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DEPARTMENT OF MINES

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BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF WILLOWDALE No. 153 SASKATCHEWAN

BY

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

Water Supply Paper No. 91

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF WILLOWDALE NO. 153, SASKATCHEWAN

INTRODUCTION

Lack of rainfall during the years 1930 to 1934 over a large part of the Prairie Provinces brought about an acute shortage both in the larger supplies of surface water used for irrigation and the smaller supplies of ground water required for domestic purposes and for stock. In an effort to relieve the serious situation the Geological Survey began an extensive study of the problem from the standpoint of domestic uses and stock raising. During the field season of 1935 an area of 80,000 square miles, comprising all that part of Saskatchewan south of the north boundary of township 32, was systematically examined, records of approximately 60,000 wells were obtained, and 720 samples of water were collected for analyses. The facts obtained have been classified and the information pertaining to any well is readily accessible. The examination of so large an area and the interpretation of the data collected were possible because the bedrock geology and the Pleistocene deposits had been studied previously by McLearn, Warren, Rose, Stansfield, Wickenden, Russell, and others of the Geological Survey. The Department of Natural Resources of Saskatchewan and local well drillers assisted considerably in supplying several hundred well records. The base maps used were supplied by the Topographical Surveys Branch of the Department of the Interior.

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 find the approximate depth to a water-bearing horizon, he 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 give 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.

Pervious 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 Willowdale, No. 153, is an area of approximately 225 square miles in southeastern Saskatchewan. It consists of five full townships and the parts of three townships that lie immediately south of Qu'Appelle river and Ochapowace Indian Reserve. These are described as tps. 16, 17, and 18, ranges 1, 2, and 3, W.1st mer. The centre of the municipality lies approximately 30 miles west of the Manitoba boundary and 96 miles north of the International Boundary line. The town of Whitewood, which is approximately 105 miles east of Regina, is situated on the main line of the Canadian Pacific railway and is in the southern part of the municipality, 6½ miles east of the western boundary.

The northern boundary of the municipality is formed by Qu'Appelle river, the valley of which is approximately 2 miles wide and has very steep slopes that rise 500 feet above the valley floor. Extending for several miles to the south of the valley are numerous steep-sided tributary valleys, several of which contain intermittent streams. The elevation of the plain above the valley in the eastern part is 1,950 feet, but in the southwestern part of the municipality the elevation is 2,050 feet above sea-level.

The municipality is mantled by glacial drift that in some sections attains a thickness of at least 390 feet. Parts of a large moraine extend over most of the eastern, southern, and western parts of the municipality. Glacial till covers an area bordering Qu'Appelle valley, and extends as narrow belts between the moraines of the central part of the municipality and covers several small areas in the eastern part. A small area south of Round lake, and another area in the northeastern corner, are mantled by glacial outwash sands and gravels that overlie the

boulder clay. The flood-plains of Qu'Appelle river and its tributaries are floored by Recent alluvium several feet in thickness.

Water-bearing Horizons in the Unconsolidated Deposits

The uppermost water-bearing horizon in the drift is formed by deposits of glacial outwash sands and gravels, and by the pockets of sand and gravel that occur within the upper 30 feet of the drift. This horizon is fairly continuous throughout the municipality. Several of the sand and gravel pockets are rather extensive, particularly those in township 16, ranges 1 and 2, and township 17, range 3. An abundant supply of moderately hard water, which is suitable for all purposes, is obtained from these extensive gravel pockets and from the deposits of glacial outwash sands and gravels. Wells tapping the smaller pockets of sand and gravel yield less abundant supplies of more highly mineralized water. The supply from these latter wells is usually insufficient for farm needs during periods of drought.

The second water-bearing horizon occurs at depths of 40 to 60 feet, and appears to extend fairly continuously throughout the municipality. It is formed by a bed of sand that is overlain by impervious blue clay or a few feet of "hardpan", and underlain by impervious blue clay. This sand bed varies from a few feet to 30 feet in thickness, but in some sections it does not contain water. The water that is obtained from this horizon is highly mineralized, but is being used for all purposes. In the southern part of the municipality the supply is more than sufficient for local needs, but in the northern part the supply, although usually sufficient for all farm needs, is not abundant. Most of the wells will supply from 30 to 70 head of stock, and a few in the southern part will supply 500 head of stock.

A third water-bearing horizon occurs at depths ranging from 100 to 165 feet, but does not extend throughout the municipality. It has been encountered in the western part of township 16, range 3, and probably extends eastward, as wells on the NW. $\frac{1}{4}$, sec. 9, tp. 16, range 1, and on the NE. $\frac{1}{4}$, sec. 7, tp. 16, range 2, obtain an abundance of water at depths of 112 and 150 feet, respectively. However, in township 17, ranges 1 and 2, holes were drilled to depths ranging from 100 to 390 feet without encountering any water. The water from this third horizon is very hard, highly mineralized, and has a large content of iron. It is used for all domestic purposes although it is not usually suitable for cooking or for the washing of clothes.

Two wells, on the SE. $\frac{1}{4}$, sec. 4, and SW. $\frac{1}{4}$, sec. 6, tp. 16, range 3, tap an abundance of highly mineralized water at depths of 203 and 182 feet, respectively. A well on the SE. $\frac{1}{4}$, sec. 29, tp. 17, range 2, taps a small supply at a depth of 228 feet, but the horizon is of small extent as dry holes, 100, 300, and 390 feet in depth, were drilled near by. These wells are the only indications of a water-bearing horizon in the drift below a depth of 165 feet in the municipality.

Water-bearing Horizons in the Bedrock

The glacial drift of this municipality is underlain throughout by a series of beds of shale of marine origin, known as the Marine Shale series. No continuous water-bearing horizons are known to occur in the bedrock of this municipality. However, in the NE. $\frac{1}{4}$, sec. 36, tp. 17, range 1, and the SE. $\frac{1}{4}$, sec. 26, tp. 18, range 1, small supplies of highly mineralized water are obtained from the upper part of the shale. With the exception of a few outcrops along Qu'Appelle valley, and in the two wells mentioned above, the shale has not been encountered at any other point in the municipality. The 390-foot hole on the SE. $\frac{1}{4}$, sec. 29, tp. 17, range 2, which did not encounter bedrock, indicates that the the pre-glacial land surface of the bedrock shale was very uneven.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 16, Range 1

This township is a rolling plain with an average elevation of 1,950 feet above sea-level. Small areas in the northeastern and southwestern corners are mantled by glacial till. The remainder of the township is covered by part of a moraine, the surface of which is characterized by small knolls and a few undrained depressions.

A few wells have tapped small supplies of hard water in the uppermost 30 feet of the glacial drift. The aquifer of these wells is formed by small pockets of sand or gravel that are embedded in the yellow clay. Generally a number of dry holes are sunk before a pocket is located and the amount of water obtained is dependent on the areal extent of the pocket and the amount of annual precipitation. The supply of water obtained from this horizon in this township is inadequate for local needs.

The main water-bearing horizon of the township is encountered at depths of 40 to 60 feet. This aquifer is a bed of sand and gravel that occurs between beds of impervious blue clay. The water from this horizon is quite hard, but is used for all household purposes. There is generally an abundant supply of water and it rises to a point 20 to 30 feet below the surface. Some of the wells yield sufficient water to supply 500 head of stock. This water-bearing horizon is encountered throughout the township, with the exception of an area composed of sections 9 and 16. In these sections a few dry holes have been sunk to depths of 30 to 60 feet.

Two drilled wells on the NW. $\frac{1}{4}$, section 9, and the NE. $\frac{1}{4}$, section 10, have tapped an abundance of water at depths of 112 and 80 feet, respectively. This water is quite hard. The areal extent of this aquifer is unknown.

Township 16, Range 2

This township is a flat plain that rises gradually from 1,950 feet in the east to 2,000 feet in the west. A wide, flat-bottomed ravine, containing an intermittent stream, runs in a southeasterly direction from the central part of the northern boundary. Paralleling this creek, and extending from ½ to 2 miles on either side of it, is an area that is mantled by boulder clay or glacial till. With the exception of another small area in the southwestern corner that is covered by glacial till, the remainder of the township is covered by part of a large moraine.

The upper 30 feet of the glacial drift is composed of yellow clay in which pockets of sand or gravel are embedded. Wells tapping the larger pockets of sand and gravel yield an abundance of water, but those tapping smaller pockets of sand and gravel yield smaller supplies of water. The water from the sand and gravel pockets of large areal extent is medium hard and is suitable for all domestic purposes, whereas the water from the smaller, isolated pockets is very hard and highly mineralized.

A second water-bearing horizon extends throughout the township. This aquifer is formed by a bed of sand and gravel at a depth of 40 to 60 feet. It is generally overlain by a few feet of "hardpan" and underlain by a bed of impervious blue clay. The water from this horizon is very hard and highly mineralized, but is being used for all general farming purposes. It is under hydrostatic pressure, and rises to a point 15 to 30 feet below the surface. Several of the wells tapping this horizon yield supplies of water sufficient for 500 head of stock, but the others yield quantities sufficient only for 30 to 80 head of stock. These two water-bearing horizons supply the township with sufficient water, and as a consequence few attempts have been made to locate water at depth. However, the Canadian Pacific Railway Company sank a hole on the NE. ¼, section 7, in an attempt to obtain water that

could be used for their locomotives. This hole is 150 feet deep and tapped three water-bearing horizons at depths of 50, 100, and 150 feet. An abundance of water was present at each level, but the mineral salt content of the water was so high that it could not be used for steam locomotives. It is probable that this lower horizon extends throughout the township.

The Marine Shale bedrock that underlies the glacial drift was not reported in any well in this township.

Township 16, Range 3

The surface of this township is quite rolling and undrained depressions are common. With the exception of a small area in the northeastern corner that is mantled by glacial till the township is covered by part of a large moraine. The elevation of the surface decreases from 2,070 feet in the south to 1,950 feet in the northeastern corner.

In the northeastern part of the township an abundant supply of water is being derived from pockets of sand and gravel that occur within the upper 20 feet of the drift. These pockets are of fairly large extent and the individual wells yield a supply that is sufficient for 50 to 100 head of stock. The water is suitable for all farm purposes. In parts of sections 14, 15, 21, 22, and 27, there is a low area in which a number of springs occur and where a water horizon is located near the surface. The water in some of the springs is under considerable pressure; during the winter it flows up through the ice to a height 2 to 10 feet above the ground surface.

A second water-bearing horizon is located in the eastern part of the township, at depths ranging from 30 to 60 feet below the surface. This aquifer is a bed of sand or gravel that is overlain by a few feet of "hardpan" and underlain by a fine-textured, hard, blue clay. Several of the wells were dug by hand until the "hardpan" was reached and then a 4-inch auger was used.

When the hardpan was penetrated the auger dropped for a few feet and the water flowed into the well under strong pressure. The water is very hard and highly mineralized, but is used for all domestic purposes. These wells are not easily affected by the amount of seasonal precipitation and during the drought period yielded an abundant supply of water.

A third water-bearing horizon is tapped at depths varying from 100 to 130 feet. It may extend throughout the township, but in the eastern part it has not been necessary to drill to these depths as large supplies of water are derived from the two higher water-bearing horizons. The third horizon is a bed of sand that is overlain by a bed of impervious blue clay. The water is highly mineralized and has a high iron content, but it is used for drinking and other household purposes. The hydrostatic pressure is sufficient to cause the water to rise to a point 40 to 60 feet below the surface where it maintains a constant level. Large herds of stock can be watered from the individual wells.

A fourth water-bearing horizon has been tapped in wells on the SW. $\frac{1}{4}$, section 6, and SE. $\frac{1}{4}$, section 4, at depths of 182 and 203 feet, respectively, or at an elevation of 1,860 feet above sea-level. These wells yield an abundant supply of water for stock, but it is unsuitable for drinking although the water from the first well is being used for domestic purposes. The water rises to a point 60 feet below the surface where it maintains a constant level. This water-bearing horizon may extend into other sections, but as adequate supplies of water can be obtained nearer the surface, wells have not as yet been drilled to this horizon in other parts of the township.

The glacial drift in this township is underlain by the Marine Shale bedrock, but it has not been encountered within a depth of 207 feet. It is not advisable to continue drilling for

water into these shales when they are encountered at depth.

Township 17, Range 1

This township has an average elevation of 1,950 feet and the surface is rolling and in the northern part is dissected by small ravines. The northeastern and southeastern corners are mantled with boulder clay or glacial till, but the remainder of the township is overlain by part of a large moraine. Overlying the boulder clay in the northeastern corner of the township, is a deposit of glacial outwash sands and gravel.

The uppermost water-bearing horizon in the glacial drift lies within 30 feet of the surface. It is formed by deposits of glacial outwash sands and gravels and by scattered pockets of sand that occur in the yellow clay. Fairly abundant supplies of medium hard water are obtained from the glacial outwash sands, but generally only small amounts are obtained from the sand or gravel pockets. The water is used for all domestic purposes, and in places for the irrigation of gardens.

A second water-bearing horizon occurs at a depth of 40 to 60 feet. It is formed by a bed of sand that varies from 5 to 30 feet in thickness in different sections and it is underlain by a bed of impervious blue clay. Because of the variation in thickness of the aquifer the amount of water derived from the individual wells varies within short distances. The water is highly mineralized and contains a large amount of iron that precipitates out as an orange-red sediment when the water stands in contact with the air. It is used for drinking and other domestic purposes although in some instances it is unfit for this use.

A well on the SE. $\frac{1}{4}$, section 1, tapped a bed of sand at a depth of 100 feet that yielded a sufficient supply of water for 60 head of stock. A hole on the NE. $\frac{1}{4}$, section 15, that was drilled to the same depth and elevation was dry. The aquifer at this depth appears to be of small areal extent and formed by pockets of sand.

Other wells may encounter a similar aquifer, however, should they be drilled to this depth.

Bedrock is known to occur within a few feet of the surface in the NE. $\frac{1}{4}$, section 36, but the Marine Shale was not encountered elsewhere in the township. A supply of water that is barely sufficient for 20 head of stock is being obtained from the shale in section 36. It is doubtful if any large supply of water will be obtained from the shale outside of this locality.

The water supply in this township is sufficient for present needs, but the residents are forced to keep only a few head of stock since the supply is not sufficient throughout the year for large herds. Should deeper wells fail to encounter an adequate supply of water a supply for stock use can be collected and stored by the use of dugouts or dams.

Township 17, Range 2

The western part of this township is mantled by boulder clay or till and is deeply dissected by tributary valleys of Qu'Appelle river, some of which are 300 feet deep. The eastern part of the township is covered by part of a moraine and is a rolling plain having an average elevation of 1,950 feet. Small undrained depressions are common in this area.

Many holes have been dug to a depth of 30 feet in an attempt to locate water in this township. A few have tapped small supplies of water in sand and gravel pockets. The water is used for drinking and other domestic purposes, but the small supplies obtained are not sufficient for more than a few head of stock.

Large supplies of water are obtained, however, at depths ranging from 40 to 60 feet, from a bed of sand that lies between beds of impervious blue clay. The water is highly mineralized and has an iron content sufficient to discolour enamelware. However, the water is used for all purposes on the farm, since in many instances water of better quality is not obtainable. The water

rises to a point 20 to 50 feet below the surface where it maintains a constant level but in several wells it takes a few hours for the water to come back to this level after it has been pumped down.

Several attempts have been made to locate water at depth. Two wells on the SW. $\frac{1}{4}$, section 17, and the NE. $\frac{1}{4}$, section 18, tapped small supplies of very hard, "alkaline" water at depths of 80 and 93 feet. A hole on the NW. $\frac{1}{4}$, section 28, was drilled to a depth of 93 feet without encountering water. On the SE. $\frac{1}{4}$, section 29, a well 228 feet deep is obtaining sufficient water for 40 head of stock. On this same quarter section holes have been drilled to depths of 100, 300, and 390 feet without obtaining water, although beds of gravel were encountered. It does not seem advisable, therefore, to drill to depth in an effort to locate water in this township.

Bedrock was not encountered in any of the wells in this township. The deepest hole on the SE. $\frac{1}{4}$, section 29, was still in glacial drift at a depth of 390 feet, or an elevation of 1,510 feet above sea-level. It is not advisable to drill into the Marine Shale bedrock that underlies the glacial drift, as it seldom contains usable water unless it occurs near the surface.

Township 17, Range 3

This township comprises an area of 18 square miles. It is bordered on the north by the Ochapowace Indian Reserve No. 71, that extends northward to Qu'Appelle river.

Squawhead creek has its headwaters in section 1, and flows northward in a steep-sided, deep valley. The township is quite rolling and the elevation rises gradually to the south. The western half is mantled by part of a moraine and the eastern half by boulder clay or glacial till.

Good supplies of water are obtained from deposits of sand and gravel in a few of the valleys or ravines, and smaller amounts are also derived from isolated pockets of sand and gravel that are embedded in the upper 30 feet of the glacial till. These deposits

form the uppermost water-bearing horizon in the glacial drift, and are the main source of supply for the township. The water varies from moderately soft to hard, but it is being used for drinking and the supply is generally sufficient for all local needs.

A number of wells in different sections of the township have tapped small supplies of water at depths varying from 40 to 70 feet. The aquifer is a bed of sand or gravel that is overlain by a fine-textured blue clay. The water is very hard and highly mineralized, but is used for all farming purposes except irrigation. With the exception of section 13, all the farms visited had a sufficient supply of water even during the drought period. The thick mantle of glacial drift is underlain by Marine Shale bedrock. No wells have encountered the bedrock and it is improbable that usable water would be located in it even if deep holes were drilled.

Township 18, Range 1

Only the part of township 18, range 1, that lies to the south of Qu'Appelle river is discussed in this report. This area is deeply dissected by abrupt, deep valleys and ravines, several of which contain intermittent streams. Recent deposits of silts and sands occur along the floodplain of Qu'Appelle river. The south-western corner is mantled by part of a moraine and the remainder is covered by glacial till. In the south-central part glacial outwash sands and gravels overlie the till.

The water supply in this township is obtained from Qu'Appelle river and its tributaries, and from shallow wells that tap small pockets of sand and gravel in the till and moraine, and the outwash sands and gravels. Wells tapping the outwash sands yield a fairly abundant supply. All the water is hard and highly mineralized and although water from some of the wells is termed "alkaline", it is being used for drinking and other domestic purposes, with no apparent ill effects.

A well on the SE. $\frac{1}{4}$, section 26, encountered the bedrock a few feet below the surface, or at an elevation of approximately 1,500 feet above sea-level. It is obtaining a supply of "alkaline" water that is sufficient for household needs. The Marine Shale outcrops in a number of localities in Qu'Appelle valley. An abundant supply of water is not to be expected from the bedrock except possibly in its upper part and at places where the shale is near the surface.

Township 18, Range 2

Only that part of this township that lies to the south of Qu'Appelle river occurs within this municipality. This part of the township is deeply dissected by tributary valleys of Qu'Appelle river, and only a few residents have settled in the area. Only one well is known to exist, a 60-foot well located on the SW. $\frac{1}{4}$, section 2, and it yields a small supply of water. At the present time the residents use the water from the river and springs for all their needs.

No outcrops of bedrock were noted to the south of the valley but shale outcrops on the northern slopes of the valley. Anyone desiring further information regarding water conditions in the northern part of this township, should obtain the report on the municipality of Fertile Belt, No. 183.

Ochapowace Indian Reserve No. 71

The following discussion covers that part of the Indian reserve that lies within the municipality of Willowdale, No. 153.

The Indian reserve is bounded on the north by Qu'Appelle river and Round lake. The whole area is dissected by numerous valleys and ravines and the land surface is quite undulating, with several abrupt hills. Squawhead creek, which occupies a very steep-sided valley in the eastern part of the reserve, and other intermittent creeks, drain the run-off water northward into Qu'Appelle river and Round lake.

The southwestern corner of the reserve is covered by part of a moraine. The remainder of that part of the reserve under discussion is mantled by glacial till, and glacial outwash gravels, whereas Recent alluvium floors the valleys of Squawhead creek and Qu'Appelle river.

One well derives a fairly abundant supply of usable water from the glacial outwash sands at a depth of 14 feet. It is probable that other wells would obtain supplies of water in these deposits at depths of 14 to 20 feet, but the area is not settled as it is too sandy for cultivation. The wells in the southern part of the reserve are 35 to 70 feet deep and are obtaining large supplies of water from beds or pockets of gravel in the drift. The water is usable for all local needs, and is under pressure, rising to a point 25 to 38 feet below the surface.

No difficulty is experienced in obtaining water at any point in this Indian reserve although the Indians use the water from Round lake, Qu'Appelle river, and the various creeks.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF WILLOWDALE NO. 153, SASKATCHEWAN

West of 2nd meridian — Township / Range	16 / 1	16 / 2	16 / 3	17 / 1	17 / 2	17 / 3	18 / 1	18 / 2	Total No. in municipality	Total No. in Indian Reserve
Total No. of Wells in Township	47	72	81	119	80	47	28	2	476	9
No. of wells in bedrock	0	0	0	1	0	0	1	0	2	0
No. of wells in glacial drift	47	72	81	118	80	47	27	2	474	9
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	33	65	67	47	53	45	28	2	340	9
No. with intermittent supply	2	2	3	35	1	1	0	0	44	0
No. dry holes	12	5	11	37	26	1	0	0	92	0
Types of Wells										
No. of flowing artesian wells	0	0	0	0	0	0	0	0	0	0
No. of non-flowing artesian wells	13	23	31	5	4	14	1	1	92	8
No. of non-artesian wells	22	44	39	77	50	32	27	1	292	1
Quality of Water										
No. with hard water	33	58	57	79	52	41	25	2	347	9
No. with soft water	2	9	13	3	2	5	3	0	37	0
No. with salty water	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	0	10	2	38	28	0	15	1	94	0
Depths of Wells										
No. from 0 to 50 feet deep	36	61	53	76	58	40	28	1	355	5
No. from 51 to 100 feet deep	9	10	14	43	18	7	0	1	102	4
No. from 101 to 150 feet deep	2	1	10	0	0	0	0	0	13	0
No. from 151 to 200 feet deep	0	0	3	0	1	0	0	0	4	0
No. from 201 to 500 feet deep	0	0	1	0	3	0	0	0	4	0
No. from 501 to 1,000 feet deep	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
How the Water is Used										
No. usable for domestic purposes	34	61	62	79	53	43	27	1	360	9
No. not usable for domestic purposes	1	6	8	3	1	3	1	1	24	0
No. usable for stock	35	66	66	82	54	45	28	1	377	9
No. not usable for stock	0	1	4	0	0	1	0	1	7	0
Sufficiency of Water Supply										
No. sufficient for domestic needs	33	66	67	46	52	45	28	2	339	9
No. insufficient for domestic needs	2	1	3	36	2	1	0	0	45	0
No. sufficient for stock needs	29	60	63	43	51	40	26	2	314	9
No. insufficient for stock needs	6	7	7	39	3	6	2	0	70	0

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 Willowdale, No. 153, 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.	Alkalinity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$MgCl_2$	
1	NW.	8	16	2	2	59	2,600	2,100	2,100	nil	17	60	490	385	1,714	21	2,356	60	1,108		1,147		13	28		* 1
2	NE.	19	16	2	2	24	911											(3)	(1)		(2)		(4)			* 1
3	NW.	20	16	3	2	133	800	800	650	150	8	90	110	151	529	40	795	90	146		450		96	13		* 1
4	SW.	23	17	2	2	25	880	800	375	425	64	640	300	97	74	19	809	537		86	93			36	57	* 1

Water samples indicated thus, * 1, are from glacial drift or other unconsolidated deposits.
Analyses are reported in parts per million; where numbers (1), (2), (3) and (4) 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 ($CaCO_3$).
Analyses No. 2 by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Four samples of water from the glacial drift of the municipality of Willowdale were analysed and the results are listed in the accompanying table. Samples Nos. 2 and 4 were from depths of 24 and 25 feet. The total dissolved solid content of each of these samples is less than 1,000 parts per million. They are hard and are termed "alkaline", but are suitable for all farm needs. In some of the waters from shallow depths the sulphate salts in solution are so concentrated that the water cannot be used for drinking.

Sample No. 1 was taken from a well 59 feet in depth. This water has a total dissolved solid content of 2,600 parts per million, approximately half of which is composed of Epsom salts. It has a laxative effect and should not be used for drinking. It is very hard and contains a considerable amount of iron. Sample No. 3 is from a 133-foot well and has a total dissolved solid content of 880 parts per million, which is relatively low for water that is derived at depth in the glacial drift. It contains some iron in solution, but is suitable for all farm purposes.

Water from the Bedrock

The water that is obtained from the bedrock in this municipality is similar to that obtained from the upper part of the glacial drift. It is being used for drinking as well as for stock. Water that is obtained at depth in the Marine Shale bedrock is often unfit for use.

WELL RECORDS—Rural Municipality of WILLOWDALE NO.153, 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.	1	16	1	2	Dug	20	1,950	- 14	1,936	14	1,936	Glacial sand and gravel	Hard, clear	46	D, S	Sufficient for 50 head stock.
2	NW.	1	"	"	"	Dug	48	1,955	0	1,955	48	1,907	Glacial drift	Soft, yellow		D, S	Oversufficient for local needs.
3	NE.	2	"	"	"	Dug	54	1,960	- 38	1,922	54	1,906	Glacial gravel	Hard, clear		D, S	Oversufficient for local needs; also a dry hole 22 feet deep.
4	SW.	2	"	"	"	Bored	45	1,950			45	1,905	Glacial gravel	Hard, clear		D, S	Sufficient for 35 head stock.
5	SW.	4	"	"	"	Bored	60	1,955	- 18	1,937	60	1,895	Glacial sand	Hard, clear		D, S	Sufficient for 60 head stock; another similar well 52 feet deep.
6	SW.	5	"	"	"	Dug	42	1,958	- 20	1,938	42	1,916	Glacial gravel	Hard, clear		D, S	Sufficient for 26 head stock.
7	SE.	6	"	"	"	Dug	22	1,957	- 20	1,937	20	1,937	Glacial gravel	Hard, clear		D	Sufficient for household needs only.
8	SW.	6	"	"	"	Dug	38	1,955	- 18	1,937	38	1,917	Glacial fine sand	Hard, clear		D, S	Sufficient for 15 head stock.
9	SW.	9	"	"	"	Dug	24	1,945									Dry hole, glacial to base; many similar holes.
10	NW.	9	"	"	"	Drilled	112	1,950	- 10	1,940	100	1,850	Glacial gravel	Hard, rusty, iron	41	D, S	Sufficient for local needs, but plugs with sand. A dry hole 105 feet deep.
11	NE.	10	"	"	"	Bored	80	1,955	- 20	1,935			Glacial drift	Hard, iron, sandy sediment		D, S	Oversufficient for local needs.
12	NE.	12	"	"	"	Dug	10	1,960	- 6	1,954	6	1,954	Glacial sand	Hard, clear		D, S	Sufficient for domestic needs and 7 head stock.
13	SW.	13	"	"	"	Dug	30	1,970					Glacial sand	Hard, clear		D, S	Sufficient for local needs.
14	SE.	14	"	"	"	Dug	40	1,960	- 20	1,940	36	1,924	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
15	NW.	16	"	"	"	?	60	1,955									Dry hole, glacial to base.
16	NW.	17	"	"	"	Dug	19	1,950	- 13	1,937	16	1,934	Glacial sand	Hard, clear, rusty on standing		D, S	Sufficient for 50 head stock.
17	SW.	18	"	"	"	Dug	43	1,960	- 29	1,931	29	1,931	Glacial sand	Hard, clear		S	Not needed.
18	NE.	20	"	"	"	Dug	60	1,960	- 45	1,915	60	1,900	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
19	NE.	21	"	"	"	Dug	36	1,965	- 34	1,931	36	1,929	Glacial sand	Hard, clear		D, S	Sufficient for 30 head stock; also a dry hole 40 feet deep in blue clay.
20	SW.	23	"	"	"	Dug	33	1,965	- 31	1,934	33	1,932	Glacial coarse gravel	Hard, clear		D, S	Easily sufficient for 30 head stock.
21	NE.	23	"	"	"	Bored	66	1,975	- 54	1,921	65	1,910	Glacial sand	Hard, clear	42	D, S	Intermittent supply; also a dry hole 70 feet deep.
22	NE.	24	"	"	"	Dug	30	1,975			28	1,947	Glacial sand	Hard, clear		D, S	Sufficient for household needs and for the horses.
23	SE.	26	"	"	"	Bored	45	1,983					Glacial sand	Hard, clear	42	D, S	Sufficient for local needs; another similar well.
24	NW.	27	"	"	"	Dug	33	1,960					Glacial drift	Hard, clear		D, S	Intermittent supply.
25	NW.	28	"	"	"	Dug	34	1,965					Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
26	SW.	28	"	"	"	Dug		1,965					Glacial gravel	Hard, clear		D, S	Sufficient for 60 head stock and several families.

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 WILLOWDALE NO.153, 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	NE.	30	16	1	2	Bored	63	1,945	- 31	1,914	63	1,882	Glacial coarse gravel	Hard, clear		D, S	Oversufficient for local needs.
28	SW.	30	"	"	"	Bored	60	1,945					Glacial sand and gravel	Hard, clear		D, S	Oversufficient for local needs; can never be lowered.
29	SW.	32	"	"	"	Dug	50	1,950	- 40	1,910	49	1,901	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock. A spring on SE. 31.
30	NE.	32	"	"	"	Dug	48	1,960	- 44	1,916			Glacial sand	Hard, clear		D, S	Sufficient for 28 head stock.
31	SW.	34	"	"	"	Dug	15	1,960	- 12	1,948			Glacial gravel	Hard, clear		D, S	Sufficient for 20 head stock.
32	NE.	34	"	"	"	Dug	35	1,960					Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock in wet seasons.
33	SW.	35	"	"	"	Dug	4	1,965	- 2	1,963			Glacial clay	Hard, clear		D,	Sufficient for household needs only.
34	SE.	35	"	"	"	Dug	30	1,980	- 27	1,953	27	1,953	Glacial sand	Hard, clear		D	Oversufficient for household needs.
1	NW.	1	16	2	2	Bored	55	1,955	0	1,955	55	1,900	Glacial gravel	Hard, clear, iron		D, S	Oversufficient for local needs; also another 14 foot well.
2	NW.	2	"	"	"	Dug	16	1,957	- 10	1,947	10	1,947	Glacial sand	Hard, clear		D, S	Sufficient for 50 to 60 head stock.
3	SE.	4	"	"	"	Bored	48	1,975	- 33	1,942	33	1,942	Glacial yellow clay	Hard, clear		S	Insufficient, enough for only 10 head stock. A seepage well for drinking water.
4	NW.	4	"	"	"	Bored	35	1,970	- 25	1,945	35	1,935	Glacial gravel	Hard, clear		D, S	Dry in 1934, but is sufficient now and can not be pumped down.
5	SW.	5	"	"	"	Dug	35	1,980	- 23	1,957	23	1,957	Glacial gravel	Hard, clear		D, S, I	Oversufficient for local needs.
6	NW.	6	"	"	"	Bored	53	1,980	- 38	1,942	53	1,927	Glacial sand	Hard, clear "alkaline"		D, S	Sufficient for 95 to 100 head stock.
7	SE.	7	"	"	"	Drilled	50	1,975	- 30	1,945	50	1,925	Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.
8	NE.	7	"	"	"	Bored	150	1,970	- 20	1,950	150	1,820	Glacial sand and gravel	Hard, clear		N	Not used because water was too hard for boiler use.
9	SW.	8	"	"	"	Dug	30	1,975	- 2	1,973	5	1,970	Glacial sand	Soft, clear		D, S, I	Sufficient; very good supply.
10	SW.	8	"	"	"	Dug	10	1,975	- 6	1,969	6	1,969	Glacial gravel	Hard, clear		D, S	Oversufficient for local needs.
11	NW.	8	"	"	"	Drilled	59	1,970	- 30	1,940			Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient; laxative effect. Also another 30 foot well. Water is hauled. #
12	NW.	9	"	"	"	Dug	60	1,970	- 10	1,960	58	1,912	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 30 head stock. 3 dry holes about the same depth.
13	SE.	10	"	"	"	Dug	46	1,960	- 30	1,930	46	1,914	Glacial sand	Hard, clear, iron		D, S, I	Sufficient for 2 households and 100 head stock.
14	NW.	10	"	"	"	Dug	19	1,955					Glacial sand and gravel	Soft, clear		D, S	Sufficient for 30 head stock.
15	NE.	11	"	"	"	Bored	30	1,945	- 15	1,930			Glacial drift	Hard, clear, iron, "alkaline"		D, S	Sufficient for local needs.
16	SE.	12	"	"	"	Dug	32	1,955	- 10	1,945	32	1,923	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient, very good supply.
17	SE.	13	"	"	"	Bored	30	1,955	- 15	1,940	29	1,926	Glacial sand	Hard, clear		D	Intermittent supply; sufficient for household needs.
18	SW.	14	"	"	"	Bored	35	1,945	- 15	1,930	35	1,910	Glacial sand and gravel	Hard, blue		S	Analysed and found fit for stock only.

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 WILLOWDALE NO. 153, 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	NE.	14	16	2	2	Dug	20	1,950	- 16	1,934	18	1,932	Glacial sand	Soft, clear		D, S, I	Sufficient for 40 head stock; 2 other similar wells.
20	SW.	15	"	"	"	Bored	41	1,955	- 16	1,939	41	1,914	Glacial sand	Hard, clear		D, S, I	Oversufficient for local needs.
21	NW.	16	"	"	"	Bored	30	1,965	- 24	1,941	30	1,935	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 50 head stock; laxative effect.
22	SW.	17	"	"	"	Bored	56	1,970	- 14	1,956	56	1,914	Glacial blue silt	Soft, clear		D, S	Sufficient for 100 head stock.
23	SE.	18	"	"	"	Dug	40	1,975	- 25	1,950	40	1,935	Glacial gravel	Hard, clear		S	Sufficient; very good supply.
24	SW.	18	"	"	"	Dug	30	1,975	- 27	1,948	30	1,945	Glacial gravel	Hard, clear		D, S	Sufficient for 40 head stock.
25	NW.	19	"	"	"	Dug	27	1,975	- 17	1,958	27	1,948	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 to 50 head stock; laxative effect.
26	NE.	19	"	"	"	Dug	24	1,965	- 21	1,944	24	1,941	Glacial coarse sand	Hard, clear		D, S	Sufficient, cannot be pumped down. #
27	SW.	20	"	"	"	Dug	24	1,970	- 12	1,958	24	1,946	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
28	NW.	20	"	"	"	Dug	25	1,965	- 22	1,943	25	1,940	Glacial coarse gravel	Hard, clear		D, S	Sufficient for 100 head stock.
29	NW.	20	"	"	"	Dug	24	1,965	- 21	1,944	24	1,941	Glacial gravel	Soft, clear		D, S	Sufficient; very good supply. Also a 10 foot and 12 foot dry holes.
30	SW.	21	"	"	"	Dug	20	1,960	- 12	1,948	19	1,941	Glacial sand	Hard, clear		D, S, I	Sufficient for 150 head stock. A spring on NE. 21.
31	SW.	22	"	"	"	Dug	20	1,950	- 12	1,938	18	1,932	Glacial sand	Hard, clear, iron		D, S	Sufficient for 50 head stock.
32	NW.	22	"	"	"	Dug	11	1,945	0	1,945	11	1,934	Glacial sand	Hard, clear		D, S	Oversufficient for local needs. Also a 12 foot bored well and a spring on farm.
33	NE.	23	"	"	"	Dug	25	1,945	- 18	1,927	21	1,924	Glacial fine sand	Hard, clear		D, S	Sufficient for 40 head stock.
34	SW.	24	"	"	"	Bored	80	1,945	- 30	1,915	80	1,865	Glacial gravel	Hard, cloudy	38	S	
35	SW.	25	"	"	"	Dug	22	1,940	- 18	1,922	22	1,918	Glacial gravel	Hard, clear		D, S	Sufficient, but used only for house. A 16 foot stock well, similar, sufficient for 100 head stock.
36	SE.	26	"	"	"	Dug	50	1,940	- 35	1,905	50	1,890	Glacial gravel	Hard, clear		D, S	Sufficient for 30 head stock.
37	NE.	26	"	"	"	Dug	28	1,940	- 14	1,926	28	1,912	Glacial gravel	Hard, clear		D, S	Sufficient for 20 head stock.
38	SW.	28	"	"	"	Dug	18	1,955	- 8	1,947			Glacial sand	Hard, clear		D, S, I	Oversufficient for local needs; another similar well.
39	SW.	29	"	"	"	Bored	28	1,960	- 16	1,944	25	1,935	Glacial sand	Hard, clear		D, S	Sufficient for 25 head stock.
40	NW.	29	"	"	"	Bored	35	1,957	- 27	1,930	35	1,922	Glacial blue gravel	Hard, clear		N	Not used enough to be kept fresh.
41	SW.	30	"	"	"	Dug	20	1,965	- 18	1,947	18	1,947	Glacial sand	Hard, clear		D, S, I	Sufficient for 100 head stock. Another well 17 feet deep; used for house.
42	NE.	30	"	"	"	Dug	30	1,960	- 16	1,944	30	1,930	Glacial blue gravel	Hard, clear		D, S	Oversufficient for local needs; 3 other wells 18 feet, 20 feet and 24 feet deep.
43	SE.	31	"	"	"	Dug	21	1,960	- 16	1,944	16	1,944	Glacial sand	Hard, clear		D, S, I	Sufficient; very good supply; another similar well.
44	NE.	32	"	"	"	Dug	30	1,950	- 12	1,938	30	1,920	Glacial sand	Soft, clear		D, S	Sufficient for 50 head stock; also a spring in the pasture.
45	SW.	33	"	"	"	Spring		1,945	+ 2	1,947	0	1,945	Glacial sand	Soft, clear		D, S, I	Oversufficient for local needs.

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 WILLOWDALE NO.153, 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
46	NW.	33	16	2	2	Bored	16	1,940	- 2	1,938	16	1,924	Glacial gravelly clay	Hard, clear, "alkaline"		D, S	Insufficient; enough for 15 head stock; also a 60 foot seepage well in blue clay.
47	NW.	34	"	"	"	Bored	50	1,935	- 30	1,905	50	1,885	Glacial fine sand	Hard, clear, "alkaline"		D, S	Sufficient for 50 to 100 head stock.
48	NE.	34	"	"	"	Dug Bored	80	1,935									Dry hole; glacial blue clay to base.
49	SW.	36	"	"	"	Dug	25	1,930					Glacial drift	Hard, clear		D, S	Sufficient for local needs.
50	NW.	36	"	"	"	Dug	42	1,940	- 28	1,912	42	1,898	Glacial stones	Hard, clear		D, S	Sufficient for 30 head stock; 2 other wells 32 feet and 35 feet deep.
1	NW.	1	16	3	2	Bored	50	2,005	- 40	1,965	45	1,960	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
2	NE.	2	"	"	"	Bored	81	2,025	- 68	1,957			Glacial drift	Hard, clear		D, S	Insufficient for 20 head stock. Dry holes up to 30 feet deep.
3	NE.	2	"	"	"	Dug	25	2,025	- 23	2,002	23	2,002	Glacial yellow clay	Hard, clear		D, S	Sufficient for 4 head stock.
4	SE.	2	"	"	"	Drilled	108	2,040	- 40	2,000	108	1,932	Glacial drift	Hard, clear		D, S	Sufficient for 100 head stock.
5	SE.	4	"	"	"	Drilled	203	2,055	- 70	1,985	90	1,965	Glacial drift	Hard, clear		S	Sufficient for local needs.
6	NE.	4	"	"	"	Dug	38	2,050	- 38	2,012	38	2,012	Glacial drift	Hard, clear		D, S	Sufficient for 40 head stock. There is an underground body of water.
7	SW.	4	"	"	"	Bored	81	2,055	- 54	2,001	81	1,974	Glacial sand	Hard, clear, iron		D, S	Easily sufficient for 60 head stock. Another similar well.
8	SW.	6	"	"	"	Drilled	182	2,050	- 57	1,993	182	1,868	Glacial sand	Hard, clear		D, S	Sufficient for 100 to 150 head stock.
9	NE.	8	"	"	"	Dug	12	2,050	- 10	2,040	10	2,040	Glacial gravel	Hard, clear		D	Sufficient for household needs.
10	NW.	9	"	"	"	Bored	65	2,050	- 49	2,001	65	1,985	Glacial sand	Hard, clear		D, S	Oversufficient for local needs.
11	SE.	9	"	"	"	Bored	32	2,020	- 28	1,992	28	1,992	Glacial gravel	Hard, clear		D, S	Sufficient for 50 head stock; also a 34 foot dry hole.
12	NW.	10	"	"	"	Dug	35	2,040			35	2,005	Glacial gravel	Hard, clear		D, S	Sufficient for 150 head stock.
13	NW.	12	"	"	"	Dug	32	1,995	- 27	1,968	27	1,968	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock.
14	SW.	12	"	"	"	Bored	42	2,000	- 40	1,960	42	1,958	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 70 to 100 head stock.
15	SE.	13	"	"	"	Bored	35	1,995	- 15	1,980	35	1,960	Glacial coarse sand	Hard, clear		D, S	Oversufficient for local needs.
16	NE.	14	"	"	"	Dug	21	1,995	- 13	1,982	21	1,974	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock.
17	NE.	14	"	"	"	Dug	20	1,990	- 12	1,978			Glacial drift	Hard, clear		D, S	Sufficient for 50 head stock.
18	NW.	14	"	"	"	Spring		1,995	+ 5	2,000	0	1,995	Glacial drift	Soft,		D, S	Oversufficient for local needs.
19	SW.	14	"	"	"	Dug	38	2,000	- 28	1,972	38	1,962	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
20	SE.	15	"	"	"	Dug	25	2,020	- 21	1,999	25	1,995	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock.
21	NE.	15	"	"	"	Spring	6	2,050	0	2,050	0	2,050	Glacial black muskeg	Hard, clear		S	Sufficient for 100 head stock.
22	NE.	16	"	"	"	Dug	46	2,025	- 26	1,999	46	1,979	Glacial gravel	Hard, clear		D, S	Sufficient for 40 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 WILLOWDALE NO. 153, 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	SE.	16	16	3	2	Bored	55	2,040	- 35	2,005	55	1,985	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 100 to 150 head stock.
24	SE.	18	"	"	"	Drilled	165	2,035	- 60	1,975	165	1,870	Glacial gravel	Hard, clear		S	Sufficient for 75 to 100 head stock.
25	NW.	18	"	"	"	Drilled	158	2,050	- 60	1,990	158	1,892	Glacial fine sand	Hard, clear		D, S	Sufficient. Can pump steady.
26	NW.	19	"	"	"	Drilled	137	2,050	- 60	1,990	137	1,913	Glacial gravel	Hard, clear		D, S	Sufficient. Town of Percival depends on this well for supply.
27	NW.	19	"	"	"	Drilled	150	2,045	- 50	1,995	150	1,895	Glacial fine grey sand	Hard, clear		D, S	Sufficient. Cannot lower by pumping.
28	NW.	20	"	"	"	Drilled	133	2,025	- 40	1,985	133	1,892	Glacial fine sand	Hard, clear, iron		D, S	Sufficient, can pump steadily. Tested to 100 feet but dry. #
29	SE.	20	"	"	"	Dug	40	2,030	- 37	1,993	40	1,990	Glacial gravel	Soft, clear		D, S	Sufficient for local needs.
30	SE.	21	"	"	"	Dug	6	2,020	- 1	2,019	1	2,019	Glacial sand	Soft, clear		D, S	Sufficient for 15 head stock.
31	SW.	22	"	"	"	Dug	16	2,000	- 3	1,997	16	1,984	Glacial gravel	Hard, clear		D, S	Sufficient for 50 head stock.
32	SW.	22	"	"	"	Dug	15	2,000	- 7	1,993	15	1,985	Glacial gravel	Soft, clear		D, S	Sufficient; cannot lower by pumping.
33	SW.	22	"	"	"	Dug	6	2,000	0	2,000	0	2,000	Glacial sand	Soft, clear		D, S	Sufficient for 200 head stock.
34	SE.	22	"	"	"	Dug	17	1,995	- 3	1,992	16	1,979	Glacial sand	Hard, clear		D, S	Oversufficient for local needs; also a spring on farm.
35	SE.	22	"	"	"	Spring		1,990	+ 10	2,000	0	1,990	Glacial sand	Soft, clear		D, S	Oversufficient for local needs.
36	NE.	22	"	"	"	Drilled	99	1,990	- 20	1,970	99	1,891	Glacial sand	Hard, clear, iron		S	Sufficient; could not pump down before it filled in; now enough for about 10 head stock; laxative effect. A shallow well for household use.
37	NW.	23	"	"	"	Bored	60	1,985	- 25	1,960	60	1,925	Glacial drift	Hard, clear, iron		D, S	Sufficient, cannot lower by pumping. A 16 foot well water too bitter for use.
38	NW.	24	"	"	"	Dug	20	1,970	- 16	1,954	16	1,954	Glacial sand	Hard, clear		D, S	Sufficient for 50 to 70 head stock.
39	SE.	24	"	"	"	Bored	27	1,985	- 22	1,963	27	1,958	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock. Another similar well 26 feet deep
40	SW.	25	"	"	"	Dug	35	1,980	- 16	1,964	35	1,945	Glacial coarse gravel	Hard, clear		D, S	Sufficient for 100 head stock.
41	SW.	26	"	"	"	Bored	52	1,980	- 22	1,958	52	1,928	Glacial gravel	Hard, clear		D, S	Sufficient for 60 head stock.
42	SW.	27	"	"	"	Spring		1,990	0	1,990	0	1,990	Glacial sand	Soft, clear		D, S	Oversufficient for local needs.
43	SE.	28	"	"	"	Bored	44	2,004	- 21	1,983	44	1,960	Glacial drift	Hard, clear		D, S	Sufficient for 100 head stock.
44	SW.	28	"	"	"	Dug	40	1,995	- 30	1,965	40	1,955	Glacial drift	Hard, clear		D, S	Sufficient; cannot lower by pumping.
45	SW.	29	"	"	"	Bored	83	2,025	- 70	1,955	83	1,942	Glacial sand	Hard, clear		D, S	Intermittent supply; dry holes from 60 to 80 feet deep.
46	NW.	29	"	"	"	Dug	22	2,025	- 11	2,014			Glacial drift	Hard, clear		D, S	Intermittent supply; depends on level of slough. A dry hole 70 feet deep.
47	SE.	30	"	"	"	Drilled	130	2,030	- 50	1,980	130	1,900	Glacial fine sand	Hard, clear		D, S	Oversufficient for local needs.
48	SW.	30	"	"	"	Dug	20	2,035	- 7	2,028	20	2,015	Glacial sand	Hard, clear		D, S	Intermittent supply. Sufficient for house and 5 head stock in normal years.

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 WILLOWDALE NO. 153, 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
49	NE.	30	16	3	2	Drilled	130	2,030	- 45	1,985	130	1,900	Glacial sand	Hard, clear, iron		D, S	Sufficient, can pump steady. A dry hole 113 feet deep.
50	NE.	31	"	"	"	Drilled	130	2,035	- 50	1,985	130	1,905	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
51	SW.	32	"	"	"	Bored	109	2,010	- 50	1,960	109	1,901	Glacial white sand	Hard, clear, iron		D, S	Sufficient; can pump steady. Tested to 40 feet but dry.
52	NE.	32	"	"	"	Dug	10	2,005	- 3	2,002	3	2,002	Glacial gravel	Soft, clear		D, S	Sufficient for 100 head stock.
53	NW.	33	"	"	"	Dug	10	2,020	- 3	2,017	3	2,017	Glacial gravel	Soft, clear		D, S	Sufficient for 40 head stock.
54	NE.	33	"	"	"	Dug	20	1,990	- 16	1,974	17	1,973	Glacial sand	Soft, clear		D, S	Sufficient for 40 head stock.
55	NE.	34	"	"	"	Dug	18	1,975	- 15	1,960	18	1,957	Glacial fine gravel	Soft, clear		D, S	Sufficient for 80 head stock.
56	SW.	34	"	"	"	Dug	18	1,975	- 15	1,960	18	1,957	Glacial fine gravel	Soft, clear		D, S	Sufficient for 70 head stock.
57	SE.	34	"	"	"	Dug	33	1,980	- 29	1,951	33	1,947	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock. Also a drilled well 140 feet deep not used.
58	SE.	35	"	"	"	Dug	12	1,975	- 6	1,969	6	1,969	Glacial gravel	Soft, clear		D, S	Sufficient for 40 head stock.
59	NW.	36	"	"	"	Dug	18	1,965	- 14	1,951			Glacial sand	Hard, clear		D, S	Sufficient for 35 head stock.
60	NE.	36	"	"	"	Dug	20	1,960	- 16	1,944	20	1,940	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
1	SE.	1	17	1	2	Bored	99	1,960	- 87	1,873	87	1,873	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 60 head stock. 30 wells dug averaging 40 feet; seepage wells dry in winte
2	NW.	2	"	"	"	Dug	42	1,960	- 39	1,921	39	1,921	Glacial coarse sand	Hard, clear, "alkaline"	43	D	Sufficient for household needs. Also a 21 foot well used for stock.
3	SE.	3	"	"	"	Bored	60	1,960	- 42	1,918	42	1,918	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 10 head stock.
4	SW.	3	"	"	"	Bored	49	1,960	- 35	1,925	49	1,911	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 25 head stock.
5	SE.	4	"	"	"	Dug	31	1,960	- 28	1,932	28	1,932	Glacial sand	Hard, clear "alkaline"	43	D, S	Sufficient for 40 head stock; an 80 foot well caved in.
6	SW.	4	"	"	"	Dug	60	1,960									Dry hole, glacial blue clay to base. 10 similar holes.
7	NE.	5	"	"	"	Dug	50	1,960	- 48	1,912	48	1,912	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 38 head stock. Also a 58 foot well, similar, used for house.
8	NW.	5	"	"	"	Dug	60	1,960	- 54	1,906	54	1,906	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 100 head stock.
9	SW.	6	"	"	"	Dug	35	1,950	- 33	1,917	33	1,917	Glacial sand	Hard, clear, iron, "alkaline"	43	D, S	Sufficient for 55 head stock.
10	NW.	7	"	"	"	Dug	20	1,950	- 17	1,933	20	1,930	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 36 head stock.
11	SW.	10	"	"	"	Dug	25	1,940	- 23	1,917	25	1,915	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock.
12	NE.	10	"	"	"	Dug	53	1,960	- 50	1,910	50	1,910	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 14 head stodk.
13	SW.	12	"	"	"	Dug	40	1,960	- 35	1,925	35	1,925	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 30 head stock.
14	NE.	12	"	"	"	Dug	35	1,960	- 30	1,930	30	1,930	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 10 head stock.
15	SE.	12	"	"	"	Dug	25	1,940									Water hauled from sec. 5. Dry hole, glacial sand at base.

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 WILLOWDALE NO.153, 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
16	SW.	13	17	1	2	Dug	45	1,960	- 41	1,919	45	1,915	Glacial sand				Caved in, water hauled from SE. 14.
17	SE.	14	"	"	"	Dug	12	1,960	- 4	1,956			Glacial drift	Soft, clear, "alkaline"		D, S	Intermittent supply.
18	SE.	14	"	"	"	Dug	40	1,960	- 34	1,926	34	1,926	Glacial gravel	Hard, clear, "alkaline"	43	D, S	Sufficient for 28 head stock.
19	NE.	15	"	"	"	Drilled	100	1,960									Dry hole, glacial black clay at base. 10 holes dug from 40 to 100 feet deep. Water hauled from section 22.
20	NW.	16	"	"	"	Dug	28	1,940	- 20	1,920	28	1,912	Glacial gravel	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock.
21	SW.	16	"	"	"	Dug	26	1,940	- 23	1,917	23	1,917	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 12 head stock.
22	NW.	17	"	"	"	Bored	35	1,950	- 21	1,929	35	1,915	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 30 head stock.
23	SE.	18	"	"	"	Dug	38	1,955	- 35	1,920	38	1,917	Glacial fine sand	Hard, clear, "alkaline"	43	D, S	
24	NE.	19	"	"	"	Dug	19	1,960	- 15	1,945	15	1,945	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 25 head stock. 3 other similar wells 21 feet, 28 feet and 34 feet deep.
25	SW.	20	"	"	"	Bored	44	1,960	- 30	1,930	44	1,916	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 28 head stock. Also 3 dry holes 50 feet, 60 feet and 70 feet deep.
26	NE.	20	"	"	"	Bored	75	1,960	- 65	1,895	65	1,895	Glacial drift	Hard, clear, "alkaline"	43	S	Insufficient for 8 head stock. A 40 foot well sufficient for house use only. A spring on SW. 28 is used for stock.
27	NE.	22	"	"	"	Dug	12	1,940	- 8	1,932	8	1,932	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 30 head stock.
28	NW.	23	"	"	"	Dug	28	1,960	- 25	1,935	25	1,935	Glacial sand	Hard, clear, "alkaline"	44	D, S	Sufficient for 15 head stock. Two 40 foot wells went dry in drought.
29	NE	23	"	"	"	Dug	48	1,960	- 47	1,913	47	1,913	Glacial gravel	Hard, clear, "alkaline"	43	D, S	Sufficient for 18 head stock. A similar 52 foot well now caved in.
30	SE.	24	"	"	"	Dug	28	1,960	- 16	1,944			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
31	NW.	24	"	"	"	Dug	20	1,960	- 17	1,943	18	1,942	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 40 head stock.
32	NE.	24	"	"	"	Dug	14	1,940	- 2	1,938	10	1,930	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for household needs. A similar well used for stock.
33	NE.	26	"	"	"	Dug	14	1,950	- 9	1,941	9	1,941	Glacial sand	Hard, clear, "alkaline"	44	D, S	Intermittent supply. Spring on section 36, used when necessary.
34	NW.	28	"	"	"	Dug	30	1,950	- 6	1,944	15	1,935	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 4 head stock. A 10 foot seepage well on NE. 28 also used.
35	NE.	31	"	"	"	Dug	50	1,960	- 42	1,918	42	1,918	Glacial sand	Hard, milky "alkaline"		S	Sufficient for 40 head stock. Drinking water hauled.
36	NE.	32	"	"	"	Dug	16	1,950	- 6	1,944	16	1,934	Glacial sand	Hard, reddish iron, "alkaline"	43	S	Sufficient for 12 head stock. Hauls water from SE. 5-18-1-2.
37	SW.	34	"	"	"	Dug	10	1,950	- 6	1,944			Glacial gravel	Soft, clear, "alkaline"		D, S	Sufficient for local needs.
38	SW.	36	"	"	"	Dug	6	1,910	- 2	1,908	2	1,908	Glacial gravel	Soft, brownish	43	D, S	Sufficient for 30 head stock.
39	NE.	36	"	"	"	Dug	24	1,910	- 14	1,896	14	1,896	Marine shale	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock. A spring on road allowance is also used.
1	NW.	1	17	2	2	Dug	51	1,950	- 30	1,920			Glacial clay	Hard, cloudy, odour		D, S	Sufficient for local needs.
2	NW.	2	"	"	"	Bored	49	1,940	- 44	1,896	44	1,896	Glacial sand	Hard, clear		D, S	Sufficient for local needs.

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 WILLOWDALE NO.153, 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
3	NW.	3	17	2	2	Bored	60	1,920	- 56	1,864	60	1,860	Glacial sand	Hard, clear, iron, "alkaline"	45	D, S	Barely sufficient for 14 head stock.
4	SW.	4	"	"	"	Dug	18	1,920									Dry hole glacial sand at base. Haul water from NE. 33-16-2- 2.
5	NW.	4	"	"	"	Bored	28	1,960	- 23	1,937	28	1,932	Glacial sand	Hard, clear	44	D, S	Sufficient for 20 head stock.
6	SW.	5	"	"	"	Dug	26	1,950	- 24	1,926	26	1,924	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 8 head stock. Wells sunk to 7 feet in coulee for supplementary use.
7	NW.	5	"	"	"	Dug	13	1,960	- 2	1,958	13	1,947	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 36 head stock.
8	SE.	5	"	"	"	Dug	18	1,920	- 12	1,908			Glacial sand	Hard, clear		D, S	Sufficient for 30 head stock.
9	SE.	6	"	"	"	Dug	50	1,950	- 40	1,910	50	1,900	Glacial gravel	Hard, clear, "alkaline"	43	D, S	Sufficient for 33 head stock. A 50 foot similar well also used.
10	SE.	7	"	"	"	Bored	30	1,960	- 25	1,935	30	1,930	Glacial sand	Hard, clear, iron, "alkaline"	43	D, S	Sufficient for 60 head stock; also a 60 foot dry hole.
11	SW.	9	"	"	"	Dug	38	1,930	- 30	1,900			Glacial drift	Hard, clear, iron		D, S	Sufficient for local needs.
12	SW.	10	"	"	"	Dug	28	1,920	- 23	1,897	23	1,897	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock. An 18 foot well on NW. 10, also used.
13	SW.	13	"	"	"	Dug	30	1,950	- 26	1,924	26	1,924	Glacial sand	Hard, clear, iron, "alkaline"	43	D, S	Sufficient for 11 head stock.
14	SE.	14	"	"	"	Bored	56	1,960	- 26	1,934	26	1,934	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 38 head stock. A 26 foot well on NE. 12, also used.
15	SW.	14	"	"	"	Dug	60	1,960	- 45	1,915	45	1,915	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 60 head stock.
16	NW.	15	"	"	"	Bored	64	1,960	- 52	1,908	52	1,908	Glacial coarse sand			D, S	Sufficient for 7 head stock. 5 dry holes on farm.
17	SE.	17	"	"	"	Drilled	65	1,960	- 55	1,905	55	1,905	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 8 head stock.
18	SW.	17	"	"	"	Bored	80	1,960	- 73	1,887	73	1,887	Glacial clay	Hard, clear, "alkaline"	43	D, S	Insufficient for 6 head stock.
19	SE.	18	"	"	"	Dug	35	1,950	- 32	1,918	35	1,915	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 6 head stock.
20	NE.	18	"	"	"	Bored	93	1,960	- 74	1,886	74	1,886	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 30 head stock. 2 wells 80 feet and 86 feet deep also used.
21	SE.	21	"	"	"	Bored	55	1,920			30	1,890	Glacial gravel	Soft, clear	39	D, S	Sufficient for local needs; also 12 dry holes.
22	SW.	22	"	"	"	Bored	50	1,930	- 49	1,881	49	1,881	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 12 head stock.
23	SW.	23	"	"	"	Dug	25	1,940	- 18	1,922	18	1,922	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 35 head stock; also a 29 foot well, not used now. #
24	SE.	25	"	"	"	Dug	40	1,940	- 32	1,908	32	1,908	Glacial drift	Clear	44	D, S	Sufficient for 6 head stock.
25	NE.	26	"	"	"	?	35	1,930	- 34	1,896	34	1,896	Glacial sand	Hard, clear "alkaline"	43	D, S	Barely sufficient for 29 head stock.
26	SE.	27	"	"	"	Bored	40	1,960	- 30	1,930	30	1,930	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 17 head stock. A 15 foot seepage well used for stock.
27	NE.	28	"	"	"	Bored	60	1,930	- 55	1,875	55	1,875	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 10 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of WILLOWDALE NO.153, 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
28	SE.	28	17	2	2	Dug	32	1,940	- 30	1,910	30	1,910	Glacial sand	Hard, clear, iron, "alkaline"	42	D, S	Barely sufficient for 15 head stock.
29	NW.	28	"	"	"	Bored	86	1,960									Dry hole; glacial sand at base. 3 other dry holes 90 feet, 60 feet and 76 feet. Hauls from SE. 29.
30	SW.	29	"	"	"	Dug	40	1,960	- 30	1,930	30	1,930	Glacial drift	Hard, clear, "alkaline"	43	D, S	Intermittent supply. 2 other wells 20 feet and 22 feet deep. The 3 wells are sufficient for 40 head stock.
31	SE.	29	"	"	"	Bored	228	1,920	-170	1,750			Glacial gravel	Hard, clear, "alkaline"	42	D, S	Sufficient for 40 head stock. Also 3 dry holes 160 feet, 300 feet and 390 feet deep.
32	NE.	30	"	"	"	Dug	20	1,960	- 15	1,945	15	1,945	Glacial drift	Hard, clear, "alkaline"	43	D, S	Sufficient for 4 head stock.
33	NW.	31	"	"	"	Bored	22	1,900	- 20	1,880	20	1,880	Glacial sand	Hard, clear, "alkaline"	43	D	Sufficient for house needs only. A spring is used for stock.
34	SW.	31	"	"	"	Dug	45	1,900	- 40	1,860			Glacial sand?	Hard, clear, "alkaline"	43	D, S	Sufficient for 15 head stock.
35	NW.	32	"	"	"	Dug	15	1,800	- 10	1,790	10	1,790	Glacial clay	Hard, clear	43	D, S	Sufficient for 5 head stock, but not used now as it has caved in. A spring supplies needs.
36	SE.	34	"	"	"	Dug	9	1,950	- 7	1,943	7	1,943	Glacial clay	Hard, clear, "alkaline"	43	D, S	Sufficient for 10 head stock. 2 other wells 27 feet and 8 feet deep.
37	SW.	34	"	"	"	Dug	29	1,950	- 21	1,929			Glacial sand and clay	Soft, clear	38	D, S	Sufficient for local needs.
38	NE.	34	"	"	"	?	28	1,960	- 14	1,946	14	1,946	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock. A spring is also used.
39	NW.	36	"	"	"	Dug	35	1,940	- 25	1,915	32	1,908	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 50 head stock.
1	SE.	1	17	3	2	Dug	20	1,950	- 16	1,934	16	1,934	Glacial fine sand	Soft, clear		D, S	Sufficient for 15 head stock if pumped at intervals.
2	SW.	1	"	"	"	Dug	20	1,950	- 17	1,933	17	1,933	Glacial sand	Soft, clear		D, S	Sufficient for 8 head stock.
3	SW.	2	"	"	"	Dug	20	1,955	- 16	1,939	16	1,939	Glacial gravel	Hard, clear		D, S	Sufficient for 20 head stock.
4	NW.	2	"	"	"	Dug	35	1,945	- 20	1,925	30	1,915	Glacial gravel	Hard, clear		D, S	Sufficient for 28 head stock.
5	SE.	3	"	"	"	Bored	60	1,960	- 20	1,940	60	1,900	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
6	SW.	3	"	"	"	Dug	38	1,970	- 28	1,942	34	1,936	Glacial gravel	Hard, iron, red sediment		D, S	Sufficient for 19 head stock; along with lake.
7	NE.	4	"	"	"	Bored	30	1,970	- 10	1,960	30	1,940	Glacial gravel	Hard, clear		D, S	Sufficient for 25 head stock.
8	SW.	4	"	"	"	Dug	22	1,980	- 14	1,966	14	1,966	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock and 50 sheep. A 12 foot well on NW. 4 has a good supply.
9	NE.	5	"	"	"	Bored	86	1,990	- 17	1,973	86	1,904	Glacial sand	Hard, clear, iron		D, S	Sufficient for 35 head stock. Also a 7 foot well with 2 feet of water always.
10	SW.	5	"	"	"	Dug	8	2,010	- 3	2,007	3	2,007	Glacial sand	Soft, clear		D, S	Sufficient for 17 head stock and 60 sheep.
11	SE.	6	"	"	"	Bored	70	2,040	- 30	2,010	70	1,970	Glacial gravel	Hard, clear		D, S	Sufficient for 35 head stock. A well on NE. 7 is 5 feet deep and gives good supply.
12	SW.	6	"	"	"	Bored	50	2,040	- 30	2,010	50	1,990	Glacial sand?	Hard, clear		D, S	Sufficient; large supply.
13	SE.	8	"	"	"	Dug	32	1,980	- 22	1,958	30	1,950	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 35 head stock. A well on NW. 8 is 8 feet deep not very good water.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of WILLOWDALE NO. 153, 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
14	SW.	8	17	3	2	Dug	13	2,000	- 3	1,997	12	1,988	Glacial sand	Soft, clear		D, S	Sufficient for 4 head stock. A well on SE. 7, is 30 feet deep not used.
15	NE.	9	"	"	"	Dug	36	1,950	- 24	1,926	36	1,914	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
16	SW.	9	"	"	"	Dug	20	1,995	- 3	1,992	14	1,981	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
17	SW.	10	"	"	"	Bored	27	1,950	- 20	1,930	27	1,923	Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.
18	SE.	10	"	"	"	Spring		1,920					Glacial drift			S	Sufficient for local needs. A 20 foot well is used for household needs.
19	NE.	10	"	"	"	Dug	35	1,920					Glacial drift	Hard, clear		D, S	Sufficient for 12 head stock. Also a 35 foot well good supply.
20	SE.	11	"	"	"	Dug	36	1,915	- 16	1,899	36	1,879	Glacial sand and gravel	Hard, clear, iron, lime		D, S	Sufficient; large supply.
21	SE.	11	"	"	"	Spring		1,910					Glacial drift	Iron		S	There are 7 springs all told.
22	SE.	13	"	"	"	Bored	68	1,910	- 58	1,852	30	1,880	Glacial sand	Hard, clear		D, S	Insufficient for local needs; also a 90 foot dry hole.
23	SE.	16	"	"	"	Bored	40	1,948	- 30	1,918	40	1,908	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 15 head stock. Also a 22 foot well with larger supply.
24	SW.	16	"	"	"	Dug	22	1,955	- 18	1,937	22	1,933	Glacial sand	Hard, clear		D, S	Sufficient for 26 head stock. Also a 22 foot well with fair supply.
25	SE.	17	"	"	"	Bored	28	1,960	- 14	1,946	28	1,932	Glacial sand	Hard, clear		D, S	Sufficient for 5 head stock.
26	SE.	18	"	"	"	Dug	20	1,980	- 5	1,975	5	1,975	Glacial sand and gravel	Soft, clear		D, S	Sufficient for local needs.
1	NE.	2	18	1	2	Dug	18	1,900	- 8	1,892	8	1,892	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock; another well 8 feet deep.
2	SW.	2	"	"	"	?	6	1,940	- 2	1,938	6	1,934	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 7 head stock.
3	NW.	2	"	"	"	Dug	24	1,940	- 9	1,931	20	1,920	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 40 head stock. A 7 foot seepage well is also used.
4	SE.	6	"	"	"	Dug	12	1,950	- 8	1,942	8	1,942	Glacial sand	Hard, clear	43	D, S	Sufficient for 14 head stock.
5	NE.	6	"	"	"	Dug	20	1,950	- 18	1,932	20	1,930	Glacial clay and gravel	Hard, clear, "alkaline"	43	D, S	Insufficient for local needs.
6	NW.	6	"	"	"	Dug	14	1,940	- 8	1,932	8	1,932	Glacial clay	Hard, clear, "alkaline"	42	D, S	Sufficient for 35 head stock.
7	SE.	7	"	"	"	Dug	7	1,950	- 2	1,948	2	1,948	Glacial sand	Hard, clear, iron, "alkaline"	43	D, S	Sufficient for 12 head stock.
8	NW.	8	"	"	"	Dug	20	1,950	- 15	1,935			Glacial drift	Hard, clear, "alkaline" iron	43	D, S	Sufficient for 22 head stock.
9	NW.	10	"	"	"	Dug	16	1,950	- 10	1,940	10	1,940	Glacial gravel	Hard, clear	43	D, S	Sufficient for 65 head stock.
10	NW.	12	"	"	"	Dug	6	1,900	- 4	1,896	4	1,896	Glacial sand	Hard, clear	42	D, S	Sufficient for 17 head stock.
11	SW.	13	"	"	"	Dug	3	1,850	0	1,850			Glacial white clay	Soft, clear	43	D, S	Sufficient for 8 head stock.
12	NW.	13	"	"	"	Dug	8	1,850	- 5	1,845	5	1,845	Glacial sand	Hard, clear	43	D, S	Sufficient for 10 head stock.
13	SE.	14	"	"	"	Dug	6	1,900	- 4	1,896	4	1,896	Glacial sand	Hard, clear	44	D, S	Sufficient for 35 head stock.

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WELL RECORDS—Rural Municipality of WILLOWDALE NO.153, 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
14	SW.	14	16	1	2	Dug	20	1,900	- 15	1,885	15	1,885	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 13 head stock.
15	NW.	14	"	"	"	Dug	24	1,950	- 20	1,930	21	1,929	Glacial coarse sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 35 head stock; another similar well 12 feet deep.
16	SW.	15	"	"	"	Dug	14	1,930	- 8	1,922	10	1,920	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 10 head stock.
17	NW.	15	"	"	"	Dug	16	1,930	- 10	1,920	10	1,920	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock.
18	SW.	16	"	"	"	Dug	33	1,940	- 13	1,927	29	1,911	Glacial gravel	Hard, clear	43	D, S	Sufficient for 59 head stock.
19	NW.	16	"	"	"	Dug	10	1,950	- 7	1,943	7	1,943	Glacial red sand	Hard, iron, red sediment, "alkaline"	43	D, S	Sufficient for 24 head stock.
20	SE.	18	"	"	"	Dug	14	1,900	- 9	1,891	9	1,891	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 30 head stock.
21	NE.	20	"	"	"	Spring		1,650	0	1,650	0	1,650	Glacial clay	Hard, clear	42	D, S	Oversufficient for 14 head stock.
22	SE.	20	"	"	"	Dug	7	1,950	- 5	1,945	5	1,945	Glacial sand	Hard, clear "alkaline"	43	D, S	Sufficient for 16 head stock.
23	SE.	26	"	"	"	Dug	26	1,500	- 24	1,476	24	1,476	Marine shale	Hard, clear, "alkaline"	42	D	Sufficient for household needs; also a 24 foot well not fit for use.
1	SW.	2	18	2	2	Drilled	60	1,900	- 35	1,865			Glacial gravel	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock. A 10 foot well used for watering garden.
1	Ochapowace Indian Reserve NO. 71					Dug	14	1,900	- 8	1,892	14	1,886	Glacial coarse gravel	Very good		D, S	Sufficient for local needs.
2	Ochapowace Indian Reserve NO. 71					Dug	53	1,935	- 38	1,897	53	1,882	Glacial sand and gravel	Good		D, S	Sufficient; large supply.
3	Ochapowace Indian Reserve NO. 71					Dug	35	1,949	- 25	1,924	35	1,914	Glacial coarse gravel	Good		D, S	Sufficient for local needs.
4	Ochapowace Indian Reserve NO. 71					Dug	53	1,940	- 38	1,902	53	1,887	Glacial coarse gravel	Good		D, S	Sufficient for local needs.
5	Ochapowace Indian Reserve NO. 71					Bored	70	1,950	- 30	1,920	70	1,880	Glacial coarse gravel	Good		D, S	Sufficient; large supply.
6	Ochapowace Indian Reserve NO. 71					Bored	70	1,950	- 30	1,920	70	1,880	Glacial gravel	Good		D, S	Sufficient; large supply.
7	Ochapowace Indian Reserve NO. 71					Dug	50	1,955	- 20	1,935	50	1,905	Glacial gravel	Good		D, S	Sufficient for local needs.
8	Ochapowace Indian Reserve NO. 71					Dug	45	1,950	- 25	1,925	45	1,905	Glacial gravel	Good		D, S	Sufficient for local needs.
9	Ochapowace Indain Reserve NO. 71					Spring		1,855	0	1,855			Glacial drift	Good		D, S	Sufficient for local needs.

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(#) Sample taken for analysis.