CANADA
DEPARTMENT OF MINES

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BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF BUCHANAN No. 304 SASKATCHEWAN

BY

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

Water Supply Paper No. 209

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GROUND WATER RESOURCES OF PART OF THE RURAL MUNICIPALITY OF BUCHANAN NO. 304 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 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.

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 côteau. 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 Buchanan, No. 304, comprises an area of approximately 286 square miles in southeastern Saskatchewan. The area consists of six full townships, described as townships 32 and 33, ranges 4, 5, and 6, and three fractional townships, described as townships 31, ranges 4, 5, and 6, all west of the Second meridian. Townships 33, ranges 1, 2, and 3, were not covered by the field part and are not discussed in this report. The three fractional townships consist of sections 19 to 36, and parts of sections 13 to 18. A branch line of the Canadian National railways crosses the southwestern corner of the area and on it are located Buchanan and Tiny. Buchanan is situated 40 miles north and 13 miles west of the city of Yorkton.

The ground surface throughout the municipality varies from flat to undulating. The maximum elevation of 1,700 feet is attained in the northern part of township 32, range 6, from where it gradually decreases in an easterly and southeasterly direction to 1,600 feet in the southeastern corner. The valley of Spirit creek, in the southwestern corner, also lies at an elevation of 1,600 feet above sea-level. Crooked creek heads near the centre of the municipality, flows in a south-easterly direction, and leaves the area in sec. 1, tp. 31, range 4. Both creeks flow intermittently. Numerous sloughs that contain water during the spring and early summer months are found in all parts of the municipality.

Three small areas in the eastern part of the municipality are covered by a few feet of glacial lake clays. A small area in the northeastern corner, and a large area in the southwestern corner, are mantled by glacial lake sands. A small deposit of glacial outwash sand and gravel occurs in parts of secs. 26 and 27, tp. 31, range 6. A large area in the north-central part of the

municipality, and a small area in the southern part of township 32, range 4, are covered by moraine. These areas are rough and are characterized by knolls and small depressions. The remainder of the municipality is mantled by glacial till. The deposits of glacial till and moraine consist of a weathered or oxidized zone composed of several feet of sandy top soil, and 10 to 20 feet of yellow clay; and an unweathered zone of blue boulder clay which, in township 32, range 6, extends to a depth of at least 200 feet, or to an elevation of 1,490 feet above sea-level. Scattered pockets of sand and gravel occur within the weathered and unweathered clays. A discontinuous layer of sand and gravel separates the two zones in some areas.

Water-bearing Horizons in the Unconsolidated Deposits

No water is obtained from the glacial lake sands or lake clays in the eastern part of the municipality as they are only a few feet thick. The deposits of lake sands in the southwestern corner of the municipality are at least 20 feet thick in places, and wells from 5 to 20 feet deep yield moderate, but sufficient, supplies of water for local needs. The water is moderately hard and usable for all farm purposes. It is probable that water can be located in most localities in the glacial lake sand-covered area in township 31, range 6.

Wells in secs. 22 and 23, tp. 31, range 6, obtain an abundant supply of water from the glacial outwash sands and gravels. The water is not highly mineralized and it is usable for drinking, irrigation, and other farm purposes. The yield from an individual well is adequate for 100 head of stock.

In general, it is very difficult to locate adequate supplies of water in the moraine and glacial till-covered areas and a shortage of water is experienced on many of the farms. No continuous water-bearing horizon occurs, and deposits of water-bearing

sand and gravel have not been located in many sections. The main source of water in these areas is from scattered pockets of sand and gravel that occur in the upper 10 to 20 feet of the drift. The amount of water obtained from individual wells depends upon the size of the deposit encountered and upon the amount of annual precipitation. A few wells in each township that tap pockets of sand and gravel of large areal extent yield abundant supplies of water. The water is moderately hard and usable for all farm purposes. A number of farmers usually haul water from the shallow wells that yield abundant supplies. The other shallow wells yield small or intermittent supplies of water that is more highly mineralized and in many cases "alkaline". The water is used for domestic purposes. In some sections from two to five wells are frequently used to obtain sufficient water for local requirements. Dry holes are numerous and it is advisable to prospect the upper part of the drift with a small hand auger before digging a shallow well.

A few wells from 30 to 60 feet deep derive small supplies of very highly mineralized water from thin layers of sand in the blue boulder clay. Most of these wells are located in townships 31 and 32, range 4. The water from many of the wells is usable for all farm purposes, but it may have a laxative effect on those not accustomed to its use. The water from some of the wells is under slight hydrostatic pressure, but the supply is small and unreliable.

Several holes from 100 to 200 feet deep have been drilled in the glacial drift and only one encountered even a small supply of water. It is located in the NE. $\frac{1}{4}$, sec. 26, tp. 31, range 6, and yields very highly mineralized water, which, however, is usable for household purposes, and the supply is sufficient for local needs. The aquifer in this well is of small areal extent, as deeper holes in the adjoining section were dry. It is not

advisable to drill to depth in this township, as the uncertainty of obtaining water and the poor quality of water, if obtained, do not warrant the expense of drilling. The only method that can be adopted in this municipality to increase water supplies is to conserve surface water by using dams or dugouts.

Water-bearing Horizons in the Bedrock

The Marine Shale series underlies the glacial drift in this part of Saskatchewan. The upper parts of these shale beds are soft and clayey, and it is difficult to distinguish them from the blue boulder clay. A hole in the NW. $\frac{1}{4}$, sec. 35, tp. 31, range 6, reports shale at a depth of approximately 300 feet, or an elevation of 1,390 feet above sea-level. The well is reported to have contained water, which probably seeped in at the contact of the drift and bedrock as other holes in this area were dry. It is useless to drill into the Marine Shale series in this part of Saskatchewan in search for water.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 31, Range 4

This fractional township comprises an area of approximately 23½ square miles and consists of sections 19 to 36, and parts of sections 13 to 18. An area in the south-central part is mantled by glacial lake clays and the ground surface is very flat. The remainder of the township is covered by glacial till and is slightly rolling. The average elevation throughout the area is 1,600 feet above sea-level. Crooked-hill creek flows intermittently through the northeastern sections of the township.

The glacial lake clays vary in thickness from a few feet to at least 14 feet. Several wells sunk in this deposit have tapped thin layers of sand in the clay, from which small supplies of water are obtained. The water is highly mineralized but usable for household purposes. Farmers residing in the glacial lake clay-covered area have been unable to obtain sufficient water for farm requirements. The glacial till consists of 1 to 3 feet of sandy top soil; 10 to 20 feet of oxidized, yellow boulder clay containing scattered pockets or lenses of sand and gravel; a discontinuous bed of sand and gravel that varies in thickness from a few inches to several feet; and unweathered blue boulder clay that extends to a depth of at least 110 feet and probably extends to bedrock. The principal and uppermost water-bearing horizon is formed by the pockets of sand and gravel, and by the discontinuous layer of sand and gravel between the yellow and blue boulder clays. Six wells, in sections 14, 16, 18, 19, and 32, tap pockets or beds of sand and gravel of large areal extent and yield large quantities of water. These wells yield sufficient water for 40 to 100 head of stock. The water is moderately hard and is locally termed soft as compared with that from other wells, it is used for all farm purposes.

Many neighbouring farmers haul their supplies of water from these wells. The shallow wells that tap aquifers of smaller areal extent yield small or intermittent supplies of water. The water is more highly mineralized, but with few exceptions it is usable for domestic purposes. In many places it is necessary to use three or more of these wells to obtain sufficient water for local needs. In some sections many dry holes have been dug before water was located, and it is, therefore, advisable to locate the water-bearing deposits by means of a small auger before digging wells.

In the northeastern corner of the township several wells from 40 to 50 feet deep encounter sand aquifers in the blue boulder clay. The sand deposits are not continuous, as dry holes to this depth have been sunk near producing wells. The wells yield small supplies of water that are adequate for only a few head of stock. The water in the well in the SW. $\frac{1}{4}$, section 36, is under slight hydrostatic pressure, but the water in the others does not rise above the aquifer. The water is very highly mineralized, but it is being used for domestic purposes, although it would act as a laxative on those not accustomed to its use. These wells are a very poor source of water. Three holes from 100 to 110 feet deep were sunk in the blue clay without obtaining water. It is not advisable to drill to depth in this township as there is little probability of locating water, and if it is located it will probably be too highly mineralized for farm use. The best method for increasing water supplies in this township is by collecting surface water in artificial reservoirs. Dugouts can be used in most sections of the township and they should be at least 12 feet deep in order to retain water throughout the year.

Township 31, Range 5

With the exception of the northern part of section 31, which is mantled by moraine, this fractional township is covered

by glacial till. The ground surface is gently rolling and the average elevation is 1,630 feet above sea-level. No lakes, creeks, or springs are found in this township, and water is either obtained from intermittent sloughs or from wells. In some sections water is hauled from sources outside the township.

The producing wells in this township are from 10 to 25 feet deep, and tap pockets of sand and gravel in the yellow clay. A well in the SE. $\frac{1}{4}$, section 20, taps a bed of gravel, and yields an abundant supply of water. Thirty-five head of stock are watered at the well and several neighbouring farmers haul from it. It is the only good well in the township. The water is moderately hard and usable for all farm purposes. The other shallow wells yield very small or intermittent supplies of hard water, which in some wells is not usable for household purposes. Many holes are sunk before water is located, and some farmers have sunk fifty to one hundred test holes without locating water-bearing deposits. Most of the farmers have been unable to obtain a satisfactory supply of water. In some sections holes have been sunk to depths of 60 to 150 feet without encountering water. Sloughs are used for stock during part of the year, but they did not contain water in 1930 to 1934. During 1934 several farmers hauled water from Good Spirit lake which lies 8 miles south of this township.

The only practical method of increasing water supplies in this township is by conserving surface water. Dugouts can be used in most sections, and they should be located in low areas where the maximum amount of water will drain into them, and they should be at least 12 feet deep.

Township 31, Range 6

This fractional township consists of sections 19 to 36, and parts of sections 13 to 18. Spirit creek occupies a shallow valley that dissects the township in a southeasterly

direction. Two small lakes are located in the same valley. The ground surface above the valley is very flat in the southern and central sections, but becomes more rolling in the northern part. The elevation of Spirit creek is 1,600 feet above sea-level, and it rises to 1,650 feet in the northeastern corner and to 1,700 feet in the western sections. The township is mantled by glacial till. Glacial lake sands overlie the till in the southern and central sections. These sand deposits are from a few inches to at least 20 feet in thickness, and in some sections layers of silty, yellow clay occur within the sands. They are underlain by blue clay. A small deposit of glacial outwash sands and gravels also overlies the glacial till in parts of sections 23, 26, and 27. Small bluffs of poplar are common in this township.

The supply of water obtained in this township is not abundant, but most farmers have sufficient for the present local needs. The best supply of water is obtained from the glacial lake sands. The water is moderately hard and usable for all purposes, including irrigation. No dry holes were reported in this area. Two wells sunk in the glacial outwash sands and gravel yield an abundant supply of water that is moderately hard and usable for all purposes. The well in the SE. $\frac{1}{4}$, section 22, is 16 feet deep, and will water at least 100 head of stock.

More difficulty is experienced in locating water in the glacial till-covered area. A few wells from 12 to 23 feet deep have tapped pockets of sand and gravel in the yellow boulder clay from which small quantities of water are obtained. The water is hard and that from some wells is very highly mineralized and not usable for domestic purposes. A few farmers in this area have tested for water and have not been able to locate any at shallow depths, and are forced to tank water from neighbouring wells.

A well in the NE. $\frac{1}{4}$, section 26, is drilled to a depth of 163 feet, or to an elevation of 1,482 feet above sea-level. The

aquifer was encountered beneath a few feet of "hardpan" and it yields an abundant supply of water. The water is used for drinking and household purposes, although it has a pronounced salty taste. It is under sufficient hydrostatic pressure to rise to a point 103 feet below the surface. It is possible that holes drilled to similar depths in the vicinity of this well would encounter water, but the horizon is not thought to be continuous. A number of wells 138 to 350 feet deep have been drilled in the village of Buchanan, and it is reported that one was drilled to a depth of 1,200 feet. The 138-foot well obtained a small amount of water that was too "alkaline" to be used. The 350-foot hole is reported to have struck fine, water-bearing sand, but the drill was lost and the well plugged. The other holes were dry. Bedrock, the Marine Shale series, is thought to occur at an approximate depth of 300 feet, or an elevation of 1,340 feet and was undoubtedly encountered in some of the wells. It rarely contains usable water and drilling into it is not advised.

Township 32, Range 4

This township is slightly rolling, and the elevation varies between 1,600 and 1,650 feet above sea-level, the rise being toward the north. Crooked-hill creek occupies a shallow valley and flows in a southeasterly direction across the township. Two small lakes are situated in section 25, but they become dry in drought periods. Swampy, undrained depressions and sloughs are common throughout the township. Clumps of poplar trees occur in the eastern sections.

With the exception of a small moraine-covered area in sections 3 and 4, the township is mantled by glacial till. In parts of sections 24, 25, and 36 thin deposits of glacial lake sands overlie the glacial till. In parts of sections 1, 12, and 13, and 14, 15, 22, and 23, thin deposits of glacial lake clays overlie the boulder clay. These glacial lake deposits are only a

few feet thick and wells sunk in the areas covered by them tap aquifers in the underlying glacial till.

The glacial till and moraine deposits as a rule consist of a thin layer of top soil; 10 to 20 feet of bright yellow clay free from stones or boulders, but containing scattered pockets of sand, and fine-textured, blue boulder clay that extends to an unknown depth. The uppermost water-bearing horizon is formed by the pockets of sand and gravel in the yellow clay. Three wells in the NW. $\frac{1}{4}$, section 16, SW. $\frac{1}{4}$, section 20, and NE. $\frac{1}{4}$, section 24, tap pockets of sand of large areal extent at depths of 18, 14, and 15 feet, respectively, and yield an abundance of water. The water is moderately hard and usable for all purposes. The well in the SW. $\frac{1}{4}$, section 20, will water at least 200 head of stock. The other shallow wells yield small or intermittent supplies of water that are sufficient only for a few head of stock. From two to five wells of this type are used in many places to obtain sufficient water for local needs. The water is very hard, and generally "alkaline", but it is usable for household purposes. The water-bearing deposits are of scattered occurrence and dry holes are frequently dug before an aquifer is located. It is advisable to locate the sand and gravel deposits by means of a small auger before digging a well.

A second, discontinuous water-bearing horizon is encountered at depths of 40 to 65 feet throughout the township, and is formed by scattered deposits of sand and gravel in the blue clay. An individual well yields an adequate supply of water for 15 to 40 head of stock. The water is very hard and "alkaline", and that from some wells is not usable for drinking or other household purposes. A few wells yield water that is under sufficient hydrostatic pressure to rise to points 20 to 25 feet below the surface.

Eighteen of the fifty farmers interviewed have been unable to obtain sufficient supplies of water, and others would have inadequate

supplies if they increased their herds of live stock. The water from wells in the township is usually highly mineralized and unfit for household purposes. Some of the residents use cisterns to collect and store rain water; others haul from neighbouring wells, and from Assiniboine river, located to the east of the township. No deep holes have been drilled, and it is not advisable to drill to depth as it is not probable that water-bearing horizons yielding usable water will be struck. The sloughs, when they contain water, are used to water stock. These depressions when dry could be deepened to retain larger supplies of water. Dugouts in other sections are also recommended for conserving surface water.

Township 32, Range 5

The average elevation of this township is 1,650 feet above sea-level. The western sections are mantled by moraine and the area is very rough with many rock-strewn knolls and ridges. Numerous undrained depressions and sloughs are found between the hills in this area. The eastern part is mantled by glacial till, and the ground surface is flat or slightly undulating. Clumps of poplar trees are common in most sections, but the growth is more dense in the moraine-covered area.

Water supplies in this township are obtained from wells and sloughs. In winter ice is packed for use during the summer, and reservoirs are used to collect rain water and snow. Twenty-seven of the forty-one farmers interviewed have insufficient water supplies. Thirteen farmers were unable to obtain water in wells, and six farmers have wells that yield intermittent supplies. All have dug numerous, shallow, dry holes. Six wells, located in the NE. $\frac{1}{4}$, section 12, NE. $\frac{1}{4}$, section 16, NE. $\frac{1}{4}$, section 18, NW. $\frac{1}{4}$, section 24, and NW. $\frac{1}{4}$ and NE. $\frac{1}{4}$, section 32, yield large supplies of water, and many farmers haul from these wells. The water is moderately hard and is derived from large deposits of sand and gravel in the yellow clay. The other wells that yield small supplies of

water also tap pockets of sand andgravel in the yellow clay, but they are of very small areal extent. The water from these small deposits is more highly mineralized and in many cases is not usable for household purposes. A 60-foot well in the NW. ¼, section 36, taps a bed of sand in the blue boulder clay from which moderate supplies of water are obtained. The water is not under hydrostatic pressure and it is very hard and "alkaline". Dry holes from 60 to 108 feet deep have been sunk in blue boulder clay.

It appears useless to drill to depth in the blue clay in this locality as very few wells encounter water-bearing horizons, and the water if located is usually not fit for domestic use. In this township it is recommended that surface water be collected by the use of dugouts or dams, depending upon the topography of the area. The reservoirs should be of sufficient depth to retain at least 12 feet of water. Water for domestic purposes can be obtained from wells dug near the reservoir and connected to it by a specially built filter. Care should be taken to see that the water does not become polluted.

Township 32, Range 6

With the exception of a narrow strip of moraine along the eastern border, the township is mantled by glacial till. The ground surface is undulating, and the elevation rises from 1,630 feet in the southern sections to 1,730 feet above sea-level in the northern sections. Spirit creek and another intermittent creek dissect the southwestern corner of the township.

Water supplies in this township are almost entirely derived from wells 12 to 25 feet deep. A few farmers use small dams or dugouts, or water their stock at sloughs, when they are unable to obtain sufficient water from wells. The wells tap pockets of sand and gravel that occur within the yellow clay, or discontinuous layers of sand and gravel that lie between the yellow and blue boulder clays. The water is moderately hard to very hard and "alkaline", and the

quality varies in wells a short distance apart. The water from most of the wells is used for all domestic purposes, as water of better quality is not available. A few farmers use rain water during the summers, and melt snow and ice in the winter for domestic purposes. No farmer obtains an oversufficient supply of water, and most of them have inadequate supplies. Many shallow, dry holes have been dug and a few farmers have been unable to obtain water from wells. Several attempts have been made to locate water at depth, holes from 40 to 75 feet deep being dug, but no water-bearing beds were encountered. In the SE. $\frac{1}{4}$, section 10, two holes 100 and 150 feet deep were drilled and no water located. In the NW. $\frac{1}{4}$, section 18, a 200-foot dry hole was still in blue clay at an elevation of 1,490 feet above sea-level. It does not appear advisable, therefore, to attempt to obtain water at depth in this township. The best method for increasing water supplies in this township is to excavate dugouts to retain surface water. Small ravines can be dammed and the impounded water used for stock. It is advisable to have the reservoirs of sufficient depth so that at least 12 feet of water can be retained.

STATISTICAL SUMMARY OF WELL INFORMATION IN PART OF THE RURAL MUNICIPALITY OF BUCHANAN, NO. 304, SASKATCHEWAN

West of 2nd mer. Township / Range	31 / 4	31 / 5	31 / 6	32 / 4	32 / 5	32 / 6	Total No. in Municipality
Total No. of Wells in Township	178	318	55	181	287	88	1107
No. of wells in bedrock	0	0	1	0	0	0	1
No. of wells in glacial drift	178	318	54	181	287	88	1106
No. of wells in alluvium	0	0	0	0	0	0	0
Permanency of Water Supply							
No. with permanent supply	47	27	39	71	50	36	270
No. with intermittent supply	69	35	10	20	12	27	173
No. dry holes	62	256	6	90	225	25	664
Types of Wells							
No. of flowing artesian wells	0	0	0	0	0	0	0
No. of non-flowing artesian wells	1	0	2	16	0	0	19
No. of non-artesian wells	115	62	47	75	62	63	424
Quality of Water							
No. with hard water	95	57	36	89	57	62	396
No. with soft water	21	5	13	2	5	1	47
No. with salty water	1	0	1	1	0	0	3
No. with "alkaline" water	12	32	5	36	23	6	114
Depths of Wells							
No. from 0 to 50 feet deep	168	303	50	174	261	80	1036
No. from 51 to 100 feet deep	8	11	1	7	25	5	57
No. from 101 to 150 feet deep	2	3	2	0	1	2	10
No. from 151 to 200 feet deep	0	1	1	0	0	1	3
No. from 201 to 500 feet deep	0	0	1	0	0	0	1
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0
How the Water is Used							
No. usable for domestic purposes	104	47	43	64	36	48	342
No. not usable for domestic purposes	12	15	6	27	26	15	101
No. usable for stock	113	62	47	84	54	62	422
No. not usable for stock	3	0	2	7	8	1	21
Sufficiency of Water Supply							
No. sufficient for domestic needs	47	27	39	71	50	36	270
No. insufficient for domestic needs	69	35	10	20	12	27	173
No. sufficient for stock needs	36	23	36	50	29	30	204
No. insufficient for stock needs	80	39	13	41	33	33	239

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. Resident

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 hardness 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 Buchanan, No. 304, 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	
1	SW.	12	32	5	2	10	23,223												(3)		(2)	(4)	(1)	(5)	x 1

Water samples indicated thus, x 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. 1 by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

One sample of water from the glacial drift of the municipality of Buchanan was analysed and the results are listed in the accompanying table. This sample is from a 10-foot well and contains an exceptionally large amount of dissolved mineral salts, 23,223 parts per million. The water is not used for any purpose. The main salts in solution are the sulphates of sodium, magnesium, and calcium. These salts are usually the predominant salts in water found in the unconsolidated deposits. This sample of water is not representative of the water derived from shallow depths in this municipality. It is not uncommon to obtain highly mineralized water at the same depth and not far distant from slightly mineralized water. The water from most of the shallow wells in this area, however, is suitable for domestic needs and for stock.

The water from deeper wells in the glacial drift contains the same mineral salts in solution, but in different proportions. The water is usually more highly mineralized than that from shallow wells, and contains a considerable amount of sodium sulphate (Epsom salts) and magnesium sulphate (Glauber's salt). It is usually unsuitable for drinking as it acts as a laxative. In some instances it may be too highly mineralized for stock use.

Water from the Bedrock

It is reported that a well in the village of Buchanan obtains a small amount of water from the Marine Shale series. In this part of Saskatchewan the Marine Shale rarely contains water, and it is possible that the water in this well is seepage from the drift. The water is not usable for domestic or stock needs. It is doubtful if usable water can be obtained from the bedrock in this municipality.

B 4-4
R. 7526

WELL RECORDS—Rural Municipality of BUCHANAN, NO. 304, 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.	13	31	4	2	Dug	19	1,600	- 15	1,585	18	1,582	Glacial sand	Hard, cloudy			Intermittent supply; many similar wells and dry holes.
2	NE.	14	"	"	"	Dug	12	1,600	- 7	1,593	7	1,593	Glacial gravel	Hard, clear		D, S	Sufficient for 100 head stock.
3	NW.	14	"	"	"	Dug	14	1,605	- 10	1,595	13	1,592	Glacial sand	Soft, clear		D, S	Intermittent supply; also another well 16 feet deep and one for domestic needs.
4	SE.	16	"	"	"	Dug	9	1,610	- 4	1,606	4	1,606	Glacial gravel	Soft, clear		D, S	Sufficient for 50 head stock; also another shallow well.
5	NE.	16	"	"	"	Dug	16	1,610	- 12	1,598	12	1,598	Glacial gravel	Soft, clear		D, S	Sufficient for 12 head stock; also another well 15 feet deep.
6	NE.	17	"	"	"	Dug	10	1,615	- 5	1,610	7	1,608	Glacial gravel	Soft, clear		D, S	Sufficient for 25 head stock; also many shallow dry holes.
7	NE.	18	"	"	"	Dug	14	1,615	- 12	1,603	12	1,603	Glacial gravel	Soft, clear		D, S	Sufficient for 10 head stock with aid of three other similar wells.
8	NW.	18	"	"	"	Dug	12	1,615	10	1,605	10	1,605	Glacial gravel	Hard, clear		D, S, I	Sufficient for 40 head stock.
9	NW.	19	"	"	"	Dug	12	1,615	- 6	1,609			Glacial gravel	Hard, clear		D, S, I	Sufficient for 50 head stock; also another similar well.
10	SE.	19	"	"	"	Dug	14	1,615	- 8	1,607	8	1,607	Glacial gravel	Soft, clear		D, S	Sufficient for 20 head stock.
11	NE.	19	"	"	"	Dug	14	1,610	- 12	1,598	12	1,598	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 30 head stock; two other wells with strongly mineralized water.
12	NW.	20	"	"	"	Dug	25	1,615									Dry hole; base in glacial drift; many similar dry holes.
13	SE.	20	"	"	"	Dug	10	1,610	- 5	1,605	5	1,605	Glacial sand	Soft, clear		D, S, I	Sufficient for 20 head stock; another similar well and some shallow dry holes.
14	NE.	20	"	"	"	Dug	12	1,615	- 10	1,605			Glacial drift	Hard, clear		D, S	Intermittent supply; also thirty to forty similar wells; also one well that is very salty and unfit for use.
15	SE.	21	"	"	"	Dug	15	1,610	- 9	1,601			Glacial drift	Hard, clear		D, S	Intermittent supply; also some shallow dry holes.
16	SE.	22	"	"	"	Dug	9	1,600	- 6	1,594	6	1,594	Glacial sand	Hard, clear		D, S	Sufficient for 25 head stock.
17	SW.	23	"	"	"	Dug	8	1,595	- 4	1,591	4	1,591	Glacial sandy clay	Hard, clear		D, S	Sufficient supply; also many shallow dry holes.
18	NW.	24	"	"	"	Dug	14	1,590	- 9	1,581	13	1,577	Glacial sand	Hard, clear		D, S	Intermittent supply; also dry holes 40 to 50 feet deep.
19	SW.	24	"	"	"	Dug	14	1,595	- 10	1,585	10	1,585	Glacial gravel	Soft, clear		D, S, I	Sufficient for 23 head stock; also another well for domestic use.
20	SE.	24	"	"	"	Dug	32	1,595	- 29	1,566	28	1,566	Glacial sand	Hard, clear		D	Intermittent supply; also many dry holes to a depth of 30 feet.
21	NE.	24	"	"	"	Dug	12	1,590	- 4	1,586	4	1,586	Glacial gravel	Soft, clear		D, S	Sufficient for 7 head stock.
22	NW.	25	"	"	"	Bored	64	1,600	- 63	1,537			Glacial drift	Hard, clear		D, S	Sufficient only for domestic needs and 3 horses; also another similar well.
23	NE.	26	"	"	"	Bored	45	1,595	- 42	1,553			Glacial sand	Hard, clear, "alkaline"		D	Sufficient only for domestic needs; also dry holes to a depth of 110 feet.
24	SE.	26	"	"	"	Dug	18	1,600	- 10	1,590	10	1,590	Glacial sand	Hard, clear		D, S, I	Sufficient for 19 head stock; also another well in pasture.
25	SW.	28	"	"	"	Dug	12	1,610	- 6	1,604	8	1,602	Glacial gravel	Hard, yellow		S, I	Sufficient for 25 head stock; also two other similar wells.
26	NW.	28	"	"	"	Bored	40	1,615	- 20	1,595			Glacial sand	Hard, yellow, "alkaline"		D, S	Sufficient for 50 head stock; also many dry holes to a depth of 11[illegible] feet.

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.

B 4-4
R. 7526

WELL RECORDS—Rural Municipality of BUCHANAN, NO. 304, 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	NW.	30	31	4	2	Dug	14	1,625	- 4	1,621			Glacial drift	Hard, clear		D, S	Intermittent supply; also many shallow dry holes.
28	NW.	31	"	"	"	Dug	16	1,625									Dry hole; base in glacial blue clay; many other similar dry holes.
29	SE.	31	"	"	"	Dug	13	1,625	- 10	1,615	12	1,613	Glacial gravel	Hard, clear		D, S	Intermittent supply; many similar wells.
30	SE.	31	"	"	"	Dug	10	1,625	0	1,625	8	1,617	Glacial sand	Hard, clear		S	Sufficient for 13 head stock; also another well for domestic needs.
31	NE.	31	"	"	"	Dug	13	1,625	- 10	1,615	10	1,615	Glacial sandy clay	Hard, clear		D, S	Intermittent supply; fifteen other similar wells.
32	NW.	32	"	"	"	Dug	10	1,625	- 3	1,622	3	1,622	Glacial gravel	Hard, clear		D, S	Intermittent supply; also dry holes to a depth of 18 feet.
33	SW.	32	"	"	"	Dug	10	1,620	- 6	1,614	6	1,614	Glacial gravel	Soft, clear		D, S, I	Sufficient for 40 head stock; two other similar wells.
34	SE.	32	"	"	"	Dug	16	1,620	- 12	1,608	12	1,608	Glacial sandy clay	Soft, clear		D, S	Intermittent supply; many other similar wells.
35	SE.	33	"	"	"	Dug	20	1,615									Dry hole; base in glacial drift; many other similar dry holes.
36	NE.	34	"	"	"	Bored	50	1,605	- 48	1,557			Glacial sand	Hard, iron, cloudy		D, S	Intermittent supply; also a 45-foot well with poor supply; also many dry holes.
37	SE.	34	"	"	"	Dug	40	1,610	- 37	1,573	37	1,573	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock; also another similar well and ten dry holes 15 to 20 feet deep.
38	NW.	35	"	"	"	Bored	100	1,605									Dry hole; base in glacial blue clay; also many other dry holes.
39	SE.	35	"	"	"	Dug	41	1,595	- 39	1,556	39	1,556	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient for more than 8 head stock; also many dry holes 20 to 45 feet deep.
40	NE.	35	"	"	"	Bored	50	1,605	- 46	1,559			Glacial drift	Hard, cloudy, "alkaline"		D, S	Sufficient for 4 head stock; also a 20-foot dry hole.
41	SW.	36	"	"	"	Bored	40	1,600	- 20	1,580	28	1,572	Glacial gravel	Hard, cloudy, "alkaline", iron		D, S	Sufficient for 12 head stock.
42	NE.	36	"	"	"	Dug	24	1,605	- 20	1,585	20	1,585	Glacial gravel	Hard, clear "alkaline"		S	Sufficient for 20 head stock; also another well for domestic needs.
1	NE.	14	31	5	2	Dug	14	1,630	- 0	1,630	13	1,617	Glacial sand	Hard, clear, "alkaline", iron		D, S, I	Intermittent supply; three other similar wells; also many dry holes to a depth of 90 feet.
2	SE.	15	"	"	"	Dug	16	1,625	- 12	1,613	13	1,612	Glacial gravel	Hard, clear		S, I	Sufficient for 30 head stock; also another similar well used for domestic needs.
3	SW.	15	"	"	"	Dug	12	1,630	0	1,630	11	1,619	Glacial sand	Hard, clear, "alkaline", iron		S	Sufficient for 17 head stock; haul drinking water.
4	NW.	16	"	"	"	Dug	8	1,630	0	1,630			Glacial drift	Hard, clear, "alkaline"		S	Intermittent supply.
5	NE.	18	"	"	"	Dug	12	1,620	- 8	1,612	8	1,612	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 22 head stock; also two other wells; many dry holes to a depth of 16 feet.
6	NW.	20	"	"	"	Dug	24	1,635	- 20	1,615	20	1,615	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 20 head stock; also another well with intermittent supply.
7	SW.	20	"	"	"	Dug	14	1,625	0	1,625	10	1,615	Glacial sand	Hard, clear, "alkaline", iron		S	Sufficient for 20 head stock; also many dry holes.
8	SE.	20	"	"	"	Dug	20	1,630	- 14	1,616	14	1,616	Glacial gravel	Soft, clear		D, S, I	Sufficient for 35 head stock; also many dry holes to a depth of 12 feet.
9	NE.	20	"	"	"	Dug	16	1,635	- 14	1,621	14	1,621	Glacial sand	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 BUCHANAN, NO. 304, 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
10	NW.	22	31	5	2	Bored	150	1,630									Dry hole; base in glacial blue clay; also four seepage wells with very small supplies.
11	SE.	22	"	"	"	Dug	14	1,635	- 13	1,622	13	1,622	Glacial gravel	Hard, clear		D, S	Sufficient for 25 head stock; also a 35-foot dry hole.
12	NE.	22	"	"	"	Dug	17	1,630	- 1	1,629	12	1,618	Glacial sand	Hard, clear		D, S	Intermittent supply; also one hundred shallow dry holes and one 170-foot dry hole.
13	SE.	23	"	"	"	Dug	14	1,630	- 6	1,624	8	1,622	Glacial sand	Hard, clear, "alkaline", iron		D, S, I	Sufficient for 21 head stock; also six other wells with poor supplies and fifty dry holes to a depth of 16 feet.
14	NE.	23	"	"	"	Dug	14	1,635	- 13	1,622	13	1,622	Glacial gravel	Hard, clear		D, S	Sufficient for 25 head stock.
15	NW.	24	"	"	"	Dug	14	1,625	- 4	1,621			Glacial drift	Hard, clear, "alkaline"		D, I	Intermittent supply; this is the only well in hamlet of Tiny; also a 150-foot dry hole.
16	SW.	24	"	"	"	Dug	12	1,625	- 6	1,61°	10	1,615	Glacial sand	Soft, clear		D, S	Sufficient for 26 head stock; also another well with a good supply.
17	SE.	24	"	"	"	Dug	23	1,630	- 15	1,615	22	1,608	Glacial sand	Hard, clear, "alkaline", iron		D, S	Barely sufficient for 13 head stock; also two other wells with poor supply; also fifty dry holes to a depth of 20 feet.
18	NE.	26	"	"	"	Dug	14	1,635	- 4	1,631			Glacial drift	Hard, clear		D, S	Intermittent supply; also many dry holes 45 to 50 feet deep.
19	NE.	27	"	"	"	Dug	16	1,630	- 8	1,622	15	1,615	Glacial sand	Hard, clear, "alkaline"		S	Intermittent supply; also two other similar wells.
20	SE.	27	"	"	"	Dug	12	1,625	0	1,625			Glacial drift	Hard, clear, "alkaline"		S, I	Intermittent supply; also five dry holes to a depth of 25 feet.
21	SW.	27	"	"	"	Dug	12	1,630	0	1,630	10	1,620	Glacial sand	Hard, yellow		D, S	Sufficient for 25 head stock; also many dry holes.
22	NE.	28	"	"	"	Dug	16	1,640	- 6	1,634	14	1,626	Glacial sand	Hard, clear, "alkaline"		S	Insufficient supply; also a well in slough that is not used much.
23	SE.	28	"	"	"	Dug	12	1,640	- 5	1,635	5	1,635	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock; two other similar wells; also many dry holes.
24	SW.	28	"	"	"	Dug	12	1,630	0	1,630	11	1,619	Glacial fine sand	Hard, cloudy		S	Intermittent supply.
25	SE.	30	"	"	"	Dug	12	1,625	0	1,625	0	1,625	Glacial sand	Hard, clear, "alkaline"		S, I	Sufficient for 18 head stock; also five dry holes to a depth of 12 feet.
26	NW.	31	"	"	"	Dug	15	1,660	0	1,660			Glacial drift	Hard, clear		D, S	Intermittent supply; also a number of dry holes 35 to 70 feet deep.
27	SE.	31	"	"	"	Dug	12	1,640	0	1,640			Glacial drift	Hard, cloudy		S	Intermittent supply; also a 150-foot dry hole; and several 40- to 50-foot dry holes.
28	NE.	31	"	"	"	Bored	30	1,655									Dry hole; base in glacial blue clay.
29	SW.	32	"	"	"	Dug	15	1,635	0	1,635			Glacial drift	Hard, clear		D, S	Intermittent supply; also dry holes 70 to 80 feet deep.
30	NE.	32	"	"	"	Dug	12	1,650									Dry hole; base in glacial drift; also other similar dry holes.
31	NE.	34	"	"	"	Dug	15	1,635	0	1,635	14	1,621	Glacial sand	Hard, clear		D, S	Intermittent supply; also many shallow dry holes.
32	NE.	35	"	"	"	Dug	14	1,625	- 8	1,617	8	1,617	Glacial sand	Soft, clear		D, S	Sufficient for 40 head stock; also another well 16 feet deep, and a 50-foot dry hole.
33	NW.	36	"	"	"	Dug	10	1,630	0	1,630	8	1,622	Glacial sand	Hard, clear, "alkaline"		D, S	Intermittent supply; five other similar wells; also many dry holes 20 to 70 feet deep.
34	NE.	36	"	"	"	Dug	14	1,625	0	1,625			Glacial drift	Hard, clear		D, S	Intermittent supply; also a 70-foot dry hole.

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.

B 4-4
R. 7526

WELL RECORDS—Rural Municipality of BUCHANAN, NO. 304, 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.	13	31	6	2	Dug	16	1,620					Glacial gravel	Hard, clear		D, S	Intermittent supply; also two other similar wells.
2	SW.	15	"	"	"	Dug	10	1,635	- 6	1,629			Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
3	NE.	16	"	"	"	Dug	12	1,630	- 2	1,628	2	1,628	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
4	NW.	16	"	"	"	Dug	20	1,660	- 10	1,650	18	1,642	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also another well.
5	SE.	17	"	"	"	Dug	14	1,650	- 10	1,640	10	1,640	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
6	NE.	18	"	"	"	Dug	8	1,700	- 4	1,696	4	1,696	Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.
7	SW.	21	"	"	"	Dug	10	1,645	- 7	1,638	7	1,638	Glacial sand	Soft, clear		D, S	Sufficient for local needs; also another well 12 feet deep.
8	NW.	21	"	"	"	Dug	9	1,645	- 3	1,642	3	1,642	Glacial sand	Soft, clear		D, S	Sufficient for local needs; also another similar well.
9	NW.	22	"	"	"	Dug	12	1,610	- 6	1,604	6	1,604	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
10	SE.	22	"	"	"	Dug	16	1,595	- 8	1,587	14	1,581	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 100 head stock; also another well 6 feet deep.
11	SW.	23	"	"	"	Dug	16	1,620	- 13	1,607	13	1,607	Glacial sand	Hard, clear		D	Sufficient for domestic needs; another well 8 feet deep is used for stock.
12	NW.	23	"	"	"	Dug	16	1,605	- 6	1,599	14	1,591	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 16 feet deep has a small supply.
13	SE.	23	"	"	"	Dug	14	1,620	- 11	1,609	13	1,607	Glacial gravel	Hard, clear		D, S	Insufficient supply during winter season.
14	SW.	24	"	"	"	Dug	14	1,620	- 8	1,612	9	1,611	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; also a 16-foot dry hole.
15	SW.	25	"	"	"	Dug	13	1,630	- 8	1,622	8	1,622	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for stock needs; use cistern for domestic needs.
16	NW.	25	"	"	"	Dug	20	1,635									Dry hole; base in glacial blue clay.
17	NE.	26	"	"	"	Bored	163	1,645	-103	1,542			Glacial(?) drift	Hard, salty, cloudy		D, S	Sufficient for local needs.
18	NW.	26	"	"	"	Dug	15	1,630	- 10	1,620			Glacial drift	Soft, clear		D, S	Intermittent supply; several similar wells.
19	SE.	27	"	"	"	Dug	14	1,615	- 8	1,607	8	1,607	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
20	NE.	28	"	"	"	Dug	13	1,610	- 6	1,604	6	1,604	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
21	SW.	28	"	"	"	Dug	15	1,640					Glacial sand	Soft, clear		D, S	Sufficient for local needs; also another well 10 feet deep.
22	NE.	29	"	"	"	Dug	12	1,640	- 9	1,631	10	1,630	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; also another well 8 feet deep.
23		29	"	"	"	Dug	10	1,655	- 4	1,651			Glacial sand	Hard, clear		D, S, I	Sufficient for local needs.
24	NW.	30	"	"	"	Dug	5	1,700	- 2	1,698	2	1,698	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
25	NW.	31	"	"	"	Dug	14	1,710	- 11	1,699	11	1,699	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
26	NE.	31	"	"	"	Dug	12	1,670	- 8	1,662	8	1,662	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
27	SE.	32	"	"	"	Dug	14	1,630					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.

B 4-4
R. 7526

WELL RECORDS—Rural Municipality of BUCHANAN, NO. 304, 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	SW.	34	31	6	2	Dug	17	1,620	- 10	1,610	10	1,610	Glacial sand	Soft, clear		S	Sufficient supply; a similar well 18 feet deep is used for domestic needs.
29	SE.	34	"	"	"	Dug	16	1,635	- 11	1,624	14	1,621	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for local needs.
30	NE.	34	"	"	"	Dug	23	1,635					Glacial drift	Hard, clear		S	Intermittent supply.
31	NW.	35	"	"	"	Drilled	350	1,640	-275	1,365	300	1,340	Marine shale	Hard		N	Also a 138-foot well that is unfit for use and several dry holes.
32	NW.	35	"	"	"	Dug	12	1,640	- 4	1,636			Glacial sand	Hard, clear		D, S	Intermittent supply; several similar wells in village of Buchanan.
33	SW.	35	"	"	"	Dug	8	1,635	- 3	1,632	4	1,632	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
34	SW.	36	"	"	"	Dug	25	1,640									Dry hole; base in glacial yellow clay.
35	NE.	36	"	"	"	Dug	15	1,660	- 7	1,653			Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
1	SE.	1	32	4	2	Bored	17	1,600	- 8	1,592	8	1,592	Glacial sand	Hard, clear		D, S	Oversufficient for 15 head stock; also another well 30 feet deep that is not used.
2	NE.	1	"	"	"	Dug	32	1,610	- 28	1,582			Glacial gravel	Hard, clear, "alkaline"		D, S, I	Intermittent supply; also twelve dry holes to a depth of 20 feet.
3	SW.	1	"	"	"	Bored	41	1,620	- 20	1,600			Glacial drift	Hard, "alkaline"		D, S	Sufficient for 70 head stock; also a 20-foot well and a number of dry holes to a depth of 20 feet.
4	SE.	2	"	"	"	Bored	50	1,605	- 35	1,570			Glacial gravel	Hard, cloudy		D, S, I	Sufficient for 20 head stock; also two other wells with small supplies are not used.
5	NE.	2	"	"	"	Dug	22	1,620	- 14	1,606	22	1,598	Glacial gravel	Hard, clear		D, S, I	Sufficient for 29 head stock; also two other wells 25 feet deep.
6	NW.	2	"	"	"	Dug	16	1,620					Glacial sand	Hard, clear		S	Intermittent supply; two other similar wells.
7	NE.	3	"	"	"	Bored	45	1,625	- 12	1,613			Glacial sand	Hard, clear, "alkaline"		D, S	Intermittent supply; four other similar wells.
8	SW.	5	"	"	"	Dug	16	1,625	- 14	1,611			Glacial sand	Hard, clear, "alkaline"		S	Intermittent supply; also twenty dry holes to a depth of 20 feet.
9	NE.	6	"	"	"	Dug	25	1,630					Glacial sand	Hard, clear		D, S	Intermittent supply; also a number of similar wells.
10	NW.	6	"	"	"	Bored	40	1,630	- 30	1,600	30	1,600	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock.
11	SE.	6	"	"	"			1,630					Glacial drift	Hard		D, S	
12	SW.	7	"	"	"	Dug	12	1,625	- 4	1,621	9	1,616	Glacial gravel	Hard, clear, "alkaline"		S	Insufficient for 50 head stock; also another similar well.
13	SE.	7	"	"	"	Bored	20	1,625	- 12	1,613	12	1,613	Glacial gravel	Soft, clear		D, S	Sufficient for 27 head stock.
14	NE.	8	"	"	"	Bored	40	1,620	- 30	1,590			Glacial gravel	Hard, cloudy, "alkaline"		S	Sufficient for 20 head stock; also another well is being cleaned.
15	SW.	10	"	"	"	Dug	18	1,600	- 2	1,598	17	1,583	Glacial sand	Hard, clear, "alkaline"		D, S, I	Intermittent supply; also another well in pasture with fair supply.
16	NW.	10	"	"	"	Dug	22	1,600	- 18	1,582	20	1,580	Glacial gravel	Hard, clear, "alkaline", black sediment		S	Sufficient for 16 head stock; also two dry holes 35 feet deep.
17	NE.	10	"	"	"	Dug	26	1,600	- 14	1,586			Glacial drift	Hard, clear, iron, "alkaline"		S	Sufficient for 30 head stock; a 19-foot well is used for domestic 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.

B 4-4
R. 7526

WELL RECORDS—Rural Municipality of BUCHANAN, NO. 304, 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
18	SE.	11	32	4	2	Bored	43	1,610	- 28	1,582	28	1,582	Glacial gravel	Hard, clear, iron		S	Sufficient supply; also two other wells.
19	NW.	12	"	"	"	Bored	65	1,610	- 30	1,580	50	1,560	Glacial sand	Hard, iron, "alkaline", cloudy		S	Sufficient for 20 head stock; a 55-foot foot well is used for domestic needs.
20	SE.	12	"	"	"	Dug	22	1,600	- 18	1,582			Glacial gravel	Hard, clear		D, S	Sufficient supply.
21	NE.	12	"	"	"	Bored	48	1,610	- 36	1,574	47	1,563	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for 40 head stock with aid of three other wells; also fifteen dry holes to a depth of 58 foot.
22	SE.	13	"	"	"	Bored	58	1,610	- 46	1,584	57	1,553	Glacial gravel	Hard, clear, "alkaline"		D	Sufficient supply; also three dry holes.
23	NE.	14	"	"	"	Dug	20	1,630	- 17	1,613			Glacial drift	Hard, clear		D, S	Insufficient supply; three other similar wells.
24	NE.	15	"	"	"	Dug	12	1,610	- 10	1,600	10	1,600	Glacial sand and gravel	Hard, clear		D, S	Sufficient supply; also two dry holes to a depth of 23 feet.
25	SW.	16	"	"	"	Dug	30	1,600									Dry hole; base in glacial blue clay.
26	NW.	16	"	"	"	Dug	16	1,610	- 16	1,594	16	1,594	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock.
27	SE.	17	"	"	"	Bored	45	1,610					Glacial drift	Hard, clear, "alkaline"		S	Sufficient supply.
28	SE.	19	"	"	"	Dug	11	1,620	- 5	1,615	5	1,615	Glacial sand and gravel	Hard, clear, "alkaline"		D, S	Sufficient for 17 head stock; another similar well; also three dry holes.
29	SW.	20	"	"	"	Dug	14	1,620	- 11	1,609	11	1,609	Glacial sand	Hard, clear		D, S	Sufficient for 200 head stock.
30	SE.	20	"	"	"	Dug	26	1,620									Dry hole; base in glacial blue clay.
31	SW.	22	"	"	"	Bored	45	1,620	- 15	1,605	43	1,577	Glacial gravel	Hard, cloudy, "alkaline"		S	Sufficient for 20 head stock; a 14-foot well is used for domestic needs; also fourteen dry holes to a depth of 32 feet.
32	NW.	22	"	"	"	Dug	44	1,630	- 20	1,610	30	1,600	Glacial fine sand	Hard, cloudy, "alkaline"		D, S, I	Sufficient for 30 head stock.
33	SE.	22	"	"	"	Dug	20	1,630	- 14	1,616			Glacial gravel	Hard, rusty, "alkaline"		D, S	Sufficient for local needs.
34	NE.	22	"	"	"	Bored	45	1,630	- 30	1,600	45	1,585	Glacial gravel	Hard, rusty, "alkaline"		S	Sufficient for 25 head stock; also an 18-foot well for domestic needs.
35	SE.	23	"	"	"	Dug	19	1,630	- 16	1,614			Glacial sand	Hard, clear		D, S	Insufficient for 10 head stock; also a shallow well for domestic needs; and a 19-foot well that is unfit for used.
36	SW.	24	"	"	"	Dug	18	1,640	- 14	1,626	16	1,624	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for head stock.
37	NW.	24	"	"	"	Bored		1,630	- 30	1,600			Glacial drift	Hard, clear, "alkaline", iron		S	Sufficient supply.
38	NE.	24	"	"	"	Dug	15	1,615	- 9	1,606	9	1,606	Glacial fine sand	Hard, clear, "alkaline"		D, S	Sufficient for 38 head stock.
39	SE.	26	"	"	"	Bored	42	1,640	- 22	1,618			Glacial drift	Hard, cloudy, "alkaline"		N	Unfit for use; also six dry holes to a depth of 25 feet.
40	NE.	26	"	"	"	Dug	45	1,640	- 42	1,598			Glacial gravel	Hard, clear		D, S	Insufficient supply; also two other similar wells.
41	SE.	30	"	"	"	Dug	13	1,625	- 10	1,615	10	1,615	Glacial sand	Soft, clear		D, S	Insufficient supply.

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.

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R. 7526

WELL RECORDS—Rural Municipality of BUCHANAN, NO. 304, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
42	NW.	32	32	4	2	Dug	25	1,650	- 12	1,638			Glacial sand	Hard, clear, salty		S	Sufficient for 40 head stock; also a shallow well for domestic needs.
43	SE.	33	"	"	"	Bored	37	1,640	- 26	1,614	35	1,605	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
44	NW.	34	"	"	"	Dug	28	1,650	- 17	1,633	26	1,624	Glacial gravel	Hard, clear		D, S	Sufficient for 40 head stock; also another well that is now abandoned.
45	SE.	34	"	"	"	Dug	22	1,640	- 10	1,630	21	1,619	Glacial gravel	Hard, cloudy, "alkaline"		D, S, I	Sufficient for 35 head stock; also six dry holes to a depth of 20 feet.
46	NE.	34	"	"	"	Bored	55	1,640									Dry hole; base in glacial blue clay; also a number of seepage wells.
47	SE.	35	"	"	"	Dug	30	1,640					Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient supply.
48	NE.	35	"	"	"	Dug	40	1,640	- 37	1,603			Glacial drift	Hard, clear		D, S	Intermittent supply.
49	SW.	36	"	"	"	Dug	12	1,640	- 5	1,635	8	1,632	Glacial sand and gravel	Hard, clear, "alkaline"		S, I	Sufficient for 12 head stock; also two other wells 20 and 16 feet deep.
50	NW.	36	"	"	"	Dug	36	1,650	- 37	1,613			Glacial drift	Hard, clear		D, S	Intermittent supply.
51	SE.	36	"	"	"	Dug	18	1,630	- 12	1,618	18	1,612	Glacial sand	Hard, clear, "alkaline"		D, S, I	Sufficient supply; also a 13-foot well that is not used and a dry hole.
1	NW.	2	32	5	2	Dug	20	1,640	- 12	1,628	19	1,621	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient for 50 head stock.
2	NE.	4	"	"	"	Dug	30	1,640	- 26	1,614	26	1,614	Glacial sand5	Hard, clear, "alkaline"		N	Unfit for use; another similar well; also two wells with good quality water.
3	SW.	4	"	"	"	Dug	36	1,640									Dry hole; base in glacial blue clay; twenty-five other similar dry holes.
4	NW.	5	"	"	"	Bored	108	1,645									Dry hole; base in glacial blue clay; also many other dryhholes to a depth of 100 feet.
5	SE.	6	"	"	"	Dug	20	1,655	- 16	1,639	17	1,638	Glacial sand	Hard, clear		D	Insufficient for 40 head stock; also another well that is not used.
6	SW.	8	"	"	"	Dug	9	1,650	- 3	1,647	8	1,642	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for 15 head stock; also two other wells with strongly mineralized water.
7	NW.	9	"	"	"	Dug	25	1,650									One of twenty dry holes; with bases in glacial drift.
8	NW.	10	"	"	"	Dug	14	1,640									Dry hole; base in glacial drift; also other similar dry holes.
9	SE.	10	"	"	"	Dug	12	1,640	0	1,640			Glacial drift	Hard, cloudy, "alkaline"		S	Intermittent supply; also numerous dry holes.
10	NE.	10	"	"	"	Dug	30	1,640									Dry hole; base in glacial blue clay; also numerous similar dry holes.
11	SW.	12	"	"	"	Dug	10	1,630	- 7	1,623	7	1,623	Glacial gravel	Hard, cloudy, "alkaline"		N	Unfit for use; also some wells with intermittent supply and dry holes to a depth of 40 feet; #.
12	NW.	12	"	"	"	Dug & Bored	70	1,630									Dry hole; base in glacial blue clay; thirty other similar dry holes; also a well with intermittent supply.
13	NE.	12	"	"	"	Dug	20	1,635	- 14	1,621	14	1,621	Glacial gravel	Soft, clear		D, S, I	Sufficient for 80 head stock; also four dry holes.
14	SE.	13	"	"	"	Dug	50	1,635	- 49	1,586			Glacial drift	Hard, clear, "alkaline"			Intermittent supply; also fifty dry holes.
15	SE.	15	"	"	"	Dug	40	1,630									One of twenty dry holes; base in glacial drift.

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.

B 4-4
R. 7526

WELL RECORDS—Rural Municipality of BUCHANAN, NO. 304, 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	NE.	14	32	5	2	Dug	15	1,640	- 8	1,632	8	1,632	Glacial sand	Hard, clear, iron		D, S	Intermittent supply; also dry holes to a depth of 20 feet.
17	SE.	15	"	"	"	Dug	14	1,650	- 10	1,640	13	1,637	Glacial sand	Hard, clear		D, S	Insufficient for 50 head stock; fiver other similar wells and some dry holes.
18	NE.	16	"	"	"	Dug	11	1,650	- 5	1,645	5	1,645	Glacial sand	Hard, clear		D, S, I	Sufficient for 40 head stock; also another well.
19	SW.	16	"	"	"	Dug	12	1,650	- 8	1,642	11	1,639	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 17 head stock with aid of two other similar wells.
20	SE.	18	"	"	"	Dug	30	1,660	- 20	1,640	20	1,640	Glacial sand	Hard, clear		S	Intermittent supply.
21	NE.	18	"	"	"	Dug	12	1,660	- 8	1,652	8	1,652	Glacial gravel	Soft, clear		D, S	Sufficient for 60 head stock; also another well.
22	SE.	19	"	"	"	Dug	7	1,650	- 5	1,645	5	1,645	Glacial gravel	Hard, iron, cloudy		S	Sufficient for 40 head stock; also four other wells; one well unfit for use; and many dry holes to a depth of 30 feet.
23	SW.	20	"	"	"	Dug	12	1,660	- 8	1,652	8	1,652	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for 60 head stock with aid of several similar wells.
24	NW.	20	"	"	"	Dug	11	1,660	0	1,650	10	1,650	Glacial sand	Hard, clear, "alkaline"		S	Intermittent supply; also dry holes to a depth of 50 feet.
25	NW.	22	"	"	"	Bored	60	1,650									Deepest of ten dry holes; base in glacial blue clay.
26	SE.	22	"	"	"	Dug	15	1,645	- 5	1,640			Glacial sand	Hard, clear, "alkaline"		D	Sufficient only for domestic needs; also many dry holes.
27	SW.	23	"	"	"	Dug	12	1,645	- 5	1,640	5	1,640	Glacial gravel	Soft, clear		D, S, I	Sufficient for 33 head stock; also another w well for domestic needs.
28	SW.	24	"	"	"	Dug	8	1,640	- 4	1,636	4	1,636	Glacial sand	Hard, clear		D, S	Sufficient for 25 head stock; also numerous dry holes to a depth of 30 feet.
29	NW.	24	"	"	"	Dug	12	1,640	- 6	1,634	10	1,630	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 35 head stock.
30	NE.	24	"	"	"	Dug	25	1,640									Dry hole; base in glacial drift; also two other similar dry holes.
31	SE.	26	"	"	"	Bored	63	1,640	- 35	1,605			Glacial drift	Hard, clear, "alkaline"		D, S	Intermittent supply; another similar well 12 feet deep; also seventeen dry holes to a depth of 20 feet.
32	NE.	26	"	"	"	Bored	60	1,640	- 45	1,595			Glacial drift	Hard, cloudy		S	Sufficient for 12 head stock; also a 15-foot well is used for domestic needs.
33	SW.	28	"	"	"	Dug	8	1,670	- 7	1,663			Glacial drift	Hard, clear		D, I	Intermittent supply; also many dry holes.
34	NW.	32	"	"	"	Dug	22	1,665	- 20	1,645	20	1,645	Glacial sand	Hard, clear		D, S	Sufficient for 90 head stock; also another well 26 feet deep.
35	SE.	32	"	"	"	Dug	9	1,660	- 4	1,656	6	1,654	Glacial sand	Hard, cloudy, "alkaline"		S	Insufficient for 39 head stock; also another well with small supply; also many dry holes.
36	NE.	32	"	"	"	Dug	7	1,660	- 4	1,656	4	1,656	Glacial sand	Hard, cloudy, "alkaline"		S	Sufficient for 8 head stock; also a 7-foot well is used for domestic needs.
37	NE.	35	"	"	"	Bored	40	1,640	- 30	1,610			Glacial drift	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
38	NW.	35	"	"	"	Bored	50	1,630	- 50	1,580			Glacial sand	Hard, clear, brown sediment		S	Sufficient for 40 head stock with aid of two other wells 42 and 38 feet deep; also four dry holes to a depth of 100 feet.
1	SE.	1	32	6	2	Bored	75	1,660									Dry hole; base in glacial drift; also other dry holes 15 to 20 feet deep.
2	NW.	1	"	"	"	Dug	12	1,660	- 6	1,654	7	1,653	Glacial sand	Hard, clear		D, S	Sufficient supply.

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 BUCHANAN, NO. 304, SASKATCHEWAN.

B 4-4
R. 7526

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	SE.	3	32	6	2	Bored	85	1,645									Dry holes; base in glacial blue clay; also two other wells 16 feet deep with very small supply.
4	SW.	3	"	"	"	Dug	18	1,630	- 15	1,615	15	1,615	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs.
5	SE.	4	"	"	"	Dug	12	1,610	- 4	1,606	4	1,606	Glacial gravel	Hard, clear		D, S	Sufficient supply.
6	NE.	4	"	"	"	Dug	19	1,630	- 13	1,617	16	1,614	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
7	NW.	4	"	"	"	Dug	12	1,625	- 8	1,617	8	1,617	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; another similar well.
8	SE.	6	"	"	"	Dug	11	1,650	- 8	1,642	8	1,642	Glacial sand	Hard, clear		D, S	Intermittent supply; also a 5-foot well with good supply.
9	SW.	6	"	"	"	Dug	16	1,700	- 10	1,690	10	1,690	Glacial sand	Soft, clear		D, S	Sufficient supply; also a 17-foot well that is not used.
10	NW.	6	"	"	"	Dug	12	1,695	- 7	1,688	7	1,688	Glacial sand	Hard, "alkaline"		D, S	Intermittent supply.
11	SW.	7	"	"	"	Dug	35	1,670									One of several dry holes; base in glacial drift.
12	NW.	7	"	"	"	Dug	15	1,685	- 12	1,673			Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient supply; also another well 12 feet deep.
13	SE.	8	"	"	"	Dug	16	1,630	- 10	1,620	10	1,620	Glacial gravel	Hard, clear		D, S	Sufficient supply; also another well 10 feet deep.
14	SW.	9	"	"	"	Dug	10	1,630	- 4	1,626	6	1,624	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply; another similar well 12 feet deep.
15	SE.	9	"	"	"	Dug	40	1,640									Dry hole; base in glacial blue clay; also a 10-foot seepage well.
16	SE.	10	"	"	"	Dug	18	1,655	- 12	1,643			Glacial sand	Hard, clear		S	Intermittent supply; six other similar wells also three dry holes 150, 100 and 75 feet deep.
17	SE.	11	"	"	"	Dug	12	1,670	- 8	1,662			Glacial drift	Hard, clear		D, S	Intermittent supply; also other similar wells.
18	SE.	13	"	"	"	Bored	50	1,660									Dry hole; base in glacial blue clay; other similar dry holes.
19	NW.	13	"	"	"	Dug	10	1,670	- 6	1,664	6	1,664	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient supply.
20	SE.	14	"	"	"	Dug	14	1,670	- 10	1,660	10	1,660	Glacial sand	Hard, clear		D, S	Intermittent supply.
21	NW.	14	"	"	"	Dug	14	1,670	- 10	1,660	10	1,660	Glacial sand	Hard, clear		D, S	Intermittent supply; other similar wells.
22	NE.	15	"	"	"	Dug	14	1,660	- 10	1,650			Glacial drift	Hard, cloudy, "alkaline"		S	Intermittent supply; also a 142-foot dry hole.
23	SE.	15	"	"	"	Dug	10	1,660					Glacial sand	Hard, clear		D	Intermittent supply; also another well 10 feet deep.
24	NW.	16	"	"	"	Dug	24	1,650	- 10	1,640	10	1,640	Glacial sand	Hard, clear		D, S	Insufficient supply; also another well 20 feet deep.
25	SE.	17	"	"	"	Dug	10	1,630	- 4	1,626	8	1,622	Glacial sand	Hard, clear		D, S	Insufficient supply; another similar well 9 feet deep.
26	NW.	18	"	"	"	Bored	200	1,690									Dry hole; base in glacial blue clay; another dry hole 66 feet deep.
27	SE.	20	"	"	"	Dug	25	1,670									One of five dry holes; base in glacial drift.
28	SE.	22	"	"	"	Dug	16	1,670	- 11	1,659			Glacial drift	Hard, clear		D, S	Insufficient for local needs.

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

WELL RECORDS—Rural Municipality of BUCHANAN, NO. 304, SASKATCHEWAN.

B 4-4
R. 7526

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
29	NW.	23	32	6	2	Dug	14	1,700	- 8	1,692	8	1,692	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
30	SE.	23	"	"	"	Dug	10	1,670	0	1,670	0	1,670	Glacial sand	Hard, clear		S	Intermittent supply; also another similar well 14 feet deep.
31	NW.	24	"	"	"	Dug	10	1,680	- 6	1,674	6	1,674	Glacial gravel	Hard, clear, iron		S	Sufficient supply; also another well 22 feet deep is used for domestic needs.
32	SE.	24	"	"	"	Dug	24	1,680	- 20	1,660			Glacial drift	Hard, clear		D, S	Intermittent supply.
33	NE.	24	"	"	"	Dug	8	1,680	- 6	1,674	6	1,674	Glacial gravel	Hard, clear		S	Sufficient supply; a 28-foot well is used for domestic needs.
34	SW.	25	"	"	"	Dug	38	1,670	- 30	1,640	36	1,634	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for local needs.
35	SE.	28	"	"	"	Dug	30	1,690	- 25	1,665	25	1,665	Glacial sand	Hard, clear		D, S	Sufficient supply; another similar well 37 feet deep.
36	SW.	28	"	"	"	Dug	14	1,690	- 10	1,680	10	1,680	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
37	SE.	29	"	"	"	Dug	12	1,680	- 8	1,672	8	1,672	Glacial sand	Hard, clear		D, S	Intermittent supply; also another well 9 feet deep.
38	NE.	29	"	"	"	Dug	10	1,710	- 7	1,703			Glacial drift	Hard, clear		D, S	Sufficient for local needs; also another well in pasture.
39	SE.	31	"	"	"	Dug	35	1,725					Glacial drift	Hard, clear		D, S	Sufficient for local needs.
40	NE.	34	"	"	"	Dug	25	1,730	- 15	1,715	15	1,715	Glacial sand	Hard, clear		D, S	Sufficient for 12 head stock.
41	NW.	35	"	"	"	Dug	8	1,725	- 4	1,721	4	1,721	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
42	SW.	36	"	"	"	Dug	20	1,700									Dry hole; base in glacial blue clay.

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.