CANADA
DEPARTMENT OF MINES

HON. T. A. CRERAR, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF CHURCHBRIDGE No. 211 SASKATCHEWAN

BY

B R. MacKay, H. N. Hainstock & P. D. Bugg

Water Supply Paper No. 157

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Map of the municipality.

Figure 1. Map showing surface and bedrock geology that affect the ground water supply.

Figure 2. Map showing relief and the location and types of wells.

Publication of Results

The essential information pertaining to the ground water conditions is being published in reports, one being issued for each municipality. Copies of these reports are being sent to the secretary treasurers of the municipalities and to certain Provincial and Federal Departments, where they can be consulted by residents of the municipalities or by other persons, or they may be obtained by writing direct to the Director, Bureau of Economic Geology, Department of Mines, Ottawa. Should anyone require more detailed information than that contained in the reports such additional information as the Geological Survey possesses can be obtained on application to the director. In making such request the applicant should indicate the exact location of the area by giving the quarter section, township, range, and meridian concerning which further information is desired.

The reports are written principally for farm residents, municipal bodies, and well drillers who are either planning to sink new wells or to deepen existing wells. Technical terms used in the reports are defined in the glossary.

How to Use the Report

Anyone desiring information about ground water in any particular locality should read first the part dealing with the municipality as a whole in order to understand more fully the part of the report that deals with the place in which he is interested. At the same time he should study the two figures accompanying the report. Figure 1 shows the surface and bedrock geology as related to the ground water supply, and Figure 2 shows the relief and the location and type of water wells. Relief is shown by lines of equal elevation called "contours". The elevation above sea-level

is given on some or all of the contour lines on the figure.

If one intends to sink a well and wishes to fine the approximate depth to a water-bearing horizon, be must learn: (1) the elevation of the site, and (2) the probable elevation of the water-bearing bed. The elevation of the well site is obtained by marking its position on the map, Figure 2, and estimating its elevation with respect to the two contour lines between which it lies and whose elevations are given on the figure. Where contour lines are not shown on the figure, the elevations of adjacent wells as indicated in the Table of Well Records accompanying each report can be used. The approximate elevation of the water-bearing horizon at the well-site can be obtained from the Table of Well Records by noting the elevation of the water-bearing horizon in surrounding wells and by estimating from these known elevations its elevation at the well-site.[1] If the water-bearing horizon is in bedrock the depth to water can be estimated fairly accurately in this way. If the water-bearing horizon is in unconsolidated deposits such as gravel, sand, clay, or glacial debris, however, the estimated elevation is less reliable, because the water-bearing horizon may be inclined, or may be in lenses or in sand beds which may lie at various horizons and may be of small lateral extent. In calculating the depth to water, care should be taken that the water-bearing horizons selected from the Table of Well Records be all in the same geological horizon either in the glacial drift or in the bedrock. From the data in the Table

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[1] If the well-site is near the edge of the municipality, the map and report dealing with the adjoining municipality should be consulted in order to obtain the needed information about nearby wells.

of Well Records it is also possible to form some idea of the quality and quantity of the water likely to be found in the proposed well.

GLOSSARY OF TERMS USED

Alkaline. The term "alkaline" has been applied rather loosely to some ground waters. In the Prairie Provinces a water is usually described as "alkaline" when it contains a large amount of salts, chiefly sodium sulphate and magnesium sulphate in solution. Water that tastes strongly of common salt is described as "salty". Many "alkaline" waters may be used for stock. Most of the so-called "alkaline" waters are more correctly termed "sulphate waters".

Alluvium. Deposits of earth, clay, silt, sand, gravel, and other material on the flood-plains of modern streams and in lake beds.

Aquifer or Water-bearing Horizon. A water-bearing bed, lens, or pocket in unconsolidated deposits or in bedrock.

Buried pre-Glacial Stream Channels. A channel carved into the bedrock by a stream before the advance of the continental ice-sheet, and subsequently either partly or wholly filled in by sands, gravels, and boulder clay deposited by the ice-sheet or later agencies.

Bedrock. Bedrock, as here used, refers to partly or wholly consolidated deposits of gravel, sand, silt, clay, and marl that are older than the glacial drift.

Coal Seam. The same as a coal bed. A deposit of carbonaceous material formed from the remains of plants by partial decomposition and burial.

Contour. A line on a map joining points that have the same elevation above sea-level.

Continental Ice-sheet. The great ice-sheet that covered most of the surface of Canada many thousands of years ago.

Escarpment. A cliff or a relatively steep slope separating level or gently sloping areas.

Flood-plain. A flat part in a river valley ordinarily above water but covered by water when the river is in flood.

Glacial Drift. The loose, unconsolidated surface deposits of sand, gravel, and clay, or a mixture of these, that were deposited by the continental ice-sheet. Clay containing boulders forms part of the drift and is referred to as glacial till or boulder clay. The glacial drift occurs in several forms:

(1) Ground Moraine. A boulder clay or till plain (includes areas where the glacial drift is very thin and the surface uneven).

(2) Terminal Moraine or Moraine. A hilly tract of country formed by glacial drift that was laid down at the margin of the continental ice-sheet during its retreat. The surface is characterized by irregular hills and undrained basins.

(3) Glacial Outwash. Sand and gravel plains or deltas formed by streams that issued from the continental ice-sheet.

(4) Glacial Lake Deposits. Sand and clay plains formed in glacial lakes during the retreat of the ice-sheet.

Ground Water. Sub-surface water, or water that occurs below the surface of the land.

Hydrostatic Pressure. The pressure that causes water in a well to rise above the point at which it is struck.

Impervious or Impermeable. Beds, such as fine clays or shale, are considered to be impervious or impermeable when they do not permit of the perceptible passage or movement of the ground water.

Porvious or Permeable. Beds are pervious when they permit of the perceptible passage or movement of ground water, as for example porous sands, gravel, and sandstone.

Pre-Glacial Land Surface. The surface of the land before it was covered by the continental ice-sheet.

Recent Deposits. Deposits that have been laid down by the agencies of water and wind since the disappearance of the continental ice-sheet.

Unconsolidated Deposits. The mantle or covering of alluvium and glacial drift consisting of loose sand, gravel, clay, and boulders that overlie the bedrock.

Water Table. The upper limit of the part of the ground wholly saturated with water. This may be very near the surface or many feet below it.

Wells. Holes sunk into the earth so as to reach a supply of water. When no water is obtained they are referred to as dry holes. Wells in which water is encountered are of three classes.

(1) Wells in which the water is under sufficient pressure to flow above the surface of the ground. These are called Flowing Artesian Wells.

(2) Wells in which the water is under pressure but does not rise to the surface. These wells are called Non-Flowing Artesian Wells.

(3) Wells in which the water does not rise above the water table. These wells are called Non-Artesian Wells.

NAMES AND DESCRIPTIONS OF GEOLOGICAL FORMATIONS, REFERRED TO IN THESE REPORTS

Wood Mountain Formation. The name given to a series of gravel and sand beds which have a maximum thickness of 50 feet, and which occur as isolated patches on the higher parts of Wood mountain. This is the youngest bedrock formation and, where present, overlies the Ravenscrag formation.

Cypress Hills Formation. The name given to a series of conglomerates and sand beds which occur in the southwest corner of Saskatchewan, and rest upon the Ravenscrag or older formations. The formation is 30 to 125 feet thick.

Ravenscrag Formation. The name given to a thick series of light-coloured sandstones and shales containing one or more thick lignite coal seams. This formation is 500 to 1,000 feet thick, and covers a large part of southern Saskatchewan. The principal coal deposits of the province occur in this formation.

Whitemud Formation. The name given to a series of white, grey, and buff coloured clays and sands. The formation is 10 to 75 feet thick. At its base this formation grades in places into coarse, limy sand beds having a maximum thickness of 40 feet.

Eastend Formation. The name given to a series of fine-grained sands and silts. It has been recognized at various localities over the southern part of the province, from the Alberta boundary east to the escarpment of Missouri coteau. The thickness of the formation seldom exceeds 40 feet.

Bearpaw Formation. The Bearpaw consists mostly of incoherent dark grey to dark brownish grey, partly bentonitic shales, weathering light grey, or, in places where much iron

is present, buff. Beds of sand occur in places in the lower part of the formation. It forms the uppermost bedrock formation over much of western and southwestern Saskatchewan and has a maximum thickness of 700 feet or somewhat more.

Belly River Formation. The Belly River consists mostly of non-marine sand, shale, and coal, and underlies the Bearpaw in the western part of the area. It passes eastward and northeastward into marine shale. The principal area of transition is in the western half of the area where the Belly River is mostly thinner than it is to the west and includes marine zones. In the southwestern corner of the area it has a thickness of several hundred feet.

Marine Shale Series. This series of beds consists of dark grey to dark brownish grey, plastic shales, and underlies the central and northeastern parts of Saskatchewan. It includes beds equivalent to the Bearpaw, Belly River, and older formations that underlie the western part of the area.

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Churchbridge, No. 211, comprises an area of 369 square miles in southeastern Saskatchewan. The area consists of nine full townships described as tps. 22, 23, and 24, ranges 30, 31, and 32, and three fractional townships described as tps. 22, 23, and 24, range 33, all W. 3rd mer. Beresina, a rural post office situated 11 miles west of the Manitoba border and 136 miles north of the International Boundary line, lies approximately in the centre of the municipality.

The elevation rises gradually from 1,650 feet in the east to 1,750 feet in the west. Smith creek drains the south-eastern part of the township and an intermittent creek drains the east-central part. At least fourteen small lakes are situated in the central and southern parts of the area, and small sloughs are also common.

The glacial drift is at least 382 feet thick. Two moraine-covered areas extend from the northwestern part southeasterly towards the central part of the municipality. A small area in the southwestern corner of township 22, range 32, is mantled by glacial outwash sands and gravels, and the remainder of the municipality is overlain by boulder clay or glacial till. The ground surface of the glacial till-covered area is slightly rolling, but that of the moraine-covered areas is very irregular with numerous knolls, northwest-southeast trending ridges, and many undrained depressions. The deposits of glacial till and moraine consist of a weathered or oxidized zone composed of several feet of sandytop-soil and 10 to 30 feet of yellow boulder clay, and by an unweathered zone of blue boulder clay that extends to a depth of at least 382 feet or to an elevation of 1,368 feet above sea-level. Scattered deposits of sand and gravel occur within both the weathered and unweathered clays.

Water-bearing Horizons in the Unconsolidated Deposits

The uppermost water-bearing horizon occurs in the upper 10 to 30 feet of the glacial drift. The horizon is not continuous and it is formed by scattered pockets of sand and gravel that occur within the yellow clay. In many places a number of dry holes are dug before a water-bearing deposit is located. It is advisable to locate the water-bearing sand deposits with a small hand auger before digging a well. Some of the wells tapping this horizon yield intermittent supplies, and in some localities two or more of these shallow wells are used in order to obtain an adequate supply of water. Sloughs, small dams, and dugouts are also used to supplement the supply from the intermittent shallow wells. The supply from other wells that tap pockets of larger areal extent is adequate for 60 to 80 head of stock. The water from wells that yield an abundant supply is usually moderately soft to hard, but that from wells that yield small or intermittent supplies is more highly mineralized, and in some sections it is unsuitable for household use. Wells that tap this water-bearing horizon are more numerous in the southeastern part of the municipality.

A second, discontinuous, water-bearing horizon is located at depths of 35 to 75 feet in the glacial drift. This aquifer is formed by deposits of sand that occur within the unweathered or blue clay. It has been tapped at many places throughout the municipality, and a large number of wells in the northern and northeastern parts derive water from this source. The water is usually very hard and "alkaline", but from most of the wells it is used for domestic purposes. It has a laxative effect on most persons not accustomed to the use of highly mineralized water. The hydrostatic pressure varies with the individual wells, but in most wells it is sufficient

to cause the water to rise to points 15 to 30 feet below the surface. The supply available from several wells in township 24, ranges 31 and 32, is adequate for 60 to 100 head of stock. Other wells generally yield sufficient water for 20 to 40 head of stock.

At least 30 wells, 90 to 250 feet deep, have been sunk in the municipality. Many did not encounter water, but some of them yield small supplies of highly mineralized water, whereas others yield an abundant supply that is under considerable hydrostatic pressure. The drilling of a dry hole does not indicate widespread, non-water-bearing conditions, as a well close by may obtain an abundant supply of water; the aquifers are formed by localized pockets of sand and gravel and not by continuous deposits. Water from most of the producing wells is too highly mineralized for domestic use, but some wells are being used as water of better quality is not obtainable within reasonable hauling distance. It is usually termed "alkaline", and it contains sufficient iron in solution to stain the water containers. The supplies from several of these wells are adequate for 100 head of stock, but in most the yield is adequate for not more than 30 head of stock. It is possible that water-bearing beds will be encountered at depths of 90 to 200 feet in any part of the municipality. However, if large quantities of water are required it does not seem advisable to drill deep wells as only a few of the thirty deep wells yield sufficient water for 100 head of stock.

Three wells in the NE.$\frac{1}{4}$, sec. 2, tp. 23, range 30, the SE.$\frac{1}{4}$, sec. 19, tp. 24, range 30, and the NE.$\frac{1}{4}$, sec. 6, tp. 24, range 31, tap aquifers of fine sand at depths of 340, 300, and 382 feet, respectively, or at an average elevation of 1,350 feet above sea-level. These deposits of sand probably lie at the contact of the drift and the bedrock. The water is suitable for

farm needs, although it is highly mineralized and contains a considerable amount of iron in solution. The content of sodium chloride or common salt is also very high. It is possible that this water-bearing horizon is continuous, but the quality and quantity of water obtained from it do not warrant the expense of drilling necessary to tap it. Another well in the NE.$\frac{1}{4}$, sec. 26, tp. 22, range 31, drilled to a depth of 333 feet, encountered a bed of sand at a depth of 260 feet that yielded a small supply of water. Drilling was continued to a depth of 333 feet or to an elevation of 1,376 feet above sea-level without encountering other water-bearing beds.

The supply of water obtained in this municipality at the present time is sufficient for local needs, but if more abundant supplies were available larger herds of stock could be kept. Should finances not permit the drilling of deep wells, dugouts can be excavated to retain surface water for stock use. Dams can also be used, and the water retained in these reservoirs is more suitable for stock than the highly mineralized water from deep, drilled wells.

Water-bearing Horizons in the Bedrock

In this part of Saskatchewan the glacial drift is underlain by the Marine Shale series. It has not been encountered by any well in this municipality, although wells have been drilled to a depth of 382 feet, but it is thought that bedrock occurs at an approximate elevation of 1,350 feet above sea-level. It is not advisable to drill into this Marine Shale series as it rarely contains water in this part of Saskatchewan. Where water has been encountered it was too highly mineralized for farm purposes.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 22, Range 30

This township is mantled by glacial till or boulder clay. The ground surface is gently undulating and the elevation averages 1,660 feet above sea-level. The glacial till is at least 234 feet thick and generally consists of a thin layer of loam top-soil; 10 to 45 feet of yellow boulder clay containing scattered pockets of sand and gravel; a fairly continuous bed of sand and gravel varying in thickness from a few inches to 6 to 8 feet; and unweathered, blue clay that contains very few deposits of sand.

Water supplies in this township are derived from two or three small lakes, Smith creek, sloughs, dugouts, and from wells. The lakes are permanent bodies of water and are situated in the northeastern and southwestern parts of the township. Smith creek, a permanent stream, flows across the SW.¼, section 6. The sloughs and dugouts do not retain water throughout the year and many farmers are forced to haul water.

The main supply of water in this township is obtained from the pockets of sand and gravel in the yellow clay, and from the discontinuous layer of sand and gravel that lies between the yellow and blue clays. Several of the shallow wells tap aquifers of large areal extent and they yield sufficient water for 30 to 40 head of stock. The water from these wells is moderately hard and is suitable for all farm purposes including irrigation. Most of the wells that tap this water-bearing horizon, however, yield smaller supplies of more highly mineralized water. Many of the farmers use two or more of these wells to obtain sufficient water for a few head of stock. During the winter months the water supply decreases and water is either hauled or snow is melted. A number of dry

holes have been dug in an effort to locate water-bearing beds in the upper part of the glacial drift. A great deal of labour and expense can be saved if the water-bearing deposits are located by means of a small auger prior to digging a well.

Few attempts have been made to locate water at depth in this township. A dry hole was sunk to a depth of 58 feet in the SE.$\frac{1}{4}$, section 16. In the NE.$\frac{1}{4}$, section 32, a well was drilled to a depth of 234 feet or an elevation of 1,441 feet above sea-level. The well passed through approximately 40 feet of yellow clay; 30 feet of blue clay; 1 foot of dry sand; 160 feet of blue clay; and 3 feet of fine water-bearing sand. It yields a fairly abundant supply of water. The hydrostatic pressure raises the water to a point 144 feet below the surface, but the water seeps into the well very slowly. The water is hard and "alkaline", but it is usable for all domestic purposes and the supply is sufficient for at least 36 head of stock. It is possible that wells to this depth in other parts of the township would encounter similar water-bearing sand or gravel. Dams and dugouts can be used to advantage in this township to retain a supply of surface water for stock.

Township 22, Range 31

With the exception of parts of sections 18, 19, and 31, which are covered by moraine, this township is overlain by boulder clay or glacial till. The moraine-covered area is characterized by knolls and undrained depressions, whereas the glacial till-covered area is a rolling plain. The elevation of the ground surface varies between 1,680 and 1,730 feet above sea-level, the maximum elevation being in the west. The headwaters of Smith creek occur in section 31, from where it flows in a southeasterly direction leaving the township in section 1. It is a permanent stream and occupies a wide, shallow valley.

Smith creek, and sloughs, are used for watering stock during part of the year.

The principal water-bearing horizon in the township is encountered in the upper 30 feet of the glacial drift and is formed by scattered pockets of sand and gravel. The amount of water derived from the individual wells depends upon the areal extent of the pocket tapped and upon the amount of annual rainfall. A few wells yield a supply of water that is sufficient for 40 to 50 head of stock. The water has a low total dissolved solid content and is in many cases termed "soft" when compared with water from wells yielding small supplies. The wells that tap small pockets of sand and gravel yield small supplies of water, and in some sections from two to five wells are used in order to obtain sufficient water for local needs. Dams or dugouts are sometimes used to supplement the supply from shallow wells, and in some instances farmers haul water from wells that yield abundant supplies. The water although quite highly mineralized is generally usable for domestic purposes. Care should be taken to see that these shallow wells do not become polluted by surface water containing sewage.

Three wells located in the NE.$\frac{1}{4}$, section 3, the SW.$\frac{1}{4}$, section 6, and the NE.$\frac{1}{4}$, section 26, obtain water at depths of 240, 209, and 260 feet, or at elevations of 1,440, 1,511, and 1,450 feet above sea-level. The water from the well in section 3 is hard and "alkaline", and contains a considerable amount of iron. It is being used for domestic purposes. The water is under hydrostatic pressure and rises to a point approximately 140 feet below the surface. The well in section 6 obtains a small supply of soft water from an aquifer composed of fine sand. This is apparently a different aquifer from that encountered by the well in section 3. The well is not being used at the present

time. The well in section 26 obtained a small supply of water at a depth of 260 feet. Drilling was continued to a depth of 333 feet without encountering any other water-bearing horizons. It is possible that the last 73 feet of this hole was drilled in the Marine Shale series, but it is more likely that it is wholly in compact blue clay.

An abundant supply of water is not obtained in this township. Many of the shallow wells become intermittent or dry during periods of drought. In many parts of the township dry holes have been dug to depths of 50 to 160 feet and it does not appear advisable to try to locate water between the depths given above. The small amount of water obtained from the three deep wells does not appear to warrant the expense of drilling, although it is possible that water-bearing deposits exist at depth throughout the township. Dugouts or dams to retain surface water are advised as a means of increasing the supply of wat for stock.

Township 22, Range 32

The average elevation of this township is 1,750 feet above sea-level. The northeastern corner is very hilly and is covered by moraine. The remainder of the township is slightly rolling and is mantled by glacial till or boulder clay. A small deposit of glacial outwash sand and gravel overlies the glacial till in parts of sections 4, 7, 8, and 18. These glacial outwash sands and gravels are from 2 to 20 feet thick and occur at or near the surface, being overlain in places by a thin veneer of top-soil. The deposits of boulder clay and moraine generally consist of 10 to 40 feet of yellow or oxidized boulder clay containing scattered pockets of sand and gravel; discontinuous beds of sand and gravel; and blue clay that

probably extends to the bedrock. A few beds of sand and gravel have been encountered in the blue clay.

The main supply of water in this township is derived from the glacial outwash sands and gravels; from the pockets of sand and gravel in the yellow clay; and from the beds of sand and gravel that lie between the yellow clay and the underlying blue clay.

Water from the glacial outwash deposits and from pockets of sand and gravel of large areal extent in the boulder clay is slightly mineralized, and the supply is sufficient for 35 to 60 head of stock. It is an excellent water for all farm purposes, including irrigation. Most of the wells that tap this water-bearing horizon, however, yield supplies of water that are just sufficient for present local needs, but with an increase in the number of live stock the supply would be inadequate. During drought periods several of the farmers were forced to haul water, as some of the shallow wells become completely dry. Several attempts have been made to locate water at depth. A 74-foot well in the NW.$\frac{1}{4}$, section 9, encountered a water-bearing sand, but the water is too highly mineralized for domestic use, and the supply is sufficient only for a few head of stock. In section 34, holes sunk to depths of 40 to 90 feet were dry, and sloughs are used for stock, or water is hauled. A 52-foot well on the outskirts of the town of Churchbridge is used by the residents for stock. The water is under hydrostatic pressure, rising to a point 28 feet below the surface where it maintains a constant level. The water is not used for domestic purposes as it contains a relatively large amount of iron. The residents haul water for domestic use from shallow wells on nearby farms.

It is probable that water-bearing deposits occur at depth in the drift, but the small quantity and the poor quality

of the water to be obtained does not warrant the expense of drilling. Dams and dugouts are recommended as a means of retaining surface water for stock use.

Township 22, Range 33

This fractional township, comprising an area of 21 square miles, is mantled by glacial till or boulder clay. The ground surface is slightly rolling and the elevation averages 1,750 feet above sea-level.

The uppermost water-bearing horizon lies within 30 feet of the surface and it is encountered mainly in the southern sections of the township. It is formed by isolated pockets of sand and gravel that occur in the yellow clay. Most of the wells tapping these deposits yield an abundant supply of water, but a few yield sufficient water for only 18 to 25 head of stock. The water is hard and in some places slightly "alkaline", but it is usable for all domestic purposes. Usually two or more of these wells are used to obtain sufficient water for local needs.

A few holes have been sunk to depths of 38 to 140 feet. On the NE.$\frac{1}{4}$, section 1, a well encountered a bed of water-bearing sand at a depth of 38 feet. The well yields sufficient water for at least 50 head of stock, but the water is so highly mineralized that it is unfit for any other use. The hydrostatic pressure causes the water to rise to a point 8 feet below the surface. Two other wells in the NE.$\frac{1}{4}$, section 14, and SE.$\frac{1}{4}$, section 16, obtain smaller supplies of water at depths of 65 and 52 feet. The water from these wells is also too highly mineralized to be used for domestic purposes. In the SW.$\frac{1}{4}$, section 36, a well drilled to a depth of 140 feet encountered a thin bed of water-bearing sand. The water is usable for all farm purposes, but the well only yields sufficient water for about 4 head of stock. The water rises to a point 130 feet below the surface, but it is

quickly lowered by pumping, and it takes a considerable time for the well to refill. Several holes dug to depths of 25 to 50 feet in this same quarter-section were dry, and the farmer is forced to haul water for all purposes.

The supply of ground water obtained in this township is barely sufficient for local needs. Drilling to depth does not appear to be advisable as water-bearing horizons that yield abundant supplies of water are not known to occur in the lower part of the drift in this township. The use of dams and dugouts is a practical and economical method of retaining a supply of surface water for stock.

Township 23, Range 30

The elevation in this township descreases from 1,700 feet in the west to 1,650 feet in the east. Several small creeks head in this township and flow eastward to Assiniboine river in Manitoba. The entire township is mantled by glacial till or boulder clay. It consists of 40 feet of weathered or yellow boulder clay that is underlain by blue clay that extends to a depth of at least 319 feet.

The main supply of water is obtained from isolated pockets of sand and gravel that occur in the yellow clay, and from discontinuous layers of sand and gravel that lie between the yellow and blue boulder clays. Several of the wells that tap beds of sand and gravel of large areal extent yield an abundant supply of slightly mineralized water sufficient for 50 to 60 head of stock. Shallow wells that tap pockets of sand of small extent yield smaller supplies of water that is more highly mineralized. A few of the wells are intermittent or yield sufficient water for only a few head of stock. Some of the farmers use from two to five wells in order to obtain sufficient water for their local needs. Several haul water

from neighbouring wells that yield an abundant supply; and others use dams, dugouts, or sloughs during part of the year. The water from all of the wells is being used for domestic purposes.

A few holes, 60 to 90 feet deep, have been dug, but with the exception of one in the NW.$\frac{1}{4}$, section 35, which encountered a deposit of water-bearing sand at a depth of 77 feet, all of them were dry. The producing well yields an abundance of very highly mineralized water. It is being used for both domestic purposes and for stock with no apparent ill effects. The hydrostatic pressure is sufficient to raise the water to a point 24 feet below the surface.

Wells in the NW.$\frac{1}{4}$, section 6, the NW.$\frac{1}{4}$, section 21, and the SE.$\frac{1}{4}$, section 36, struck beds of sand at a depth of 100, 104, and 110 feet, respectively. Water from the 100-foot well was too bitter and "alkaline" to be used for any purposes, and the supply is very small. The 104- and 110-foot wells yield supplies that are more than adequate for 45 head of stock. The water rises to a point 15 feet below the surface and it is suitable for drinking and for stock. The aquifers of these wells are not continuous as deeper wells failed to encounter them.

Two wells in the SE.$\frac{1}{4}$, section 12, and the NE.$\frac{1}{4}$, section 20, tap sand and gravel aquifers at depths of 180 and 202 feet, or at an average elevation of 1,470 feet above sea-level. The water is very hard and contains a considerable amount of iron, but it is usable for household purposes. The hydrostatic pressure in the 180-foot well is only sufficient to cause the water to rise to a point 155 feet below the surface, but in the 202-foot well it rises to a point 19 feet below the surface where it maintains a constant level. This water-bearing horizon may be located in other sections of the township. A 350-foot well in the NE.$\frac{1}{4}$, section 2, taps an aquifer of fine sand at

a depth of 319 feet or an elevation of 1,341 feet above sea-level. The sand bed is at least 31 feet thick and it yields an abundant supply of usable water. The deposit of sand may occur at the contact of the glacial drift and bedrock. The water is hard and has a high iron content, but it is usable for all domestic purposes. It is under sufficient hydrostatic pressure to rise to a point 190 feet below the surface. It is probable that this or similar deposits of sand may occur throughout the township.

The supply of water on most farms in this township is adequate for the present needs, but it is not sufficient to allow the raising of larger herds of live stock. Drilling may locate water at depths of 100 to 350 feet, but the expense of pumping the water, the cost of drilling the well, and the possibilities of not obtaining good water, are factors to be considered before drilling deep wells. Dugouts and dams are recommended as a means of conserving surface water for stock.

Township 23, Range 31

A small area in section 6, and another in parts of sections 32, 33, and 34, are overlain by moraine, but the remainder of the township is mantled by glacial till or boulder clay. The ground surface is slightly rolling and contains a few undrained depressions or small sloughs.

Few good wells exist in this township. Most of the water is derived from wells that tap pockets of sand or gravel in the upper or weathered zone of the drift. These deposits do not form a continuous water-bearing horizon as numerous holes have failed to strike sand or gravel aquifers. A few of the producing wells yield sufficient water for 30 to 40 head of stock, but most of them yield only small supplies that are sufficient for a few head. They are readily affected by drought conditions.

The water is moderately hard and some is "alkaline", but it is usable for domestic purposes. Some of the residents use shallow wells for household purposes, and water their stock from a slough, dam, or dugout.

A number of attempts have been made to locate water-bearing beds at depths of 35 to 65 feet below the surface. With the exception of a well in the SW.$\frac{1}{4}$, section 9, that derives a small amount of highly mineralized water from a deposit of sand, the others failed to encounter water. Two wells on the NE.$\frac{1}{4}$, section 24, and the NW.$\frac{1}{4}$, section 32, encounter a fine water-bearing sand at a depth of 210 and 200 feet, respectively, or at elevations of 1,500 feet above sea-level. The water is hard and "alkaline", but it has been used for household purposes. It has a laxative effect on those not accustomed to the use of highly mineralized water. The first well is not being used at present as the casing is broken. The hydrostatic pressure is sufficient to cause the water to rise to points 44 and 19 feet below the surface where it maintains constant levels. This water-bearing horizon is not continuous, as several holes in the NE.$\frac{1}{4}$, section 26, failed to encounter water. One of these holes was drilled to a depth of 250 feet and its base was in blue clay when drilling was discontinued.

Few farmers reside in this township, probably because it is difficult to obtain sufficient water for farm needs. During periods of drought, such as from 1930-35, great difficulty was experienced in obtaining sufficient water even for a few head of stock. Water may exist at depth in the glacial drift, but the uncertainty of obtaining it, and the poor quality of the water located at depth in the other townships, do not warrant the expense of drilling. Reservoirs to retain and store surface water are excellent means of increasing the supply of water for stock. There are many suitable locations for the excavation of dugouts, and dams could be constructed in some sections.

Township 23, Range 32

The northeastern and southwestern corners of the township are mantled by boulder clay or glacial till, but the remainder of the area is covered by moraine. The till-covered areas are rolling and the moraine-covered area is rough and is characterized by low hillocks and undrained depressions. The elevation varies from 1,730 to 1,760 feet above sea-level. The general drainage is towards the east and southeast.

The supply of water in this township is derived from two or three small lakes that occur in sections 23, 24, and 25, from a few small dams and dugouts, and from wells. The uppermost source of ground water in this area is formed by scattered pockets of sand and gravel that occur in the weathered zone or yellow clay. Three or four shallow wells tap aquifers of large areal extent and yield a supply of water that is sufficient for 35 to 65 head of stock. Most of the wells, however, yield small, insufficient supplies of water, and often two or more wells are used in order to obtain sufficient water for local needs. The water contains a considerable amount of mineral salts in solution, but it is often termed soft when compared with water from deeper wells. It is suitable for all farm purposes including irrigation. It is advisable to locate a water-bearing sand deposit by means of a small auger before digging a shallow well.

Blue clay underlies the yellow clay to an unknown depth. Deposits of sand and gravel that occur in the blue clay at depths of 40 to 72 feet or at an average elevation of 1,690 feet above sea-level, have been encountered by at least twelve wells in the southwestern half of the township. The supply from the individual wells is sufficient, and in some cases it is more than adequate for local needs and will water from 30 to 80 head of stock. With one exception the wells are non-flowing artesian,

and the water is under sufficient hydrostatic pressure to rise to points 15 to 40 feet below the surface. Most of the water from the wells is "alkaline" and has a high iron content, but it is being used for all domestic purposes. The water-bearing deposits encountered by these wells may be fairly continuous, although a 70-foot well in the SW.¼, section 15, failed to encounter water.

A well in the NE.¼, section 20, taps a bed of water-bearing sand at a depth of 84 feet or at an elevation of 1,666 feet above sea-level. The water is highly mineralized, but usable for all domestic purposes. It is under hydrostatic pressure and rises to a point 20 feet below the surface. This is the deepest well in the township and the areal extent of the aquifer cannot be determined. It is possible that wells to this or greater depths would encounter water-bearing beds, but the uncertainty of obtaining water does not warrant the expense of deep drilling. Although the dams and dugouts in this township do not retain sufficient water for large herds of stock, they are an excellent means of supplementing the supply from wells. The dugouts should be made at least 12 feet deep in order to retain sufficient water during the winter months. Sloughs are excellent locations for dugouts.

Township 23, Range 33

This fractional township comprises an area of 12 square miles. Parts of sections 25, 35, and 36 are mantled by moraine and the other sections are covered by glacial till. The surface elevation averages 1,750 feet above sea-level. The ground surface is gently rolling and contains a few sloughs, and the drainage is towards the east.

Three shallow wells tap pockets of sand or gravel in the yellow clay within the upper 30 feet of glacial drift. These

wells yield supplies of water that are sufficient for 24 to 60 head of stock. The water is moderately hard and usable for all farm purposes.

Five wells tap deposits of water-bearing sand at depths of 40 to 75 feet. The water is very hard and highly mineralized, but it is usable for domestic purposes. The water is under pressure and rises to points 32 to 43 feet below the surface. Three of the wells yield sufficient water for 60 to 100 head of stock, but in the other two wells the supply is adequate for only 18 and 45 head of stock. This water-bearing horizon is not continuous as deeper wells in other sections have failed to encounter it.

A well in the SW.$\frac{1}{4}$, section 13, strikes a bed of sand at a depth of 81 feet, and delivers an abundant supply of water. The water is hard and has a high iron content, but it was pronounced usable for farm purposes by the Provincial Analyst. The water maintains a constant level at 48 feet below the surface, and in 1935 the well watered 120 head of stock. A 286-foot hole was drilled some distance from the 81-foot well on the same quarter section. The well penetrated two water-bearing beds of sand. A very small supply was encountered at a depth of 42 feet, and sufficient water for 33 head of stock was encountered at a depth of 81 feet. Drilling was continued to a depth of 286 feet in hope that an abundant supply of water would be located. The base of the well is in fine, dry sand, and blue clay was passed through from 81 feet to within a few feet of the bottom of the hole. Deep drilling is not advised in this area. A 100-foot well in the SW.$\frac{1}{4}$, section 24, struck a bed of water-bearing sand, but only a small supply of water is obtained as the seepage into the well is very slow. The water is hard and highly mineralized, and upon analysis was found suitable for domestic needs. The supply is insufficient

for local needs and dry holes nearby indicate the small areal extent of the aquifer.

Although most farms have sufficient water for present needs, the supply would not be adequate if the number of live stock were much increased. Dugouts or dams are the most economical means of increasing the supply of water for stock.

Township 24, Range 30

The average elevation of this township is 1,670 feet above sea-level. The surface is rolling and shallow valleys drain the surface water towards the east. The township is mantled by glacial till or boulder clay to a depth of at least 300 feet. The drift consists of a weathered zone composed of yellow boulder clay in which scattered pockets of sand and gravel occur, and an unweathered zone of blue boulder clay, which in one well extends to a depth of 290 feet, or to an elevation of 1,395 feet above sea-level. Discontinuous beds of sand occur at various elevations in the blue clay.

The uppermost water-bearing horizon is formed by the scattered pockets of sand and gravel in the yellow clay. In some localities the pockets are sparsely distributed, and it is always advisable to locate them by means of a small test auger before digging a well. An abundant supply of moderately hard water is obtained from several wells in sections 12, 18, 24, and 26, but most of the other wells yield supplies that are adequate only for a few head of stock. The amount of water obtainable is dependant upon the areal extent of the sand and gravel deposits and upon the amount of annual rainfall. Although the water from wells yielding a small supply contains a relatively large amount of mineral salts in solution, it is usable for all domestic purposes. Care should be taken to see that the shallow wells are not contaminated by surface waters containing animal refuse. The water should be frequently tested for bacteria.

Eight wells tap beds of sand in the blue clay at depths of 30 to 74 feet. These wells are mainly located in the northwestern part of the township. The water from them is highly mineralized, but with few exceptions it is used for all household purposes. A well in the SW.$\frac{1}{4}$, section 22, in the village of MacNutt, yields an abundant supply of water, but it is too highly mineralized to be used for all domestic purposes. Water for drinking and for cooking is hauled from wells yielding usable water. The water in most of the wells is under hydrostatic pressure and rises to points 15 to 30 feet below the surface.

Three wells in the NW.$\frac{1}{4}$, section 10, the SE.$\frac{1}{4}$, section 21, and the SW.$\frac{1}{4}$, section 22, tap beds of water-bearing sand and gravel at depths of 92, 100, and 100 feet, respectively, or at an elevation of 1,570 feet. The yield from the individual wells is more than sufficient for 60 to 125 head of stock. The water is hard and contains a considerable amount of iron, but it is usable for all domestic purposes. It rises to points 15 to 30 feet below the surface. This water-bearing deposit is probably continuous in the vicinity of these wells, but deeper wells to the south and the west failed to encounter it.

In section 4, two wells strike a water-bearing bed at depths of 168 and 170 feet. The water is hard, "alkaline", and is not used for domestic purposes where water of better quality is obtainable. The supply is sufficient for 60 to 70 head of stock and the hydrostatic pressure causes the water to rise to points 25 to 40 feet below the surface. This water-bearing bed may be located at similar depths in the vicinity of these wells, but it is not probable that it is continuous over a very large area. A 300-foot well in the SE.$\frac{1}{4}$, section 19, did not encounter it, but at 290 feet below the surface or at an elevation of 1,395 feet, a 10-foot bed of fine sand was struck that yields an

abundant supply of water. The water is too highly mineralized to be used for domestic purposes, but it is suitable for stock. The water is under strong hydrostatic pressure as it rises to a point 15 feet below the surface where it maintains a constant level. The water-bearing horizon is probably fairly continuous, as several wells in other townships of the municipality have located it at about the same elevation. The sand deposit may lie between the glacial drift and bedrock, as the Marine Shale series is thought to occur at or near an elevation of 1,300 feet below sea-level.

Most of the farms in this township have adequate supplies of water for present needs and some have an over-sufficiency. In several sections, however, where only shallow wells are used, a shortage is experienced during periods of drought. In such cases dams or dugouts could be used to retain surface water for stock use. The water from these reservoirs is more suitable for stock than the highly mineralized water from the deep wells.

Township 24, Range 31

The southwestern part of the township is mantled by moraine and is characterized by rock-strewn knolls, ridges, and by several undrained depressions or sloughs. The remainder of the township is mantled by glacial till, and its ground surface is gently rolling. The moraine and glacial till deposits are similar in composition and water conditions are practically the same in each area.

Eleven wells, 16 to 30 feet deep, tap pockets of sand and gravel in the yellow boulder clay. The water from these wells is hard, frequently "alkaline", but is usable for all domestic purposes. The supply from most of these wells is more than adequate for local needs, but in some areas two or more

wells are necessary to obtain sufficient water for a few head of stock. In some sections a number of dry holes were dug before a producing well was obtained, and it, therefore, appears advisable to test with a small hand auger before digging a well. This water-bearing horizon has been tapped mainly in the southeastern and northeastern sections.

In the northwestern part of the township, five wells, 30 to 65 feet deep, have struck deposits of water-bearing sand that occur within the blue clay. The water on coming in contact with the blue clay takes into solution a large amount of mineral salts which cause it to have a laxative effect on those not accustomed to the use of a highly mineralized water. The water is very hard, and that from some wells is "alkaline" and contains a high iron content. The individual wells yield sufficient water for 30 to 100 head of stock, and the water is under sufficient hydrostatic pressure to rise to points 15 to 25 feet below the surface. This water-bearing horizon has not been located in other parts of the township, although deeper holes have been sunk.

Six wells from 80 to 130 feet deep in sections 7, 10, 17, 18, 22, and 34, encounter beds of fine water-bearing sand. The well in the SW.$\frac{1}{4}$, section 17, is plugged with fine sand and another in the SW.$\frac{1}{4}$, section 22, is abandoned. The other wells yield sufficient water for 30 to 100 head of stock, but some difficulty is experienced in keeping the wells from plugging with sand. The water rises to points 20 to 40 feet below the surface and it is used for all domestic purposes, as water of better quality is not obtainable within reasonable hauling distance. It is possible that wells drilled to these depths in other parts of the township may locate similar water-bearing deposits, but the aquifers are not thought to be continuous.

A well in the NE.¼, section 6, taps a fine, water-bearing sand at a depth of 382 feet or at an elevation of 1,368 feet above sea-level. The well passed through 20 feet of yellow boulder clay, and then blue clay to within a few feet of the base. The water maintains a constant level 50 feet below the surface. It is hard and contains a fairly large amount of iron in solution, but it is used for household purposes. It is possible that this horizon may be located in other sections of the township, as wells in adjacent townships have encountered a similar horizon at approximately the same elevation.

In several sections farmers have been unable to locate water within 70 feet of the surface, and it is advised that dams or dugouts be used to collect and store a supply of surface water for stock in these areas.

Township 24, Range 32

The average elevation of this township is 1,750 feet above sea-level. The southwestern part and a narrow area in the northeastern corner of the township are covered by moraine. These areas are very hilly and contain a number of undrained depressions. The remainder of the township is slightly rolling and is mantled by glacial till or boulder clay.

The moraine and glacial till deposits generally consist of a thin layer of sandy top-soil; 10 to 30 feet of yellow boulder clay containing scattered pockets of sand and gravel; and blue boulder clay that extends to a depth of at least 250 feet and which probably reaches to the bedrock. Thin, discontinuous beds and pockets of sand occur at various horizons in the blue clay.

The uppermost water-bearing horizon is formed by the scattered pockets of sand and gravel that occur in the upper

30 feet of the glacial drift. These deposits are not numerous and only eight wells are reported that obtain water from this source. The yield from the individual wells is sufficient for 15 to 45 head of stock. The water contains a considerable amount of mineral salts in solution, but locally it is often termed "soft" when compared with water from deeper wells. It is suitable for all general farm purposes.

Deposits of sand and gravel that occur in the blue clay at depths of 37 to 65 feet, or at an average elevation of 1,695 feet above sea-level, have been encountered by thirteen wells in different parts of the township. These wells are the main source of water in the township. The water is hard and generally "alkaline" and it contains a considerable amount of iron in solution. It is being used for domestic purposes, however, as water of better quality is not obtainable within reasonable hauling distance. It has a laxative effect on those not accustomed to the use of highly mineralized water. The hydrostatic pressure is sufficient to cause the water to rise to points 14 to 32 feet below the surface in most wells. The supply from some of the wells is sufficient for 60 to 100 head of stock, whereas that from others is sufficient for 25 to 35 head of stock. This water-bearing horizon is not continuous as deeper holes failed to encounter it. Similar deposits, however, may be encountered in other parts of the township.

Three wells in the SE.$\frac{1}{4}$, section 4, the NE.$\frac{1}{4}$, section 7, and the SW.$\frac{1}{4}$, section 14, tap beds of water-bearing beds of sand or gravel at depths of 250,200, and 90 feet, respectively. The water from the 90-foot well is suitable only for stock. It rises to within 20 feet of the surface, but the supply is decreasing, and in 1935 it was inadequate for 50 head of stock. The other two wells yield an abundant supply of water, but it is

not usable for household purposes as it contains a large amount of mineral salts in solution, and its iron content makes it very unpalatable. The water is under sufficient hydrostatic pressure to rise to points 19 and 25 feet below the surface. The similarity of the quality and quantity of water obtainable, and the hydrostatic pressure, appear to indicate that the wells encounter the same aquifer. It is possible that it might be located at similar depths in other sections of the township.

Although it is possible that wells from 200 to 250 feet deep would encounter water-bearing beds, the uncertainty of obtaining water and the poor quality of the water may not warrant the expense of drilling. Numerous locations for dams or dugouts exist throughout the township and the slightly mineralized surface water retained by these reservoirs is more suitable for stock than the highly mineralized water from the wells. The construction of dams or the excavation of dugouts is highly recommended.

Township 24, Range 33

This fractional township is an area of 12 square miles. It is mantled by moraine, the ground surface of which is characterized by numerous knolls and a few undrained depressions. The elevation is approximately 1,750 feet above sea-level.

No pockets of sand or gravel have been located in the yellow clay in this township and all wells, with the exception of one, derive their water from beds of sand within the blue clay at depths of 30 to 50 feet. Two of the wells yield intermittent supplies, but the others yield sufficient water for 40 to 50 head of stock. It is highly mineralized and very hard, but is usable for all domestic purposes. A few of the

wells yield water that is under sufficient hydrostatic pressure to rise to points 15 to 20 feet below the surface. These wells are the main source of water in the area.

A well in the SW.¼, section 2, encountered a water-bearing sand at a depth of 115 feet and it yields a supply of highly mineralized water that is sufficient for 20 head of stock. The water is usable for all farm purposes except irrigation. It is possible similar water-bearing deposits would be encountered in other sections of the township.

All farms, with the exception of two, have sufficient water for local requirements. Dams and dugouts are recommended as a means of supplementing the supply of water for stock.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF CHURCHBRIDGE, NO.211, SASKATCHEWAN

Township	22	22	22	22	23	23	23	23	24	24	24	24	Total No. in municipality
West of 1st meridian Range	30	31	32	33	30	31	32	33	30	31	32	33	
Total No. of Wells in Township	51	94	36	19	55	48	33	14	41	43	31	11	476
No. of wells in bedrock	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of wells in glacial drift	51	94	36	19	55	48	33	14	41	43	31	11	476
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply													
No. with permanent supply	39	33	23	16	40	19	28	11	38	30	30	9	316
No. with intermittent supply	3	5	2	0	8	1	0	0	2	1	0	2	24
No. dry holes	9	56	11	3	7	28	5	3	1	12	1	0	136
Types of Wells													
No. of flowing artesian wells	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of non-flowing artesian wells	1	3	1	1	5	2	12	5	18	13	16	5	82
No. of non-artesian wells	41	35	24	15	43	18	16	6	22	18	14	6	258
Quality of Water													
No. with hard water	41	33	22	15	44	17	25	11	38	29	28	11	314
No. with soft water	1	5	3	1	4	3	3	0	2	2	2	0	26
No. with salty water	0	0	0	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	7	10	4	2	14	6	12	1	12	16	8	3	95
Depths of Wells													
No. from 0 to 50 feet deep	49	78	32	16	41	39	24	6	29	33	18	10	375
No. from 51 to 100 feet deep	1	6	4	2	8	4	9	6	9	6	11	0	66
No. from 101 to 150 feet deep	0	4	0	1	3	1	0	1	0	3	0	1	14
No. from 151 to 200 feet deep	0	3	0	0	1	2	0	0	2	0	1	0	9
No. from 201 to 500 feet deep	1	3	0	0	2	2	0	1	1	1	1	0	12
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0	0
How the Water is used													
No. usable for domestic purposes	41	32	20	12	42	17	28	10	33	22	21	10	288
No. not usable for domestic purposes	1	6	5	4	6	3	0	1	7	9	9	1	52
No. usable for stock	42	35	25	16	47	19	28	11	37	28	28	11	327
No. not usable for stock	0	3	0	0	1	1	0	0	3	3	2	0	13
Sufficiency of Water Supply													
No. sufficient for domestic needs	39	33	23	16	39	19	28	11	38	30	30	9	315
No. insufficient for domestic needs	3	5	2	0	9	1	0	0	2	1	0	2	25
No. sufficient for stock needs	31	27	16	7	30	12	22	8	34	26	22	9	244
No. insufficient for stock needs	11	11	9	9	18	8	6	3	6	5	8	2	96

ANALYSES AND QUALITY OF WATER

General Statement

Samples of water from representative wells in surface deposits and bedrock were taken for analyses. Except as otherwise stated in the table of analyses the samples were analysed in the laboratory of the Borings Division of the Geological Survey by the usual standard methods. The quantities of the following constituents were determined; total dissolved mineral solids, calcium oxide, magnesium oxide, sodium oxide by difference, sulphate, chloride, and alkalinity. The alkalinity referred to here is the calcium carbonate equivalent of all acid used in neutralizing the carbonates of sodium, calcium, and magnesium. The results of the analyses are given in parts per million--that is, parts by weight of the constituents in 1,000,000 parts of water; for example, 1 ounce of material dissolved in 10 gallons of water is equal to 625 parts per million. The samples were not examined for bacteria, and thus a water that may be termed suitable for use on the basis of its mineral salt content might be condemned on account of its bacteria content. Waters that are high in bacteria content have usually been polluted by surface waters.

Total Dissolved Mineral Solids

The term "total dissolved mineral solids" as here used refers to the residue remaining when a sample of water is evaporated to dryness. It is generally considered that waters that have less than 1,000 parts per million of dissolved solids are suitable for ordinary uses, but in the Prairie Provinces this figure is often exceeded. Nearly all waters that contain more than 1,000 parts per million of total solids have a taste due to the dissolved mineral matter. Residents

accustomed to the waters may use those that have much more than 1,000 parts per million of dissolved solids without any marked inconvenience, although most persons not used to highly mineralized water would find such waters highly objectionable.

Mineral Substances Present

Calcium and Magnesium

The calcium (Ca) and magnesium (Mg) content of water is dissolved from rocks and soils, but mostly from limestone, dolomite, and gypsum. The calcium and magnesium salts impart hardness to water. The magnesium salts are laxative, especially magnesium sulphate (Epsom salts, $MgSO_4$), and they are more detrimental to health than the lime or calcium salts. The calcium salts have no laxative or other deleterious effects. The scale found on the inside of steam boilers and tea-kettles is formed from these mineral salts.

Sodium

The salts of sodium are next in importance to those of calcium and magnesium. Of these, sodium sulphate (Glauber's salt, Na_2SO_4) is usually in excess of sodium chloride (common salt, NaCl). These sodium salts are dissolved from rocks and soils. When there is a large amount of sodium sulphate present the water is laxative and unfit for domestic use. Sodium carbonate (Na_2CO_3) "black alkali", sodium sulphate "white alkali", and sodium chloride are injurious to vegetation.

Sulphates

Sulphates (SO_4) are one of the common constituents of natural water. The sulphate salts most commonly found are sodium sulphate, magnesium sulphate, and calcium sulphate ($CaSO_4$). When the water contains large quantities of the sulphate of sodium it is injurious to vegetation.

Chlorides

Chlorides are common constituents of all natural water and are dissolved in small quantities from rocks. They usually occur as sodium chloride and if the quantity of salt is much over 400 parts per million the water has a brackish taste.

Iron

Iron (Fe) is dissolved from many rocks and the surface deposits derived from them, and also from well casings, water pipes, and other fixtures. More than 0.1 part per million of iron in solution will settle as a red precipitate upon exposure to the air. A water that contains a considerable amount of iron will stain porcelain, enamelled ware, and clothing that is washed in it, and when used for drinking purposes has a tendency to cause constipation, but the iron can be almost completely removed by aeration and filtration of the water.

Hardness

Calcium and magnesium salts impart hardness to water. Hardness of water is commonly recognized by its soap-destroying powers as shown by the difficulty of obtaining lather with soap. The total hardness of a water is the hardness of the water in its original state. Total hardness is divided into "permanent hardness" and "temporary hardness". Permanent hardness is the hardness of the water remaining after the sample has been boiled and it represents the amount of mineral salts that cannot be removed by boiling. Temporary hardness is the difference between the total hardness and the permanent hardness and represents the amount of mineral salts that can be removed by boiling. Temporary hardness is due mainly to the bicarbonates of calcium and magnesium and iron, and permanent harness to the sulphates and chlorides of calcium and magnesium. The permanent hardness

can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. Water that has a total hardness of 300 parts per million or more is usually classed as excessively hard. Many of the Saskatchewan water samples have a total hardness greatly in excess of 300 parts per million; when the total hardness exceeded 3,000 parts per million no exact hardness determination was made. Also no determination for temporary hardness was made on waters having a total hardness less than 50 parts per million. As the determinations of the soap hardness in some cases were made after the samples had been stored for some time, the temporary hardness of some of the waters as they come from the wells probably is higher than that given in the table of analyses.

Analyses of Water Samples from the Municipality of Churchbridge, No.211, Saskatchewan

LOCATION						Depth of well, ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS								Source of Water
No.	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alka-linity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1	NE.	32	22	30	1st	234	1,700	850	850	Nil	45	160	180	119	830	295	1,396	160	219		355		588	74		✱1
2	NE.	2	23	30	1st	350	2,180	700	650	50	195	125	110	122	1,057	617	1,934	123	97		364		1,026	322		✱1
3	SE.	4	24	32	1st	250	2,380	750	750	Nil	330	130	130	126	1,025	714	2,164	130	139		375		976	544		✱1
4	SE.	19	24	30	1st	300	1,920	950	700	250	138	395	250	119	828	440	1,780	395	70		355		732	228		✱1
5	SW.	22	24	30	1st	70	2,617										2,617		(2)		(3)	(4)	(1)	(5)		✱1
6	SW.	22	24	30	1st	70	2,911	Date of collection, 6-11-34									2,911	(4)	(1)		(2)		(3)		(5)	✱1
7	SE.	33	24	30	1st	49	4,577	Unfit for any use									4,577	(4)	(1)		(2)		(3)		(5)	✱1
8		5	23	32	1st	14	4,871	Unfit for any use									4,871		(2)		(3)	(4)	(1)	(5)		✱1

Water samples indicated thus, ✱1, are from glacial drift.
Analyses are reported in parts per million; where numbers (1), (2), (3), (4), and (5) are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).
Analysis No. 5 by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Eight samples of water from the glacial drift of the municipality of Churchbridge were analysed and the results are listed in the accompanying table. Samples 1 to 4 inclusive were taken from wells 234, 350, 250, and 300 feet deep, respectively. The total dissolved solid content varies from 1,396 to 2,164 parts per million. The following mineral salts occur in each sample, their abundance usually decreasing in the order given: sodium sulphate (Glauber's salt), magnesium sulphate (Epsom salts), sodium chloride (common salt), calcium carbonate, and calcium sulphate. The water is suitable for all general farm purposes, but the relatively large content of common salt in some of the samples may render it unpalatable. The water is a "sulphate water", and is commonly called "alkaline". It is quite hard and would probably have a laxative effect on persons not accustomed to its use.

The fifth and sixth samples were taken at different dates from the same 70-foot well. The variation in the amount of total dissolved mineral solids in the water, and even the presence of different salts, indicate that water from the same well may vary considerably in quality from time to time. Sample No. 6 was taken at a later date than No. 5 and has 294 parts per million more dissolved salts in solution than No. 5. The water can be used for all general farming purposes.

Sample No. 7 is taken from a 49-foot well and has a total dissolved solid content of 4,577 parts per million. The analyst reports that the water is too hard for use as a drinking water for either men or stock. The elimination from the system of such quantities of these mineral salts would rapidly overwork some of the body functions. There is no fractional way in which this water can be made fit for use.

The water also has a high content of iron which settles out as a red sediment of iron oxide when the water is exposed to light and air. The bacteria content is also high, and bacteria coli is present.

Sample No. 5 was taken from a 14-foot well. This well is not shown on the map nor in the well records. The water has a total dissolved solid content of 4,871 parts per million and is not fit for drinking water for either men or stock. This water is not representative of that derived from most shallow wells in the municipality. The water from most shallow wells is not so highly mineralized and is usable for all farm purposes.

Water from the Bedrock

No water is obtained from the bedrock in this municipality. Water that is obtained from the Marine Shale series in this part of Saskatchewan is usually too highly mineralized for any farm use.

WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SE.	2	22	30	1	Dug	44	1,650	- 41	1,609	41	1,609	Glacial sand and gravel	Hard, clear, "alkaline"		D, S	Usually sufficient by using two other similar wells.
2	SE.	3	"	"	"	Dug	30	1,660	- 26	1,634	26	1,634	Glacial sand	Hard, clear		D, S	Sufficient for 26 head stock.
3	SW.	3	"	"	"	Dug	25	1,665									Dry hole; glacial sand at base; hauls water for all requirements.
4	SE.	4	"	"	"	Dug	18	1,660	- 13	1,647	13	1,647	Glacial gravel	Hard, clear	44	D	Sufficient for 5 head stock; another well 16 feet deep is used for stock needs.
5	SW.	4	"	"	"	Dug	22	1,660	- 16	1,644	16	1,644	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock; another similar well 16 feet deep.
6	NW.	4	"	"	"	Dug	19	1,660	- 14	1,646	14	1,646	Glacial sand	Hard, clear		D, S	Intermittent supply.
7	NE.	5	"	"	"	Dug	22	1,660	- 20	1,640	20	1,640	Glacial sand	Hard, clear	42	D, S	Sufficient for 30 head stock; also four shallow dry holes.
8	SW.	5	"	"	"	Dug	35	1,660	- 31	1,629			Glacial sand	Hard, clear		D, S	Intermittent supply.
9	NW.	6	"	"	"	Dug	30	1,660	- 27	1,633	27	1,633	Glacial sand	Hard, clear	44	D, S	Sufficient for 40 head stock; another similar well 28 feet deep.
10	NE.	11	"	"	"	Dug	25	1,650	- 22	1,628	24	1,626	Glacial sand	Hard, clear, iron	42	D, S	Insufficient for 15 head stock.
11	SW.	12	"	"	"	Dug	32	1,650	- 20	1,630	24	1,626	Glacial gravel	Hard, clear		D, S	Sufficient for 30 head stock.
12	SW.	13	"	"	"	Dug	31	1,650	- 27	1,623	27	1,623	Glacial sand and gravel	Hard, clear		D, S	Barely sufficient for 20 head stock.
13	SE.	14	"	"	"	Dug	32	1,650	- 30	1,620	30	1,620	Glacial gravel	Hard, clear, iron	43	D	Intermittent supply; another well 26 feet deep is sufficient for 30 head stock.
14	SW.	14	"	"	"	Dug	21	1,660	- 17	1,643	19	1,641	Glacial sandy clay	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock; three other wells used as auxiliary supply.
15	SW.	16	"	"	"	Dug	45	1,670	- 41	1,629	43	1,627	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 50 head stock; another well 15 feet deep.
16	SE.	16	"	"	"	Dug	38	1,675	- 31	1,644			Glacial sand	Hard, clear		D, S	Insufficient for local needs; another well 7 feet deep; also a 58-foot dry hole.
17	NE.	19	"	"	"	Dug	18	1,685					Glacial sand	Hard		D	
18	NW.	21	"	"	"	Dug	25	1,650									Dry hole; glacial yellow clay at base; hauls water for all requirements.
19	SW.	22	"	"	"	Dug	24	1,660	- 20	1,640	20	1,640	Glacial sand	Hard, clear		D, S	Sufficient for 36 head stock.
20	NW.	22	"	"	"	Dug	15	1,660	- 11	1,649	12	1,648	Glacial sand	Hard, clear	42	D, S	Sufficient for 35 head stock; another well 12 feet deep; also a dry hole 26 feet deep.
21	SW.	24	"	"	"	Dug	30	1,640	- 23	1,617	28	1,612	Glacial sand	Hard, clear		D, S	Sufficient for 25 head stock; another similar well.
22	SE.	28	"	"	"	Dug	16	1,660	- 9	1,651	9	1,651	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 30 head stock.
23	SE.	29	"	"	"	Dug	18	1,680	- 14	1,666	14	1,666	Glacial sand	Hard, clear	44	D, S	Sufficient for 10 head stock; also an 18-foot well and a 20-foot dry hole.
24	NE.	32	"	""	"	Drilled	234	1,675	-144	1,531	234	1,441	Glacial sand	Hard, cloudy, iron, "alkaline"	41	D, S	Sufficient for 36 head stock; #.
25	SE.	33	"	"	"	Dug	17	1,660	- 6	1,654	6	1,654	Glacial gravel	Soft, clear		D, S	Sufficient for 25 head stock; another well 9 feet deep.
26	NE.	34	"	"	"	Dug	16	1,650	- 12	1,638	12	1,638	Glacial gravel	Hard, clear, "alkaline".		D, S	Sufficient for 30 head stock.

NOTE—All depths, altitudes, heights and elevations given above are in feet.

(D) Domestic; (S) Stock; (I) Irrigation; (M) Municipality; (N) Not used.
(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE: Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED: Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
27	SE.	35	22	30	1	Dug	22	1,650	- 12	1,638	12	1,638	Glacial gravel	Hard, clear, iron	44	D, S	Sufficient for 80 head stock; another similar well is used for stock.
28	NW.	36	"	"	"	Dug	29	1,640	- 27	1,613	27	1,613	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
1	SE.	2	22	31	1	Dug	14	1,680	- 11	1,669	11	1,669	Glacial sand	Hard, clear		D,S	Oversufficient for 45 head stock; another well 24 feet deep.
2	NE.	3	"	"	"	Drilled	240	1,680	-140	1,540	240	1,440	Glacial sand	Hard, clear, iron, "alkaline"		D, S	Oversufficient for 30 head stock.
3	SW.	4	"	"	"	Bored	58	1,700									Several dry holes; base in glacial blue clay; also a well with highly mineralized water and poor yields.
4	SW.	5	"	"	"	Dug	30	1,720	- 26	1,694	26	1,694	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 45 head stock.
5	SW.	6	"	"	"	Drilled	209	1,720	-109	1,611	209	1,511	Glacial sand	Soft, clear	40	N	Not used at present; haul water for all requirements; also 25 dry holes.
6	SE.	7	"	"	"	Dug	14	1,720	- 6	1,714	6	1,714	Glacial sand	Soft, clear		D, S	Sufficient for 32 head stock; another well 20 feet deep used for domestic needs during summer.
7	SE.	8	"	"	"	Dug	18	1,720	- 10	1,710	10	1,710	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
8	NE.	10	"	"	"	Dug	18	1,690	- 13	1,677	13	1,677	Glacial sand	Hard, clear		D, S	Sufficient for 25 head stock.
9	SW.	11	"	"	"	Dug	30	1,680	- 26	1,654	26	1,654	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 30 head stock
10	NW.	13	"	"	"	Dug	32	1,680					Glacial drift	Hard		D, S	Farmer on SW.¼, section 24, uses this well.
11	NE.	14	"	"	"	Dug	23	1,695	- 15	1,680	15	1,680	Glacial sandy clay	Hard, clear		D, S, I	Insufficient for local needs.
12	SE.	14	"	"	"	Dug	21	1,690	- 14	1,676	17	1,673	Glacial gravel	Hard, rusty, iron		D, S	Sufficient for 30 head stock; another well 20 feet deep.
13	NW.	14	"	"	"	Dug	23	1,720	- 12	1,708	12	1,708	Glacial fine sand	Hard, clear		D, S	Barely sufficient for 40 head stock; also another well that is used for stock.
14	NW.	16	"	"	"	Dug	16	1,710					Glacial sandy clay	Hard, clear		D, S	
15	NE.	18	"	"	"	Dug	24	1,730	- 22	1,708	22	1,708	Glacial gravel	Soft, clear	44	D, S	Sufficient for 35 head stock; another well with poor supply of mineralized water, 16 feet deep.
16	SW.	20	"	"	"	Dug	18	1,725	- 14	1,711	14	1,711	Glacial fine sand	Soft, clear		D, S	Sufficient for 24 head stock.
17	SE.	20	"	"	"	Dug	17	1,720	- 8	1,712	8	1,712	Glacial sand	Hard, clear		D, S	Sufficient for 45 head stock.
18	NE.	22	"	"	"	Dug	20	1,720	- 15	1,705	15	1,705	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 30 head stock.
19	SW.	22	"	"	"	Dug	18	1,725	- 15	1,710			Glacial sand	Hard, clear		D, S	Supply intermittent; also 4 dry holes 50, 60, 150 and 160 feet deep.
20	SW.	24	"	"	"	Dug	26	1,690	- 19	1,671	19	1,671	Glacial fine sand	Hard, clear, "alkaline"		D, S	Sufficient for 85 head stock during summer.
21	NW.	24	"	"	"	Bored	35	1,690									Several dry holes; glacial blue clay at base.
22	SW.	25	"	"	"	Dug	30	1,690	- 26	1,664	26	1,664	Glacial sand	Hard, clear	42	D, S	Sufficient for 50 head stock.
23	NE.	26	"	"	"	Drilled	333	1,710	-100	1,610	260	1,450	Glacial sand	Hard		N	When supply struck, it was considered insufficient, so cased off and no further supply obtained.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
24	NW.	26	22	31	1	Dug	18	1,715	- 14	1,701	14	1,701	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
25	SW.	28	"	"	"	Dug	20	1,730	- 15	1,715	15	1,715	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock.
26	SW.	30	"	"	"	Dug	24	1,725	- 18	1,707	18	1,707	Glacial gravel	Hard, cloudy, "alkaline"		D, S	Intermittent supply; by using two other wells the supply is sufficient.
27	NW.	30	"	"	"	Dug	10	1,720	- 8	1,712	9	1,711	Glacial fine sand	Hard, clear, "alkaline"		D, S	Sufficient for 30 head stock.
28	NE.	31	"	"	"	Dug	16	1,690	- 14	1,676	14	1,676	Glacial sand	Hard, clear	44	D, S	Sufficient for 50 head stock.
29	NW.	33	"	"	"	Bored	74	1,730									Ten dry holes; base in glacial clay.
30	SW.	35	"	"	"	Dug	20	1,685	- 10	1,675			Glacial sand	Hard, clear	44	D, S	Intermittent supply; another similar well.
31	SE.	36	"	"	"	Dug	20	1,700	- 15	1,685	15	1,685	Glacial sand	Hard, clear, iron	43	D, S	Sufficient for 50 head stock; also several dry holes.
32	NE.	36	"	"	"	Dug	30	1,700	- 28	1,672	28	1,672	Glacial sand	Hard, clear		D, S	Sufficient for domestic needs, only.
1	SW.	1	22	32	1	Dug	11	1,715	- 7	1,708			Glacial sand	Hard, clear, "alkaline"		D, S	Intermittent supply.
2	NE.	1	"	"	"	Dug	22	1,720	- 14	1,706	14	1,706	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
3	NW.	4	"	"	"	Dug	8	1,735	- 5	1,730	5	1,730	Glacial sand	Hard, clear	45	D, S	Sufficient for 60 head stock; two other similar wells.
4	SW.	6	"	"	"	Dug	20	1,750	- 15	1,735	18	1,732	Glacial fine sand	Hard, clear		D, S	Sufficient for 28 head stock.
5	NW.	6	"	"	"	Dug	13	1,720	- 8	1,712	8	1,712	Glacial gravel	Soft, clear	43	D, S	Sufficient for 35 head stock.
6	NW.	9	"	"	"	Bored	74	1,750	- 62	1,688	62	1,688	Glacial sand	Hard, clear, iron		S	Insufficient for local needs; due to plugging.
7	NE.	9	"	"	"	Bored	40	1,740	- 12	1,728			Glacial sand	Hard, clear, iron		D, S	Insufficient for local needs.
8	NW.	10	"	"	"	Dug	40	1,740	- 35	1,705	35	1,705	Glacial gravel	Hard, clear, iron	43	S.	Insufficient for local needs; enough for only 20 head stock.
9	SE.	11	"	"	"	Dug	14	1,720									Dry hole; base in glacial yellow clay.
10	NE.	14	"	"	"	Dug	20	1,725	- 12	1,713	17	1,708	Glacial fine sand	Hard, clear		D, S	Sufficient for 20 head stock.
11	SE.	15	"	"	"	Dug	25	1,730	- 10	1,720	10	1,720	Glacial sand	Soft, clear		D, S	Oversufficient for local needs; 2 tanks a day; also another well for stock.
12	NW.	17	"	"	"	Dug	52	1,750	- 28	1,722	52	1,698	Glacial sand and gravel	Hard, clear, iron		S	Water is hauled to Town of Churchbridge.
13	SE.	19	"	"	"	Dug	28	1,755	- 20	1,735	24	1,731	Glacial sand	Hard, cloudy, iron		D, S	Sufficient for 60 head stock.
14	NE.	20	"	"	"	Dug	36	1,750	- 28	1,722	28	1,722	Glacial sand and gravel	Hard, cloudy, iron, "alkaline"		S	Intermittent supply; another well 21 feet deep is used for domestic needs.
15	NW.	25	"	"	"	Bored	40	1,750	- 35	1,714	38	1,712	Glacial gravel	Hard, clear, iron	44	D	Supply sufficient for domestic needs, another similar well 40 feet deep; also an 11-foot well.
16	SW.	29	"	"	"	Dug	20	1,755	- 18	1,747	18	1,747	Glacial sand	Hard, clear, iron		D, S	Sufficient only for domestic needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
17	SE.	30	22	32	1	Dug	33	1,765	- 21	1,744			Glacial drift	Hard, clear, "alkaline", yellow sediment	42	D, S	
18	NW.	32	"	"	"	Dug	9	1,765	- 2	1,763	2	1,763	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 25 head stock.
19	SW.	34	"	"	"	Dug	30	1,740	- 25	1,715	25	1,715	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for domestic needs; another well is used for stock needs.
20	NW.	34	"	"	"	Bored	90	1,750									Several dry holes; base in glacial clay.
21	SE.	34	"	"	"	Bored	40	1,740									Several dry holes; base in glacial clay.
1	NE.	1	22	33	1	Dug	38	1,750	- 8	1,742	34	1,716	Glacial sand	Hard, clear		S	Sufficient for 50 head stock; another well 23 feet deep is used for domestic needs.
2	NE.	2	"	"	"	Dug	30	1,750	- 16	1,734			Glacial drift	Hard, "alkaline"		D, S	Sufficient for local needs.
3	SW.	2	"	"	"	Dug	12	1,740	- 7	1,733	7	1,733	Glacial sand	Hard, clear		D, S	Insufficient for 25 head stock.
4	NW.	3	"	"	"	Dug	30	1,750	- 22	1,728	22	1,728	Glacial sand	Hard, clear		D, S	Sufficient for 27 head stock.
5	NE.	10	"	"	"	Dug	30	1,750					Glacial drift	Hard		D, S	Insufficient for local needs; 2 other wells 30 and 32 feet deep.
6	SW.	12	"	"	"	Dug	12	1,750	- 10	1,740	10	1,740	Glacial sand and gravel	Hard, clear		D, S	Oversufficient for 16 head stock; another similar well that is not used.
7	NW.	12	"	"	"	Dug	12	1,750	- 10	1,740	10	1,740	Glacial sand	Hard, clear		D, S	Oversufficient for 18 head stock.
8	NE.	14	"	"	"	Dug	55	1,750	- 53	1,697			Glacial drift	Hard, clear		S	Insufficient for more than 8 head stock; also two shallow wells.
9	SE.	16	"	"	"	Bored	52	1,750	- 44	1,706			Glacial drift	Hard, clear, iron, bitter		S	Insufficient for more than 25 head stock.
10	SW.	36	"	"	"	Bored	140	1,760	-130	1,630	130	1,630	Glacial sand(?)	Hard, clear		D, S	Insufficient supply; also a few shallow wells and dry holes to a depth of 50 feet.
1	NE.	2	23	30	1	Drilled	350	1,660	-190	1,470	319	1,341	Glacial sand	Hard, clear, iron	43	D, S	Oversufficient for 70 head stock; also a shallow well for stock. (#).
2	SW.	3	"	"	"	Dug	19	1,680	- 17	1,663	17	1,663	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock.
3	SW.	4	"	"	"	Dug	20	1,685	- 17	1,668			Glacial sand	Hard, clear		D, S	Intermittent supply; two other similar wells; also a 62-foot dry hole.
4	NE.	5	"	"	"	Dug	40	1,690	- 38	1,652	38	1,652	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 12 horses; another similar well.
5	NW.	6	"	"	"	Bored	100	1,700	- 95	1,605	99	1,601	Glacial sand	Hard, clear, "alkaline"		N	Unfit for use; all water hauled.
6	SW.	8	"	"	"	Dug	16	1,690	- 13	1,677	13	1,677	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for domestic needs.
7	NE.	9	"	"	"	Dug	24	1,680	- 18	1,662			Glacial sand	Hard, clear, "alkaline"		D	Sufficient for domestic needs.
8	SW.	10	"	"	"	Dug	28	1,685	- 26	1,659	26	1,659	Glacial sand	Soft, clear		D, S	Sufficient for 24 head stock; another well 18 feet deep.
9	NW.	11	"	"	"	Dug	20	1,660	- 18	1,642	18	1,642	Glacial sand	Hard, clear		D, S	Sufficient for domestic needs and 2 horses.
10	SE.	12	"	"	"	Drilled	180	1,650	-155	1,495	180	1,470	Glacial gravel	Hard, iron, rusty		D, S	Oversufficient for 35 head stock.
11	NE.	13	"	"	"	Dug	6	1,650	- 3	1,647	3	1,647	Glacial sand	Soft, clear		D, S	Sufficient for 15 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
12	NW.	15	23	30	1	Dug	15	1,675	- 11	1,664	11	1,664	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 70 head stock; another well 12 feet deep.
13	NE.	16	"	"	"	Dug	16	1,675	- 10	1,665	13	1,662	Glacial sand	Hard, clear		D, S	Sufficient for 18 head stock.
14	SE.	17	"	"	"	Dug	20	1,680	- 14	1,666	19	1,661	Glacial sand	Hard, clear		D, S	Sufficient for 14 head stock.
15	NW.	19	"	"	"	Dug	29	1,720	- 27	1,693	27	1,693	Glacial sand	Hard, clear		D	Sufficient for domestic needs; another well 24 feet deep is used for stock.
16	SE.	20	"	"	"	Dug	14	1,680	- 10	1,670	10	1,670	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient for 22 head stock during winter.
17	NE.	20	"	"	"	Drilled	202	1,680	- 19	1,661	172	1,508	Glacial sand	Hard, clear, iron		D, S	Oversufficient for 90 head stock.
18	NW.	21	"	"	"	Drilled	104	1,675	- 15	1,660	104	1,571	Glacial sand	Hard, cloudy, iron		D, S	Oversufficient for 45 head stock.
19	SW.	22	"	"	"	Dug	18	1,675	- 13	1,662	13	1,662	Glacial sand	Hard, clear		D, S	Sufficient for 65 head stock; another well 10 feet deep.
20	NW.	22	"	"	"	Dug	40	1,680	- 38	1,642	38	1,642	Glacial sand	Hard, clear, iron, "alkaline"		S	Insufficient for 40 head stock; another well 20 feet deep is used for domestic needs.
21	NE.	24	"	"	"	Dug	24	1,650	- 18	1,632	24	1,626	Glacial sand	Hard, rusty, iron		D, S	Sufficient for 8 head stock.
22	NW.	25	"	"	"	Bored	27	1,650	- 25	1,625	25	1,625	Glacial sand and gravel	Soft, clear		D, S	Sufficient for 20 head stock.
23	SE.	26	"	"	"	Dug	25	1,660	- 23	1,637	23	1,637	Glacial sand	Soft, clear		D	Insufficient for local needs; another well 8 feet deep is used for stock.
24	NE.	26	"	"	"	Dug	82	1,660	- 78	1,582	78	1,582	Glacial sand	Hard, clear, "alkaline"		S	Barely sufficient for 16 head stock; also two shallow wells.
25	NE.	28	"	"	"	Drilled	140	1,675									Dry hole; base in glacial blue clay.
26	NE.	31	"	"	"	Dug	90	1,700									Five dry holes; base in glacial blue clay.
27	SE.	32	"	"	"	Dug	22	1,680	- 14	1,666	14	1,666	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock; another similar well.
28	SW.	34	"	"	"	Dug	15	1,675	- 13	1,662	13	1,662	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock; two other similar wells.
29	NW.	35	"	"	"	Drilled	77	1,660	- 24	1,636	77	1,583	Glacial sand	Hard, "alkaline"		D, S	Oversufficient for 50 head stock.
30	NW.	36	"	"	"	Dug	25	1,660	- 23	1,637	23	1,637	Glacial gravel	Hard, cloudy, "alkaline"		D, S	Intermittent supply; four other similar wells.
31	SE.	36	"	"	"	Drilled	110	1,650					Glacial gravel	Clear, iron		D, S	
1	SE.	2	23	31	1		40	1,710									Several dry holes; base in glacial blue clay.
2	SW.	2	"	"	"	Dug	21	1,720	- 17	1,703	17	1,703	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock.
3	NW.	3	"	"	"	Dug	30	1,720	- 25	1,695			Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient for more than 15 head stock.
4	SE.	3	"	"	"	Dug	22	1,720	- 20	1,700			Glacial drift	Hard		N	
5	NE.	4	"	"	"	Dug	67	1,715									Several dry holes; base in glacial blue clay.
6	SW.	4	"	"	"	Dug	12	1,720	- 7	1,713	7	1,713	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock.

NOTE—All depths, altitudes, heights and elevations given above are in feet.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
7	NW.	5	23	31	1	Dug	12	1,720	- 9	1,711	9	1,711	Glacial sand	Hard, clear		D, S	Sufficient for 70 head stock; another similar well.
8	SE.	6	"	"	"	Dug	22	1,730									Dry hole; base in glacial blue clay.
9	NE.	8	"	"	"	Bored	60	1,725									Dry hole; base in glacial blue clay.
10	SW.	9	"	"	"	Dug	34	1,720	- 31	1,689	31	1,689	Glacial sand	Soft, clear		D	Sufficient for domestic needs only.
11	NE.	17	"	"	"	Dug	20	1,700	- 15	1,685			Glacial sand	Hard, clear		S	Insufficient for local needs.
12	SE.	19	"	"	"	Dug	12	1,720	- 7	1,713	10	1,710	Glacial sand	Hard, clear, "alkaline"		S	Insufficient for 25 head stock.
13	NE.	22	"	"	"	Dug	25	1,725									Several dry holes; base in glacial blue clay.
14	NE.	23	"	"	"	Dug	50	1,715									Dry hole; base in glacial blue clay; also a 15-foot well that is used for domestic needs.
15	NE.	24	"	"	"	Drilled	210	1,710	- 44	1,666	210	1,500	Glacial fine sand	Hard, iron, cloudy, "alkaline"		D, S	This well is not being used at present. Two shallow wells are being used.
16	SE.	25	"	"	"	Dug	17	1,720	- 12	1,708	12	1,708	Glacial sand	Hard, clear, "alkaline"		D	Sufficient for domestic needs; two other wells 6 and 9 feet deep are used for stock needs.
17	SE.	26	"	"	"	Dug	45	1,720	- 38	1,682	38	1,682	Glacial sand	Hard, clear, iron, "alkaline"		D, S	Sufficient for 30 head stock.
18	NE.	26	"	"	"	Drilled	250	1,720									Several dry holes; base in glacial blue clay.
19	SW.	28	"	"	"	Dug	15	1,725	- 14	1,711	14	1,711	Glacial sand	Soft, clear		D	Intermittent supply.
20	NW.	32	"	"	"	Drilled	200	1,715	- 19	1,696	200	1,515	Glacial sand	Hard, clear, "alkaline"		D, S	Oversufficient for 36 head stock.
21	NE.	32	"	"	"	Dug	30	1,720									Several dry holes; base in glacial clay.
22	NE.	34	"	"	"	Dug	14	1,715	- 7	1,708	7	1,708	Glacial sand	Soft, clear		D, S	Sufficient for 16 head stock.
1	SW.	3	23	32	1	Dug	24	1,740	- 22	1,718	22	1,718	Glacial coarse sand	Hard, clear, "alkaline"		D, S	Sufficient only for domestic needs.
2	NW.	3	"	"	"	Dug	60	1,750	- 30	1,720	60	1,690	Glacial sand	Hard, clear		D, S	Sufficient for 37 head stock; another well 12 feet deep.
3	SW.	6	"	"	"	Dug	22	1,750	- 14	1,736	18	1,732	Glacial sand	Soft, clear		D, S	Sufficient for 60 head stock; another well 45 feet deep.
4	NW.	6	"	"	"	Bored	50	1,750	- 40	1,710	50	1,700	Glacial gravel	Hard, clear, iron, "alkaline"		D, S	Sufficient for 26 head stock.
5	SW.	10	"	"	"	Dug	26	1,750	- 22	1,728	22	1,728	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient only for domestic needs.
6	NE.	10	"	"	"	Dug & Bored	60	1,750	- 20	1,730	60	1,690	Glcaial sand	Hard, clear, iron, "alkaline"		D, S	Oversufficient for 50 head stock.
7	SW.	12	"	"	"	Dug	23	1,730	- 17	1,713	19	1,711	Glacial fine sand	Hard, clear, "alkaline"		D, S	Sufficient for 45 head stock.
8	SW.	13	"	"	"	Bored	48	1,735	- 4	1,731	48	1,687	Glacial sand and gravel	Hard, cloudy, iron, "alkaline"		D, S	Oversufficient for 40 head stock.

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WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
9	SW.	14	23	32	1	Dug	50	1,740	- 15	1,725	50	1,690	Glacial sand	Hard, iron, cloudy		D, S	Sufficient for 60 head stock.
10	SW.	15	"	"	"		70	1,750									Four dry holes; base in glacial drift.
11	NE.	16	"	"	"	Dug	30	1,740	- 15	1,725	15	1,725	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 65 head stock.
12	SE.	17	"	"	"	Dug	23	1,750	- 17	1,733	23	1,727	Glacial sand	Soft, clear		D, S	Sufficient for 18 head stock.
13	NE.	17	"	"	"	Dug	18	1,750									Dry hole; glacial drift at base.
14	SW.	17	"	"	"	Dug	43	1,750	- 15	1,735	43	1,707	Glacial sand and gravel	Soft, clear		D, S	Sufficient for 27 head stock.
15	SE.	18	"	"	"	Dug & Bored	72	1,760	- 36	1,724	72	1,688	Glacial sand	Hard, clear		D, S	Oversufficient for 80 head stock.
16	NE.	20	"	"	"	Drilled	84	1,750	- 20	1,730	84	1,666	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
17	NW.	25	"	"	"	Dug	16	1,740	- 9	1,731	14	1,726	Glacial sand	Hard, clear		D, S	Sufficient for 35 head stock.
18	SE.	28	"	"	"	Dug	18	1,750	- 17	1,733	17	1,733	Glacial sand	Hard, clear		D	Sufficient for domestic needs; another similar well is used for stock needs.
19	NW.	29	"	"	"	Dug	30	1,760	- 25	1,735	25	1,735	Glacial sand	Hard, clear		D, S	Sufficient for domestic needs.
20	SE.	30	"	"	"	Drilled	60	1,750	- 30	1,720	58	1,692	Glacial sand	Hard, clear, iron, "alkaline"		D, S	Insufficient for 25 head stock; another well 6 feet deep.
21	NE.	30	"	"	"	Dug	45	1,760	- 20	1,740	45	1,715	Glacial coarse sand	Hard, clear, iron		D, S	Sufficient for 40 head stock.
22	NW.	30	"	"	"	Drilled	60	1,760	- 40	1,720	60	1,700	Glacial sand	Hard, clear, iron, "alkaline"		D, S	Sufficient for 30 head stock.
23	NW.	31	"	"	"	Bored	68	1,750	- 15	1,735	68	1,682	Glacial sand	Hard, clear, iron		D, S	Sufficient for 40 head stock.
24	SE.	35	"	"	"	Dug	18	1,740	- 14	1,726	16	1,724	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock; two other similar wells.
1	NE.	11	23	33	1	Bored	40	1,750	- 32	1,718			Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock; another similar well.
2	SE.	12	"	"	"	Bored	24	1,750	- 22	1,728	22	1,728	Glacial sand	Hard, clear		D, S	Sufficient for domestic needs; another well 16 feet deep is sufficient for 60 head stock.
3	SW.	13	"	"	"	Bored	81	1,750	- 48	1,702	81	1,669	Glacial sand	Hard, iron, cloudy		D, S	Sufficient for 120 head stock; another well 42 feet deep.
4	SW.	13	"	"	"	Drilled	280	1,750									Dry hole; base in glacial sand; water supply cased off.
5	SE.	14	"	"	"	Bored	52	1,750	- 37	1,713	52	1,698	Glacial sand	Hard, clear		D, S	Sufficient for 18 head stock.
6	SW.	14	"	"	"	Dug	16	1,750	- 10	1,740	16	1,734	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 24 head stock.
7	NE.	23	"	"	"	Bored	75	1,750	- 43	1,707	75	1,675	Glacial sand	Hard, clear		D, S	Sufficient for 100 head stock.
8	SW.	24	"	"	"	Bored	100	1,750	- 25	1,725			Glacial gravel	Hard, iron, red sediment		D, S	Insufficient for local needs; also two dry holes 108 and 82 feet deep.
9	NE.	36	"	"	"	Bored	65	1,750	- 35	1,715	65	1,685	Glacial sand	Hard, clear, iron		D, S	Sufficient for 60 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	NE.	4	24	30	1	Drilled	168	1,670	- 25	1,645	168	1,502	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for 70 head stock; a shallow well used for domestic needs.
2	SW.	4	"	"	"	Drilled	170	1,680	- 40	1,640	170	1,510	Glacial sand	Hard, clear		D, S	Sufficient for 60 head stock.
3	SW.	5	"	"	"	Dug	14	1,690	- 9	1,681	9	1,681	Glacial sand	Hard, clear, "alkaline"		D, S	Intermittent supply; also another well on farm.
4	NW.	10	"	"	"	Drilled	92	1,670	- 15	1,655	92	1,578	Glacial sand	Hard, clear, iron		D, S	Oversufficient for 50 head stock.
5	SE.	10	"	"	"	Dug	48	1,650	- 19	1,631	48	1,602	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 55 head stock.
6	SE.	12	"	"	"	Dug	9	1,650	- 7	1,643	7	1,643	Glacial gravel	Hard, clear		D, S	Sufficient for 90 head stock; also two other wells.
7	NE.	12	"	"	"	Dug	12	1,670	- 8	1,662			Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.
8	SE.	16	"	"	"	Dug	13	1,670	- 11	1,659	11	1,659	Glacial sand and gravel	Soft, clear,		D, S	Sufficient for 20 head stock; also two other wells.
9	NW.	17	"	"	"	Drilled	32	1,675	- 29	1,646	29	1,646	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient for more than 20 head stock; also another well 13 feet deep.
10	SE.	18	"	"	"	Dug	22	1,680	- 18	1,662	20	1,660	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock.
11	NE.	18	"	"	"	Bored	32	1,680	- 16	1,664	32	1,648	Glacial fine sand	Hard, clear, "alkaline"		D, S	Sufficient for 35 head stock.
12	SE.	19	"	"	"	Drilled	300	1,685	- 15	1,670	300	1,385	Glacial sand	Hard, clear, iron	40	S	Sufficient for 40 head stock. #.
13	SE.	21	"	"	"	Drilled	100	1,670	- 17	1,653	100	1,570	Glacial gravel	Hard, clear, iron		D, S	Oversufficient for local needs; yields 5,000 gallons a day.
14	SW.	22	"	"	"	Dug	70	1,670	- 30	1,640	70	1,600	Glacial sand	Hard, iron, cloudy, "alkaline", yellow sediment		N	Unfit for use; another similar well. #.
15	SE.	22	"	"	"	Dug	100	1,670	- 30	1,640	100	1,570	Glacial sand	Hard, clear, iron		D, S	Oversufficient for 125 head stock.
16	NE.	24	"	"	"	Dug	24	1,668	- 18	1,642	24	1,636	Glacial sand	Hard, clear		D, S	Sufficient for 55 head stock.
17	NW.	25	"	"	"	Bored	30	1,660	- 25	1,634	28	1,632	Glacial sand	Hard, clear		D, S	Sufficient for 17 head stock.
18	NE.	26	"	"	"	Dug	14	1,660	- 12	1,648	12	1,648	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 50 head stock.
19	NW.	26	"	"	"	Dug	22	1,670	- 16	1,654	20	1,650	Glacial sand	Soft, clear		D, S	Sufficient for 10 head stock.
20	SE.	28	"	"	"	Dug	40	1,670	- 20	1,650	40	1,630	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
21	NW.	28	"	"	"	Bored	67	1,670	- 52	1,618	67	1,603	Glacial gravel	Hard, iron, cloudy, "alkaline"		S	Sufficient for 9 head stock; a shallow well is used for domestic needs.
22	NW.	30	"	"	"	Dug	30	1,700									Dry hole; base in glacial clay.
23	SE.	31	"	"	"	Dug	82	1,690	- 80	1,610	80	1,610	Glacial sand	Hard, clear		D, S	Intermittent supply; another well 45 feet deep is unfit for use.
24	SW.	32	"	"	"	Dug	30	1,670	- 10	1,660	30	1,640	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock; another well 25 feet deep.
25	SE.	32	"	"	"	Bored	74	1,675	- 34	1,641	74	1,601	Glacial sand	Hard, cloudy, iron, yellow sediment		D, S	Sufficient for 25 head stock.

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WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE: Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED: Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
26	SE.	33	24	30	1	Dug	55	1,675	- 25	1,650	55	1,620	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
27	SE.	33	"	"	"	Dug	49	1,675	- 22	1,653	49	1,626	Glacial sand and gravel	Hard, red, iron		S	Sufficient for 13 head stock; another well 16 feet deep is used for domestic needs.
28	SW.	35	"	"	"	Bored	25	1,670	- 22	1,648	22	1,648	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
29	NW.	36	"	"	"	Dug	20	1,660	- 8	1,652	19	1,641	Glacial sand	Hard, clear		D, S	Sufficient only for domestic needs.
1	SE.	4	24	31	1	Dug	40	1,740									Several dry holes; base in glacial clay.
2	NW.	4	"	"	"	Dug	45	1,740									Dry hole; glacial sand at base.
3	NE.	6	"	"	"	Drilled	382	1,750	- 50	1,700	382	1,368	Glacial sand	Hard, rusty, iron		D, S	Oversufficient for 50 head stock.
4	NE.	7	"	"	"	Drilled	96	1,750	- 25	1,725	96	1,654	Glacial sand	Hard, iron, cloudy, "alkaline"		D, S	Oversufficient for 100 head stock.
5	NW.	9	"	"	"	Dug	25	1,730									Dry hole; base in glacial clay.
6	NE.	9	"	"	"	Dug	30	1,760	- 25	1,735	30	1,730	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 24 head stock.
7	NW.	10	"	"	"	Bored	130	1,740	- 45	1,695	130	1,610	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock.
8	NE.	10	"	"	"	Dug	24	1,725	- 20	1,705	20	1,705	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
9	NE.	11	"	"	"	Dug	16	1,730	- 13	1,717	13	1,717	Glacial sand	Hard, clear, iron		D, S	Sufficient for 18 head stock.
10	SW.	12	"	"	"	Dug	19	1,750	- 16	1,734	16	1,734	Glacial sand	Hard, clear,		D, S	Sufficient for 20 head stock; also dry holes on farm.
11	NW.	12	"	"	"	Dug	30	1,730	- 25	1,705	30	1,700	Glacial sand	Hard, clear, "alkaline"		N	Unfit for use.
12	NE.	15	"	"	"	Dug	27	1,740	- 23	1,717	25	1,715	Glacial gravel	Hard, clear, "alkaline"		S	Insufficient for local needs; another similar well.
13	SW.	17	"	"	"	Drilled	100	1,760									Dry hole; base in glacial drift.
14	SE.	18	"	"	"	Bored	23	1,750	- 13	1,737	13	1,737	Glacial sand	Soft, clear		D, S	Sufficient for 12 head stock.
15	SW.	18	"	"	"	Drilled	80	1,750	- 20	1,730	80	1,670	Glacial sand	Hard, iron, cloudy, "alkaline"		D, S	Sufficient for 40 head stock.
16	SW.	22	"	"	"	Drilled	105	1,760	- 20	1,740	105	1,655	Glacial sand	Hard, clear, "alkaline"		N	Unfit for use; another well 30 feet deep.
17	SE.	26	"	"	"	Dug	15	1,750	- 10	1,740	13	1,737	Glacial sand	Soft, clear		D, S	Sufficient for 34 head stock.
18	SW.	26	"	"	"	Bored	70	1,740					Glacial sand	Hard, clear, "alkaline"		N	Unfit for use; also a 20-foot seepage well.
19	NE.	26	"	"	"	Dug	15	1,740					Glacial drift	Hard		S	Farmer on SW.¼, section 26, uses this well.
20	SE.	28	"	"	"	Dug	35	1,740	- 30	1,710	35	1,705	Glacial fine sand	Hard, iron, cloudy		D, S	Sufficient for 60 head stock.
21	SW.	31	"	"	"	Dug	30	1,750	- 24	1,726	30	1,720	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 35 head stock.
22	SW.	32	"	"	"	Bored	65	1,750	- 25	1,725	65	1,685	Glacial sand	Hard, iron, rusty		D, S	Sufficient for 30 head stock.

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WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
23	NW.	32	24	31	1	Dug	35	1,750	- 20	1,730	32	1,718	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 40 head stock.
24	SE.	32	"	"	"	Drilled	60	1,750	- 15	1,735	60	1,690	Glacial sand	Hard, clear		D, S	Sufficient for 100 head stock; another well 32 feet deep.
25	SW.	34	"	"	"	Dug	30	1,740	- 24	1,716	24	1,716	Glacial sand and gravel	Hard, clear, "alkaline"		D, S	Barely sufficient for 10 head stock.
26	NW.	34	"	"	"	Drilled	108	1,740	- 40	1,700	108	1,632	Glacial sand	Hard, iron, rusty		D, S	Sufficient for 30 head stock.
27	SE.	35	"	"	"	Dug	21	1,740									Dry hole; base in glacial clay.
28	SW.	36	"	"	"	Bored	25	1,730	- 10	1,720	22	1,708	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient only for domestic needs and 4 head stock.
29	SE.	36	"	"	"	Dug	45	1,700	- 40	1,660			Glacial sand	Hard, clear, "alkaline"		D, S	Intermittent supply; also two other wells.
1	SW.	2	24	32	1	Bored	54	1,750	- 14	1,736	54	1,686	Glacial fine sand	Hard, cloudy, iron		D, S	Oversufficient for 60 head stock.
2	SE.	4	"	"	"	Drilled	250	1,750	- 25	1,725	250	1,500	Glacial sand	Hard, rusty, "alkaline", iron	40	S,	Oversufficient for 60 head stock; #.
3	NE.	4	"	"	"	Dug	60	1,750	- 56	1,694	58	1,692	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for domestic needs; another well 40 feet deep is used for stock.
4	SW.	6	"	"	"	Bored	72	1,750	- 32	1,718	72	1,678	Glacial sand	Hard, iron, cloudy, "alkaline"		D, S	Sufficient for 30 head stock.
5	NE.	6	"	"	"		64	1,750					Glacial drift	Hard, iron		S	Good supply.
6	NW.	6	"	"	"	Dug	16	1,750	- 13	1,737	15	1,735	Glacial sand and gravel	Soft, clear		D, S	Insufficient for 30 head stock.
7	NE.	7	"	"	"	Drilled	200	1,750	- 19	1,731	200	1,550	Glacial coarse sand	Hard, iron, cloudy		S	Sufficient for 45 head stock.
8	NE.	9	"	"	"	Dug	29	1,750	- 13	1,737	29	1,721	Glacial sand	Hard, clear		D, S	Sufficient for 28 head stock.
9	NW.	10	"	"	"	Dug	24	1,750	- 10	1,740	24	1,726	Glacial sand	Hard, clear, sulphur, "alkaline"		N	Unfit for use; also two other wells that are used for all requirements.
10	SE.	10	"	"	"		47	1,750	- 27	1,723	43	1,707	Glacial sand and gravel	Hard, clear, "alkaline"		D, S	Sufficient for 80 head stock.
11	NE.	10	"	"	"	Bored	55	1,750	- 45	1,705			Glacial sand	Hard, clear, "alkaline"		S	Insufficient for more than 5 head stock.
12	SE.	14	"	"	"	Bored	50	1,750									Dry hole; base in glacial clay.
13	SW.	14	"	"	"	Drilled	90	1,750	- 20	1,730	90	1,660	Glacial gravel	Hard, clear, iron, "alkaline"		S	Insufficient for 50 head stock; a shallow well used for domestic needs.
14	SW.	20	"	"	"	Dug	56	1,760	- 27	1,733	56	1,704	Glacial sand	Hard, clear		D, S	Sufficient for 25 head stock; another well 29 feet deep is not used.
15	SE.	22	"	"	"	Bored	65	1,760	- 25	1,735	65	1,695	Glacial sand	Hard, clear, "alkaline"		D, S	Oversufficient for 70 head stock.
16	NW.	25	"	"	"	Dug	23	1,700	- 16	1,684			Glacial gravel	Hard		D, S	Sufficient for local needs.
17	SE.	27	"	"	"	Dug	55	1,750	- 17	1,733	55	1,695	Glacial sand	Soft, clear		D, S	Sufficient for 100 head stock.
18	SW.	27	"	"	"	Dug	20	1,750	- 16	1,734	18	1,732	Glacial sand	Hard, clear		D, S	Insufficient for 17 head stock.

NOTE—All depths, altitudes, heights and elevations given above are in feet.

(D) Domestic; (S) Stock; (I) Irrigation; (M) Municipality; (N) Not used.
(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CHURCHBRIDGE, NO. 211, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
19	NW.	28	24	32	1	Dug	24	1,750	- 16	1,734			Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock; another well 16 feet deep.
20	SE.	30	"	"	"	Dug	40	1,740	- 30	1,710	40	1,700	Glacial sand	Hard, clear, iron		D, S	Sufficient for 30 head stock.
21	NW.	30	"	"	"	Dug & Bored	37	1,750	- 22	1,728	37	1,713	Glacial gravel	Hard, clear		D, S	Sufficient for 45 head stock; another well 25 feet deep.
22	SE.	32	"	"	"	Dug	22	1,750	- 18	1,732	20	1,730	Glacial sand	Hard, clear		D, S	Sufficient for 7 head stock.
23	NE.	34	"	"	"	Dug	55	1,750	- 24	1,726	55	1,695	Glacial fine sand	Hard, cloudy, iron		D, S	Oversufficient for 65 head stock.
24	NE.	36	"	"	"	Dug	30	1,750	- 16	1,734	30	1,720	Glacial coarse sand	Hard, clear, iron		D, S	Sufficient for 35 head stock.
1	SW.	2	24	33	1	Bored	113	1,740	- 83	1,657	113	1,627	Glacial sand	Hard, iron, cloudy		D, S	Sufficient for 20 head stock.
2	SW.	11	"	"	"	Dug	40	1,750	- 17	1,733	34	1,716	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock; another similar well.
3	NW.	13	"	"	"	Dug	30	1,750	- 27	1,723			Glacial clay	Hard, clear, "alkaline"		S	Intermittent supply.
4	NW.	14	"	"	"	Bored	50	1,710					Glacial gravel	Hard, clear		D, S	Intermittent supply.
5	SE.	14	"	"	"	Bored	[illegible]	1,750	- 28	1,722	28	1,722	Glacial sand	Hard, clear		D, S	Sufficient for 45 head stock
6	SE.	25	"	"	"	Dug	45	1,750					Glacial drift	Hard, clear		D, S	
7	NW.	26	"	"	"	Dug	33	1,750	- 8	1,742	33	1,717	Glacial blue sand	Hard, clear, iron		D, S	Sufficient for 70 head stock; another similar well.
8	SW.	35	"	"	"	Dug	35	1,750	- 15	1,735	35	1,715	Glacial sand	Hard, clear, iron		D, S	Sufficient for 40 head stock.
9	NE.	36	"	"	"	Dug	40	1,750	- 20	1,730	40	1,710	Glacial sand	Hard, clear, iron		D, S	Sufficient for 50 head stock.

NOTE—All depths, altitudes, heights and elevations given above are in feet.

(D) Domestic; (S) Stock; (I) Irrigation; (M) Municipality; (N) Not used.
(#) Sample taken for analysis.