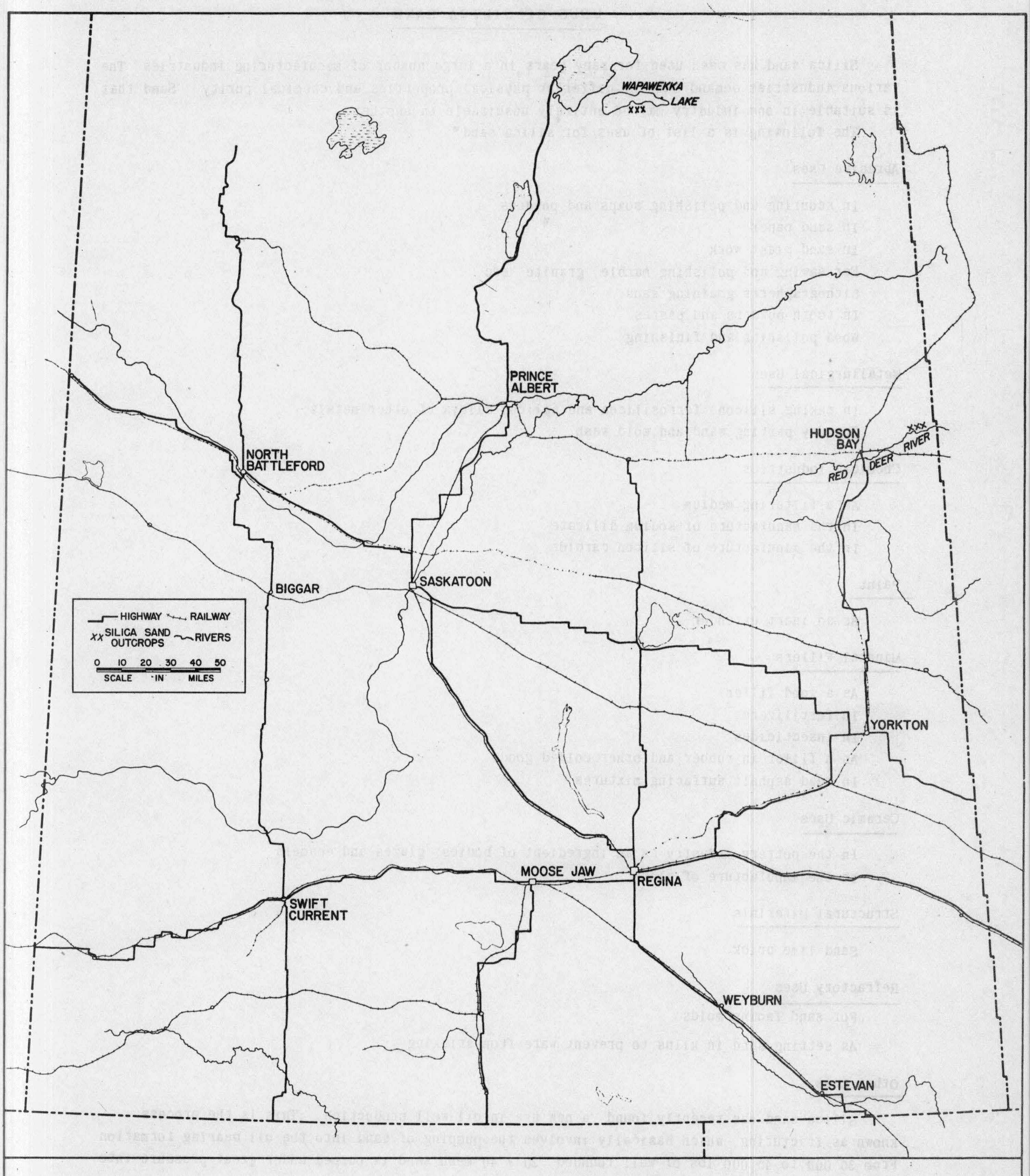
Unconsolidated, white, quartzose sand with a few streaks of dark shale	20 feet
Crossbedded, buff weathering sandstone	10 feet
Total	30 feet

Below this again is found uniform unconsolidated, fine-grained, quartzose, white sand exposed in a cliff about 30 feet high and 600 feet long.

"The lowest exposure of the sandstone on Red Deer River was on the south side in Sec. 20, Tp. 46, Rge. 30, W1st. and Landes records this as follows:

Sandstone, fine and medium-grained, light grey with a few streaks of shale and a few beds with small fragments of lignite, some coarse reddish brown sand	25 feet
Covered	20 feet
Clay, dark green plastic	4 feet
Covered	6 feet
Sandstone, hard, red weathered	1 feet
Total	56 feet

VIEW OF DOWNSTREAM DEPOSIT



SOUTHERN SASKATCHEWAN

FIGURE 2

USES OF SILICA SAND

Silica sand has been used for many years in a large number of manufacturing industries. The various industries demand sand of different physical properties and chemical purity. Sand that is suitable in one industry may be entirely unsuitable to another.

The following is a list of uses for silica sand*

Abrasive Uses

In scouring and polishing soaps and powders.
In sand paper.
In sand-blast work.
For sawing and polishing marble, granite, etc.
Lithographer's graining sand.
In tooth powders and pastes.
Wood polishing and finishing.

Metallurgical Uses

In making silicon, ferrosilicon and silicon alloys of other metals.
Foundry parting sand and mold wash.

Chemical Industries

As a filtering medium.
In the manufacture of sodium silicate.
In the manufacture of silicon carbide.

Paint

As an inert extender.

Mineral Fillers

As a wood filler.
In fertilizers.
In insecticides.
As a filler in rubber and other molded goods.
In road asphalt surfacing mixtures.

Ceramic Uses

In the pottery industry as an ingredient of bodies, glazes and enamels.
In the manufacture of glass.

Structural Materials

Sand-lime brick.

Refractory Uses

For sand facing molds.
As setting sand in kilns to prevent ware from sticking.

Other Uses

Silica sand has recently found a new use in oil-well production. This is the process known as fracturing, which basically involves the pumping of sand into the oil bearing formation. From 30,000 to 40,000 lbs of well rounded, 20 - 40 mesh sand is pumped under great pressure into marginal wells in order to boost production.

---

* *Non-Metallic Minerals, Second Edition*, by Ladoo and Myers.

SPECIFICATIONS

Very few standard specifications exist for silica sand. Many firms set their own specifications and tests, and a good deal of the product is sold on sample. For ceramic use, the product must pass a certain screen size, generally 99 percent through 140 mesh. In addition limitations are placed on the percent of iron present. For paints and fillers a 325 mesh product is usually required. For coarse sand paper, a large angular grained sand is required whereas for fine polishes a fine dust, 325 mesh or finer is used. Table I shows the proposed chemical requirements for glass sand as formulated by the American Ceramic Society in conjunction with the Bureau of Standards.

PREVIOUS INVESTIGATIONS

Several previous reports have appeared on the silica sand deposits. Professor W.G. Worcester, former head of the Department of Ceramic Engineering, University of Saskatchewan, made his first report in the 1942 Annual Report of the Department of Natural Resources.

The Department of Mines and Technical Surveys, Ottawa, issued a report* in October, 1946 "Foundry Potentialities of a Sample of Saskatchewan Sand". The second report** in June 1947, by the Department of Mines and Technical Surveys, was entitled "A Preliminary Report on the Beneficiation of a Siliceous Sand from the Red Deer River, Saskatchewan".

In September, 1948, Mr. G.S. Crawford and Mr. M. Viminitz of the Department of Natural Resources made a topographic survey in the immediate area of the two outcrops.

---

* *Department of Mines and Technical Surveys Investigation No. 2088.*

** *Department of Mines and Technical Surveys Investigation No. 2198.*

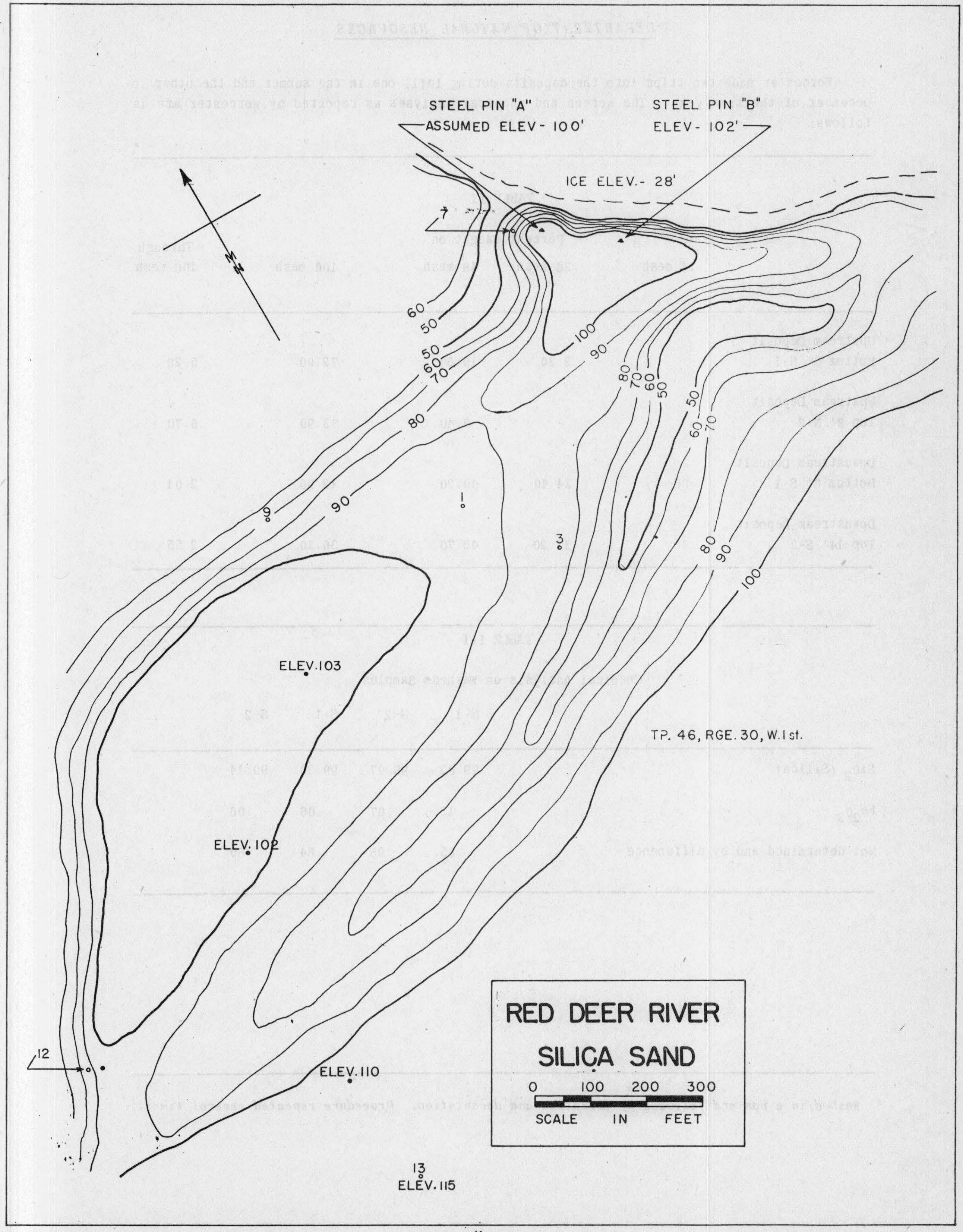
TABLE I

PROPOSED CHEMICAL REQUIREMENTS FOR GLASS SAND*

(Specification formulated by the American Ceramic Society in conjunction with the Bureau of Standards)

Qualities of glass	Silica (SiO_2)		Alumina (Al_2O_3)		Iron Oxide (Fe_2O_3)		Calcium and Magnesium ($CaO + MgO$)	
	Min. %	Tolerance	Max. %	Tolerance	Max. %	Tolerance	Max. %	Tolerance
First-quality optical glass	99.8	± 0.1	0.1	± 0.05	0.02	± 0.005	0.1	± 0.05
Second-quality flint glass containers, tableware	98.5	± 0.5	0.5	± 0.1	0.035	± 0.005	0.2	± 0.05
Third-quality flint glass	95.0	± 1.0	4.0	± 0.5	0.035	± 0.005	0.5	± 0.1
Fourth-quality sheet glass, rolled and polished plate	98.5	± 0.5	0.5	± 0.1	0.06	± 0.005	0.5	± 0.1
Fifth-quality sheet glass, rolled and polished plate	95.0	± 1.0	4.0	± 0.5	0.06	± 0.005	0.5	± 0.1
Sixth quality green glass containers and window glass	98.0	± 1.0	0.5	± 0.5	0.3	± 0.05	0.5	± 0.1
Seventh-quality green glass	95.0	± 1.0	4.0	± 0.5	0.3	± 0.05	0.5	± 0.1
Eight-quality amber glass	98.0	± 1.0	0.5	± 0.5	1.0	± 0.1	0.5	± 0.1
Ninth-quality amber glass	95.0	± 1.0	4.0	± 0.5	1.0	± 0.1	0.5	± 0.1

* *From Ladoo and Myers. (Non-Metallic Minerals 2nd Edition)*


STEEL PIN "A"
ASSUMED ELEV - 100'
STEEL PIN "B"
ELEV - 102'
ICE ELEV. - 28'
N
7
ELEV. 103
ELEV. 102
ELEV. 110
12
13
ELEV. 115
TP. 46, RGE. 30, W. 1st.
RED DEER RIVER
SILICA SAND
0 100 200 300
SCALE IN FEET

Worcester made two trips into the deposits during 1941, one in the summer and the other in December of the same year. The screen and chemical analyses as reported by Worcester are as follows:

TABLE II

	Percent Caught on				
	14 mesh	28 mesh	48 mesh	100 mesh	Through 100 mesh
Upstream Deposit Bottom 9' N-1	-	2.30	19.60	72.90	5.20
Upstream Deposit Top 8' N-2	-	-	9.40	83.90	6.70
Downstream Deposit Bottom 8' S-1	.86	34.40	49.20	12.60	2.01
Downstream Deposit Top 14' S-2	.45	17.20	43.70	36.10	2.55

TABLE III

Chemical Analysis on Washed* Samples

	N-1	N-2	S-1	S-2
SiO_2 (Silica)	99.02	98.97	99.30	99.14
Fe_2O_3	.13	.07	.06	.06
Not determined and by difference	.85	.96	.64	.80

* *Washed in a pan and followed by flotation and decantation. Procedure repeated several times.*

Shipments No's 1 and 2, were obtained from the downstream deposit, and in both cases the total samples were thoroughly mixed and a head sample was taken out.

The screen and chemical analysis of these two samples are reported as follows:

TABLE IV

Chemical Analysis

	Shipment No. 1 (54 lbs.)	Shipment No. 2 (1800 lbs.)
SiO_2	98.50	97.40
Al_2O_3	0.54	0.93
Fe_2O_3	0.14	0.07
TiO_2	0.22	0.06
CaO	0.03	0.04
MgO	0.03	0.09

* *Preliminary Report on the Beneficiation of a Siliceous Sand from the Red Deer River, Saskatchewan Investigation No. 2198.*

TABLE V

Screen Analysis

Mesh Size	Shipment No. 1 (54 lbs.)	Shipment No. 2 (1800 lbs.)
+ 14	2.2	-
- 14 + 20	2.5	5.0
- 20 + 28	34.5	10.3
- 28 + 35	19.8	19.2
- 35 + 48	21.0	21.7
- 48 + 65	11.6	26.2
- 65 + 100	4.7	12.3
- 100	3.7	5.3
TOTAL	100	100

Microscopic Examination of Head Samples, Shipment No. 1

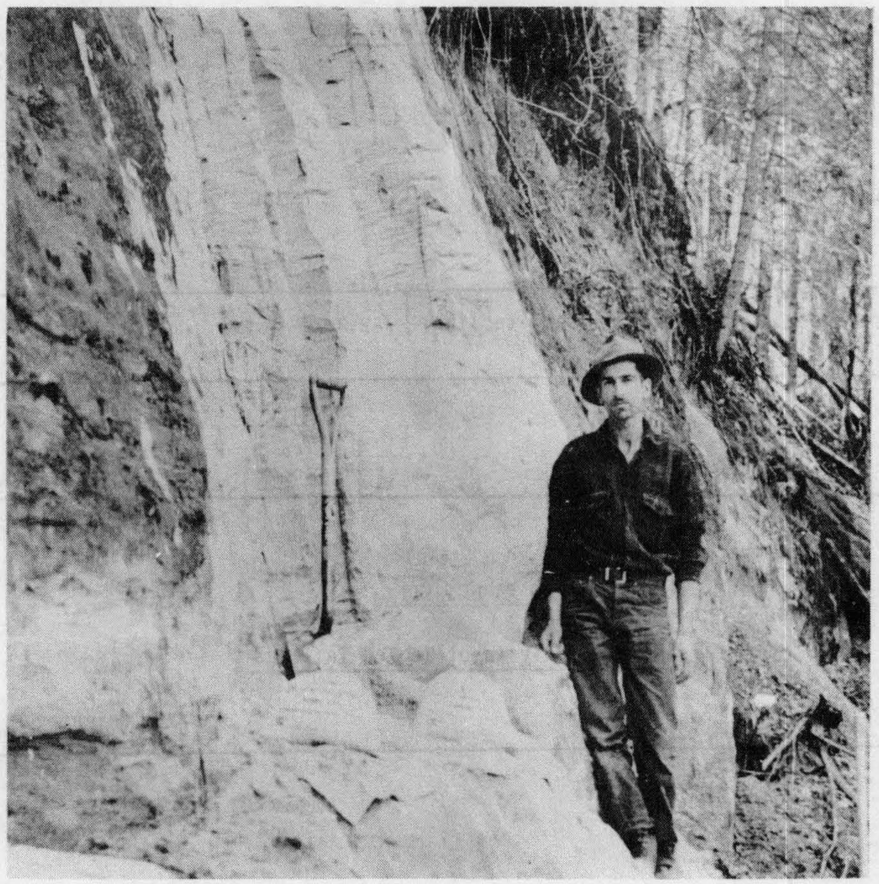
Examined under the binocular microscope, the silica particles appeared to be rounded to subangular, translucent to opaque, with many grains pitted with iron stains or kaolin. This pitting may make it difficult to clean. Some of the larger sizes have incipient fractures which will break down, but the majority of the grains are sound. Most of the grains are equidimensional. Occasional black specks of ilmenite were observed, and also a few flat plates of sericite mica.

Microscopic Examination of Head Samples, Shipment No. 2

Examination under the binocular microscope of this head sample showed rounded to angular quartz grains, with the bulk of the impurities in the form of ironstained quartz. A small amount of carbonaceous material was also observed, as were a few grains of limonite and ilmenite. Some sericite mica was seen as smaller-sized particles. An examination of the different sizes of material from the screen test gave

- 48 + 100 mesh : Angular shaped grains more pronounced. A few grains of ilmenite were observed with some carbonaceous material and some sericite mica.

- 100 mesh : More sericite mica and a much larger proportion of ilmenite and carbonate.



SAMPLING FOR SHIPMENT, NO. 2

A small sample of sand was taken and plus 20 mesh screened out. The remaining portion was washed and the overflow was washed and dried. The underflow was dried, weighed, sampled, and passed over a Wilfley table. The different products were assayed for Fe_2O_3 and the final table tailings were given a screen test with the following results:

TABLE VI

Washing

	Weight %	Assay, Fe_2O_3 %	Distribution of Fe_2O_3 %
Feed	100.00	0.074	100.0
Plus 20 mesh	4.80	0.054	3.5
Overflow (slime)	8.30	0.200	22.5
Underflow (sand)	86.90	0.054	74.0
Tabling the Washed Sand			
Feed	100.00	0.055	100.0
Table Conc.	3.30	0.280	16.8
Table middling	1.50	0.106	2.9
Table tailing	95.20	0.046	80.2

Overall recovery of sand (washing and tabling) = 82.7%

TABLE VII

Screen Analysis of Tabled Tailings

Mesh	Weight %
- 20 / 28	15.8
- 28 / 35	20.4
- 35 / 48	29.6

Mesh	Weight %
- 48 / 65	26.5
- 65 / 100	6.6
- 100	1.1

In the second test a hundred and fifty pound sample was taken and the plus 20 mesh material was screened out. The remaining product was washed in a small spiral classifier, the underflow was returned and washed three times. The classifier overflow was filtered, dried, weighed and assayed. The classifier cleanout was dried, weighed, sampled and mixed with the classifier sand and this product was passed over a Wilfley table with the following results:

TABLE VIII

Washing

Product	Weight %	Assay Fe_2O_3 %	Distribution of Fe_2O_3 %
Feed	100.0	0.066	100.0
Plus 20	5.3	0.070	5.6
Classifier Cleanout	2.6	0.480	18.9
Classifier Overflow	0.9	0.580	7.9
Classifier Sand	91.2	0.049	67.6
Tabling the Washed Sand			
Feed	100.0	0.049	100.0
Table Conc.	3.2	0.400	26.0
Table Middling	16.2	0.090	29.7
Table Tailing.	80.6	0.027	44.3

TABLE IX

Screen Analysis of Tabled Sand

Mesh	Weight %
- 20 / 28	13.2
- 28 / 35	24.2
- 35 / 48	31.3
- 48 / 65	23.8
- 65 / 100	5.7
- 100	1.8

The final results showed that a final product was obtained with a chemical analysis of 0.027% Fe_2O_3, 0.027% TiO_2, and 99.65% SiO_2 with a recovery of approximately 85% of the original feed.

*DEPARTMENT OF MINES AND TECHNICAL SURVEYS, OTTAWA**

The second investigation was testing the foundry potentialities of this sand, which was carried out as received and also after washing. The sands were tested using the standard procedures of the American Foundrymen's Association**.

Mechanical tests made on the sand included core oil requirements, permeability of moulding sand, weight of A.F.A. test specimens of moulding sand, and hot strength determination. Commercial sand results are included for comparative purposes.

* *Foundry Potentialities of a Sample of Saskatchewan Sand Investigation No. 2088*

***Foundry Sand Testing Handbook, 1944 Edition A.F.A.*

The following mixtures were used in the various determinations.

1. Core Mixture to Test Core Oil Requirements

2000 grams sand

20 grams cereal

20 grams core oil

2.6 percent moisture

Baked at 400°F for 2 hours.

2. Core Mixture to Test Hot Strength

2000 grams sand

20 grams cereal

20 grams core oil

20 grams "No-Vein" (iron oxide)

2.6 percent moisture

Baked at 400°F for 2 hours.

3. Moulding Sand Mixture

2000 grams sand

100 grams western bentonite

2.4 percent moisture.

Mulled 2 minutes dry and 4 minutes wet in an 18 inch laboratory mixer.

TABLE X

Screen Analysis

Mesh	As Received Percent Retained	Washed and Tabled Percent Retained
20	Nil	Nil
28	15.3	19.7
35	19.2	20.6
48	21.7	23.6
65	26.2	25.5
100	12.3	9.7
150	3.3	0.9
200	0.8	Nil
-200	1.2	Nil
A.F.A. Fineness No.	45	40

TABLE XI

Mechanical Properties

Core Sand	Red Deer Sand* As Received	Red Deer Sand* After Washing	Commercial Sand A	Commercial Sand B
A.F.A. Fineness No.	45	40	45.5	43
Percent on 3 adjacent screens	67.1	69.7	84.3	90.5
Green Compression, psi.	2.0	0.4	0.7	0.5
Flowability	86	89.5	88	90
Tensile Strength, psi.	132	180	191	224

* *Downstream deposit*

TABLE XI - cont'd

Red Deer Sand *

Core Sand	Red Deer Sand As Received	Red Deer Sand After Washing	Commercial Sand A	Commercial Sand B
Hot Strength of Mixture No. 2, psi. (2500^oF)	48	57	85	36
Moulding Sand				
Green Compression, psi.	8.8	5.5	5.0	7.4
Permeability	287	313	313	375
Flowability	78.5	81.5	82.0	83
Weight of A.F.A. Specimen, grams	165	159	160	164

* *Downstream deposit*

In order to determine whether the foundry properties of the sand could be improved by selective screening, two additional tests were made on the sand.

1. The material coarser than 28 mesh was discarded from the unwashed sand, and the residue was tested as a moulding sand with the following results:

TABLE XII

Moulding Sand

	Sand as Received	Sand with + 28 mesh Removed
Green Compression, psi.	8.8	8.8
Permeability	287	275
Flowability	78.5	82
Weight of A.F.A. Specimen, grams	165	161

2. The washed material falling between 28 and 65 mesh was tested as a core sand and the results were as follows:

TABLE XIII

Core Sand

	Washed Sand	
	Unscreened	- 28 / 65 Mesh
Permeability	230	300
Green Compression, psi.	0.4	0.5
Flowability	88.5	89
Tensile Strength, psi.	180	185
Weigth of A.F.A. Specimen, grams	167	162

The conclusions reached by the Department of Mines and Technical Surveys were as follows:

1. The sample of sand as received is suitable as a steel foundry sand, when additional clay is added. This is the usual practice in preparing steel foundry sand.

2. The sand may be improved for use as a moulding sand, by removing the material coarser than 28 mesh.

3. The moulding properties of the sand are not improved by washing. If it is to be used as a core sand, however, the sand should be washed.

4. The washed sand is suitable for a core sand for steel, iron and non-ferrous work, with the following reservations.

   (a) The core oil requirements of this sand are somewhat higher than normal.

   (b) The low flowability makes it difficult to use in core blowers, or to make cores of uniform hardness.

5. This sample of sand is as satisfactory as many now in use in Canadian foundries. Whether this sand should be used in preference to imported sands, which are perhaps superior, depends upon the economic factors involved (price of core oils, price of sand, percentage of scrap produced, etc) and also upon the personal preference and skill of the foundryman.

RECENT INVESTIGATIONS

In December, 1953, Mr A. Sacuta and the writer made a trip to the deposits and camped at the site for several days.

The purpose of this trip was to prove up a quantity of sand by hand augering, which was attempted on the top of the ridge of the downstream deposit. We were not able to penetrate the overburden due to its nature and thickness.

The next attempt was to drill on the north slope of the ridge at the same elevation as the outcrop. Sand was encountered in these holes at a depth of 4-5 feet and sampled every foot to a depth of 24 feet. The sand was traced from the downstream deposit to the upstream deposit, a total distance of about 2400 feet.

No augering was attempted at the upstream deposit because of the flat terrain and the greater amount of overburden.

Samples were obtained from two holes which were successfully drilled to a considerable depth. These holes, No. 7 and No. 12, are represented on the contour map of the region.

The complete screen and chemical evaluation of hole 7 and hole 12 are listed in Tables XIV and XV. The photomicrographs shown on the following page are of washed sands. The coarse sand was taken at a depth of 19.5 feet in hole 7 and the fine sand at a depth of 13 feet in hole 12.

The initial objective of proving up a quantity of this sand was not realized because of the limitations on the drilling. The upstream and downstream deposits previously referred to are essentially the same sand deposit, as the drilling indicates that the sand extends from one deposit to the other.

Any further work in this region will necessitate power equipment. Because the surrounging area is mainly muskeg, it could not be reached with heavy equipment until freeze-up.

CONCLUSIONS

From the three separate investigations it seems reasonable to assume that a washing operation followed by tabling of the washed sand, should produce a final product of sand acceptable to the glass trade, that is a product with a final chemical analysis of 0.02 - 0.04% Fe_2O_3, 9.02 - 0.04% TiO_2 and 99.00 - 99.6% SiO_2. The above chemical analysis should meet all requirements for a second-quality glass.

In addition this sand is as satisfactory as many now in use in Canadian foundries and its use would depend upon the economic factors involved and also upon the personal preference of the foundryman.

OTHER OCCURRENCES

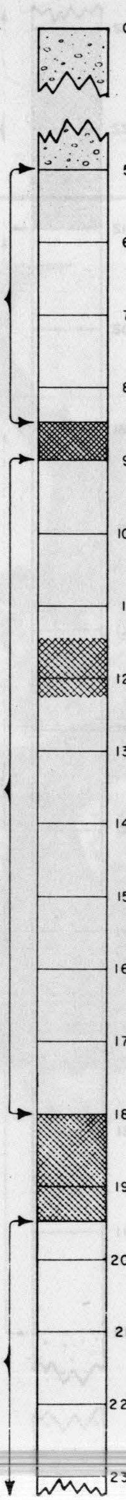
A deposit of sandstone and unconsolidated sand occurs on the south shore of Wapawekka Lake, approximately 125 miles to the north of Prince Albert. Although this sand is not of commercial importance at present due to its remoteness from railway transportation, it is of interest on account of its high degree of purity.

L.H. Cole* reports that McInnes, of the Department of Mines, Ottawa, made an exploratory survey of the district in 1909 and refers to the occurrence of the sandstone as follows:

---

* *Silica in Canada by L.H. Cole, Dept. of Mines and Technical Surveys, Ottawa, 1928.*

TABLE 15 HOLE NUMBER 12



Overburden — sandy top soil, sand and gravel

Good sand

Iron Stain — Clay and shale

(light) Iron stain

Good sand High in mica

Heavy iron stain Shale, clay and mica

Iron stain — Mica

Good sand to depth drilled

DEPTH IN FEET	UNWASHED SAND SCREEN ANALYSIS — PERCENT RETAINED ON TYLER SCREENS 20	35	48	65	100	150	200	PAN	LOSS	PERCENT Fe_2O_3 UNWASHED DRY SAND	NUMBER OF WASHINGS A.F.S. WASH (MODIFIED)	WASH LOSS PERCENT	PERCENT Fe_2O_3 WASHED DRY SAND
5	1.61	12.52	25.80	39.48	13.06	4.05	1.67	1.52	0.28		8	2.81	0.074
8	0.01	5.46	24.82	46.56	15.90	4.24	1.35	1.01	0.64	0.33	6	2.89	0.079
10	2.48	26.88	36.74	26.30	4.76	1.64	0.60	0.56	0.04	0.14	5	1.03	0.036
11	3.84	21.07	22.77	33.47	5.98	1.44	0.55	0.65	0.22		5	1.20	0.041
12	0.66	2.88	4.33	30.15	46.87	10.44	1.93	2.13	0.60	0.17	8	2.57	0.074
13	0.82	1.74	2.63	37.75	41.03	10.39	2.49	2.76	0.38		7	3.32	0.057
14	1.69	3.63	4.08	31.54	45.56	9.77	1.69	1.60	0.46		7	3.92	0.094
15	0.16	0.38	1.27	42.72	44.36	7.63	1.74	1.57	0.16	0.11	5	1.85	0.047
16	1.02	1.63	2.51	47.82	37.82	6.55	1.21	1.02	0.42		6	1.87	0.077
17	0.43	1.37	2.59	35.20	49.92	7.69	1.19	1.01	0.60	0.11	6	1.31	0.076
18	1.42	2.08	3.15	27.52	51.96	9.86	1.90	1.48	0.62		5	3.44	0.067
19	4.82	12.84	11.67	31.78	29.18	6.74	1.25	1.22	0.50		7	11.20	
20	0.10	0.47	1.82	39.19	47.63	8.00	1.63	0.86	0.30	0.53	8	1.69	0.130
21	0.[redacted]	0.67	2.87	44.61	41.64	7.04	1.12	1.19	0.50		5	1.46	0.031
22	0.61	1.37	2.67	38.75	44.41	8.49	2.02	1.42	0.26	0.099	6	2.09	0.060
23	1.02	1.80	2.85	42.56	40.65	7.33	1.81	1.70	0.28		6	3.09	0.034

WEJ

The white quartz sand and loosely coherent sandstone, occurring as thick beds in the Dakota formation, on the south shore of Wapawekka Lake, seem to be well adapted for glass. The quartz grains are subangular and are fairly uniform in size, about 93 percent passing a 60 mesh screen. An unwashed sample of the sand, collected from the face of a scarped bank, was analyzed by H.A. Leverin of the Mines Branch. It gave the following result:

TABLE XVI

Chemical Analysis of Wapawekka Sand

SiO_2	98.60 %
Fe_2O_3 and Al_2O_3	1.20 %
Other impurities	0.20 %
	100.00 %

As neither the iron oxide nor the alumina occur in the grains of quartz, but rather as coating and cementing materials, this sand after washing should be sufficiently clean for glass manufacture. This sand occurs in cliffs 30 to 40 feet high, facing the lake and are so loosely coherent as to be easily reduced and collected by the hydraulic method.

Professor W.G. Worcester, of the Ceramic Department of the University of Saskatchewan, examined these sandstones in 1921, and his description is contained in an unpublished report made to the Minister of Labour and Industries, Saskatchewan, entitled "Reconnaissance Survey of Part of Northern Saskatchewan, 1921".

W.H. Hasting, Mining Engineer of the Saskatchewan Government, who visited Northern Saskatchewan during the summer of 1926, submitted a sample of sand to the Department of Mines, Ottawa, which analyzed as follows:

TABLE XVII

Chemical Analysis of Wapawekka Sand

SiO_2	98.50 %
Fe_2O_3	0.008 %
Al_2O_3	0.21 %

TABLE XVIII

Screen Analysis of Wapawekka Sand

	percent	Cumulative percent
+ 28	1.0	1.0
+ 35	51.4	52.4
+ 48	39.7	92.1
+ 65	4.1	96.2
+ 100	1.1	97.3
+ 150	2.3	99.6
+ 200	0.2	99.8
- 200	0.2	
	100.00	

It is of interest to note that the Wapawekka and the Red Deer River sand deposits occur in the same geological formation and the chemical and physical properties are much the same.

An interesting deposit of sand is found on Hanson Lake, about forty air miles west of Flin Flon. Chernoff* makes the following general statement:

"The Winnipeg sandstone is a grayish orange medium grained sand, which is friable but will stand up in vertical cliffs. Outcrops of the sand are numerous in the Hanson Lake region, occurring along the Paleozoic - Precambrian contact. The outcrops are linear, usually only the upper two to four feet of the sand are exposed. The lower contact is in all cases obscured by a talus slope of the dolomite"

"The Winnipeg sandstone is a blanket deposit with cross bedding, horizontal bedding, and possessing uniformity of size and shape. This along with marine fossils indicates a marine depositional environment.

Fossils are absent from the lower unconsolidated sand but are found in the overlying consolidated sandstone.

Textually, the sand has a medium diameter of 0.4 mm., with high sphericity, roundness, good sorting and intense frosting and pitting.

Only the stablest minerals are present in the heavy mineral suite, indicating an intense mechanical and chemical disintegration. The removal of unstable "heavies" could also have been aided by intrastratal solution.

The sand was derived from a complex area. The majority of the sand was derived from the weathered Precambrian with lesser amounts being supplied by the reworking of pre-existing sediments."

The above occurrence of sandstone is described by Byers** in a report of the geology of that area.

Kupsch*** describes other deposits of Winnipeg sandstone that occur in the Namew Lake - Ballantyne Bay area and a somewhat smaller deposit on Amisk Lake.

---

* *The Winnipeg Sandstone by C.N. Chernoff, B.Sc. Thesis, University of Saskatchewan, 1955.*

** *The Geology of the Hanson Lake Area by Dr. A.R. Byers. Sask. Department of Mineral Resources. In preparation.*

*** *Ordovician and Silurian Stratigraphy of East Central Saskatchewan, by Dr. W.O. Kupsch. Report No. 10, Sask. Department of Mineral Resources.*