CANADA
DEPARTMENT OF MINES

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

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF TERRELL No. 101 SASKATCHEWAN

BY

B. R. MacKay, & H. H. Beach

Water Supply Paper No. 9

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INTRODUCTION

Lack of rainfal during the years of 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 e 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-boaring 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. 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.

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

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

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

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

<ins>Water Table</ins>. 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.

<ins>Wells</ins>. 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 <ins>Flowing Artesian Wells.</ins>

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

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

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-carine 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 Terrell is an area of 326 square miles and consists of nine and one-half townships, described as townships 10, 11, and 12, ranges 25, 26, and 27, and that part of township 10, range 28, lying to the east of the lake of the Rivers, all west of the Second meridian.

The most striking topographic feature of the municipality is a roughly crescent-shaped range of hills which extends from the eastern boundary of township 11, range 25, in a westerly direction to the southwest corner of townhip 11, range 26, from which point it continues north along the western edge of township 11, range 26, and northeasterly across township 12, range 26. From an average elevation of 2,300 feet above.sea-level, along the southern and western boundaries of the municipality, the hills rise rapidly to elevations of 2,750 feet, and at several points exceed 2,800 feet above sea-level. Spring valley, which lies on the concave side of this crescent-shaped ridge, has an elevation of 2,100 feet in the northeast corner of the municipality, but rises uniformly to the south and west to form much more gently sloping sides to the hills than occur on the western and southern sides of the ridge.

Lake of the Rivers extends along the southern part of the western boundary of the municipality. Sloughs form in the many undrained depressions that occur scattered throughout the area, but no well-developed drainage system exists. During periods of ample precipitation these sloughs provide water for stock, and in some places shallow wells dug beside the sloughs form the source of supply for domestic requirements. Most of the water used in the municipality is derived from springs and from wells sunk into the unconsolidated glacial deposits and into the Ravenscrag bedrock formation. The distribution of the different types of glacial deposits and the underlying bedrock formations is indicated by means of symbols on the geological map (Figure 1) accompanying this report.

Water-bearing horizons in the Unconsolidated Deposits

The unconsolidated deposits mantle the bedrock throughout the area and are of three general types, i.e., glacial till, moraine, and outwash sands and gravels, differentiated by the character of the material, comprising them and the manner in which they were deposited. These deposits, collectively termed the glacial drift, have a thickness of 25 to 50 feet over the western and southern lowland area, but become considerably thicker in the central and northern parts over the high, crescent-shaped ridge that forms the western extension of Dirt hills.

Many thousands of years ago a great continental ice-sheet passed in a general southwesterly direction over the province of Saskatchewan. During both the advance and retreat it laid down a mantle of drift over the bedrock throughout this entire municipality. The greater part of this material is glacial till formed largely of bluish grey, unstratified clay containing scattered boulders. The upper weathered part has a yellowish buff appearance. Interspersed through the clay with no apparent regularity of size or area distribution are isolated pockets of sands and gravels. These pockets are more porous than the boulder clay, and success in prospecting for ground water in the drift in this area depends upon whether such pockets are tapped.

Over much of the higher land the retreating ice-sheet paused for a considerable period of time, allowing much greater thicknesses of material to accumulate. Such deposits present a much more irregular surface relief than does the gently rolling till plain and are referred to as moraine. The moraines usually contain thicker and more extensive deposits of porous sands and gravels than the till, and are in many places found to be more productive of water than the till.

Water issuing as streams from the melting ice-sheet tended to concentrate sands and gravels as outwash material over large areas. One of these deposits extends over several sections in the southwest corner of township 10, range 25, and into the southeast corner of township 10, range 26. Within this area it has been found possible to obtain moderately large supplies of hard, drinkable water at shallow depths.

Throughout much of the remainder of the area ground water is by no means plentiful in the drift, and many residents have not obtained adequate supplies even after considerable prospecting. Along the bases of the steeper hills and in the valleys, erosion in Recent time has tended to concentrate coarse sands and gravels, and they form suitable reservoirs for the accumulation of the surface run-off from the hills. In prospecting for water at shallow depths it seems much more advantageous to locate wells at or near the bases of slopes and in the bottoms of the valleys and coulées than on the more level land. Efforts to find water at shallow depths on the highest hills have been very discourageing, and in these areas it has not been possible to raise stock on any large scale.

In an area extending along the western edges of townships 11 and 12, range 27, fairly extensive pockets of sand are encountered in the boulder clay at depths of 15 to 20 feet from the surface. The water is hard and in many cases contains "alkali" and iron. It is generally drinkable, however, and in sufficient quantities for 15 to 20 head of stock. As these sand pockets do not form a continuous productive horizon over this part of the area it is in some places necessary to dig several holes before a water- bearing pocket is encountered and an adequate supply obtained. Similar water conditions are found in a fairly extensive sand bed in the bottom of the narrow valley in which is located the town of Galilee. This valley widens in an easterly direction to the northeast corner of the municipality. Immediately to the northeast of Galilee the valley bottom is covered by boulder clay from which only small seepages of, usually highly "alkaline", water are obtainable. This conditions persists in the central and northern parts of township 12, range 25, but in the eastern half of this township the clay becomes much more sandy, and adequate supplies of drinkable water are usually obtainable at shallow depth. It is inadvisable, however, to carry wells through the drift into the underlying bedrock, as the glacial deposits of the entire valley bottom are underlain by the Marine Shale series from which no adequate supplies of drinkable water are to be expected.

Springs form the best source of water in this valley, as in many other parts of the municipality. A certain uniformity exists in the location of these springs, which indicates a common source. They are found at elevations between 2,400 and 2,500 feet above sea-level on all sides of the crescent-shaped ridge, and at similar elevations on the southern and western slopes of the ridge that occupies the greater part of township 12, range 26. Lack of time during the field season of 1935 prevented a detailed study of this spring horizon, and as the accuracy of the elevations recorded at the individual springs may be in error, it was not considered advisable to indicate the zones by distinct lines on the map (Figure 1). Most of the springs observed, however, have been found to lie within the are between the 2,400- and 2,450-foot contour lines, along the southern and western sides of the crescent-shaped ridge, and at only slightly lower elevations on the concave side of the ridge in the vicinity of, and to the east and west of, Spring Valley. It is probable that an impervious layer at the top of the Ravenscrag bedrock formation is present at this elevation, and water percolating through the drift of the highlands is concentrated in a porous bed above it and comes to the surface as seepage springs. Although the bedrock is not known to appear at the surface along this spring horizon, it is possible that it is covered by only a thin mantle of drift. It is not probable, however, that drilling down to this horizon from the higher parts of the ridges will yield any large quantities of water. Many of the springs yield sufficient water for 100 head of stock or more. The most notable of these covers an area about 400 yards long and 30 yards wide in the SW.$\frac{1}{4}$, section 1, tp. 11, range 26, and yields an abundant supply of hard, iron-bearing water.

Throughout township 10, range 27, the south-central part of township 11, range 27, and in a narrow zone extending in an easterly direction through townships 10, ranges 25 and 26, the drift contains very little snad, and most of the wells are either dry or yield only small supplies of "alkaline" water. Much better supplies are obtainable by sinking wells through the drift into the blue sands of the underlying Ravenscrag formation.

Water-bearing Horizons, in the Bedrock

There are four bedrock formations underlying the glacial drift in this municipality. In descending order those recognized in drilling are: the Ravenscrag, Whitemud, and Eastend formations, and Marine Shale series. The Ravenscrag and Eastend only may be considered as potential sources of water suitable for farm use in this district. The Ravenscrag formation, composed of yellow-brown clays, brown shales, beds of blue sand, and occasional coal seams, underlies the drift down to an approximate elevation of 2,220 feet above sea-level throughout all but the northeastern part of the municipality. It is underlain in turn, by some 20 feet of white clay called the Whitemud formation. This grades downward into a coarse grey sandstone, which together with the underlying beds of fine grey silts and sands is referred to as the Eastend formation. It ranges in thickness from 25 to 50 feet and underlies the Whitemud formation at an approximate elevation of 2,200 feet above sea-level. The lower part of the Eastend becomes quite shaly and grades imperceptibly into the dark grey, impervious Marine Shale. The Ravenscrag formation immediately underlies the glacial dirft throughout the greater part of the municipality; the Eastend underlies the drift in the valley of lake of the Rivers and in the upper parts of Spring valley;and the Marine Shale underlies the drift in the lower part of Spring valley.

The most productive horizon in the bedrock is the blue sand bed near the base of the Ravenscrag. Wells situated along the southern and western edges of the municipality derive large supplies of medium hard, iron-bearing water at about 2,230 feet above sea-level, or at depths of 100 feet or less, depending upon the elevation of the ground surface. The high iron content and occasionally considerable amounts of sulphate salts render this water unfit for household use, but it is quite suitable for stock, many wells watering 50 head or more. It is not definitely known whether the blue sand horizon is productive under the highland area, but surface indications favour this possiblity. It will be necessary, however, to drill to depths of 350 to 450 feet to reach this horizon from the higher parts of the ridges.

Throughout the southern and southwestern lowland parts of the municipality the blue sands of the lower Ravenscrag offer much better possibilities of finding suitable supplies of water than the overlying glacial deposits. A bed of buff-white clay probably nowhere exceeding 30 feet in thickness underlies the Ravenscrag formation. This clay is exposed at the surface in a small area in secs. 27 and 28, tp. 10, range 20, and farther west it is thought to become very thin and may be absent over considerable areas, as the Ravenscrag formation is known to rest directly upon the Eastend formation along the eastern edge of the valley of Lake of the Rivers. The Whitemud clay holds very little water, but the underlying sand bed yields fair supplies of hard water. The silts and sand of the Eastend are in most places too finely grained for individual wells to produce very large supplies, but much of the water is quite soft and suitable for house use and is in amply sufficient quantities for a few head of stock. Soda is as a rule present in varying amounts in water from the Eastend and makes it unsuitable for watering plants. The underlying Marine Shale being practically impervious to the passage of water yields only small amounts of highly mineralized water which is quite unfit for drinking and usually unsatisfactory for stock. Hence, drilling for water should be confined to the drift, and to the upper formations which immediately overlie the shale, and which can be expected to give supplies suitable for farm requirements.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 10, Range 25

Supplies of ground water used at the present time in this township are derived almost entirely from the glacial deposits. Little or no drilling has been done into the bedrock, so that the water conditions of the underlying formations can be surmised only from findings in adjoining townships.

All but the southwest corner of the area is covered by a blanket of moraine, showing irregular variations in thickness from 25 to 75 feet. This morainic material is composed of yellow and blue clay interspersed with pockets of gravel and sand of limited areal extent. Generally throughout the area wells sunk to depths of 25 feet or less have encountered these sand beds, from which supplies of medium hard water are obtained in sufficient quantities for watering 25 to 50 head of stock. The water is usually slightly "alkaline", but not unfit for household use. Most wells located at the bottoms of slopes yield even larger supplies of water of a similar quality. Springs yielding large quantities of drinkable water are to be found along the bottoms of slopes in the northern part of the township. The source of the spring water is the base of the drift immediately overlying the Ravenscrag bedrock formation.

A fairly extensive area of outwash sands and gravels is known to exist in the southwestern quarter of the township. Shallow wells dug into these deposits can be expected to yield adequate supplies of medium hard, drinkable water, which is suitable for both domestic and stock requirements.

The glacial deposits are underlain by the yellow-brown clays and shales, and blue sands, of the Ravenscrag formation. It seems altogether probable that wells sunk to depths of 60 to 100 feet from the surface into the bedrock will give fairly large supplies of soft to medium hard water, with varying amounts of Glauber's salt, (Na_2SO_4); soda (Na_2CO_3); and considerable amounts of iron. The fine grey sands of the Eastend formation will be encountered at an approximate elevation of 2,200 feet above sea-level. Small supplies of soft, soda-bearing water have been derived from this horizon in the municipality to the east, and it is thought to be similarly productive in this area. The Eastend formation grades downward into the Marine Shale at an elevation between 2,150 and 2,100 feet. Due to the impervious nature of the shale no large supplies of water can be expected from it. Most of the water is salty and "alkaline", unfit for drinking, and usually harmful to stock. Drilling should be confined to the overlying formations.

Township 10, Range 26

Adequate supplies of ground water may be derived both from the glacial deposits and the underlying bedrock formations in this township.

The glacial deposits are of three types which differ markedly in their water-bearing properties, namely, moraine, glacial till, and glacial sand and gravel. The moraine, composed of the yellow and blue clay interspersed with many small pockets of sand and gravel, covers the northern highland region and extends southward over the central part of the township with considerable variation in thickness. The drift is non-existent in the southern part of section 28, where white bedrock clays are exposed at the surface, but has a thickness of approximately 50 feet immediately to the north and the south of this locality. It is probable that the drift does not exceed 60 to 70 feet in thickness at any point in this area. Shallow wells dug into the moraine in most cases yield sufficient supplies of drinkable water for household needs and for a few head of stock. The pockets of sand that hold the water are of limited areal extent. Hence, several dry holes may be dug entirely in clay before a productive sand pocket is encountered. Many springs exist along the base of the southern edge of the hills along the northern border. These springs yields large supplies of medium hard, slightly "alkaline" water from the glacial drift. The quantity is in may cases sufficient for 200 head of stock or more.

The central part of the township is overlain by glacial till which differs from the moraine mainly in its almost entire lack of sand or gravel pockets. Wells sunk into the clay yield only small supplies of highly "alkaline" water, which is as a rule, unfit for driking. Much larger supplies of good water have been obtained in this area by locating shallow wells in the valley and coulée bottoms, or by drilling to depths not exceeding 100 feet from the surface into the underlying Ravenscrag bedrock formation.

Throughout the more level, southeastern quarter of the township many small areas of glacial sands and gravels occur in many places forming low ridges and knolls. Large supplies of good water are derivable from these gravels at shallow depths.

The glacial deposits are underlain down to an elevation of approximately 2,200 feet above sea-level by the Ravenscrag formation, beneath which occur 50 to 100 feet of grey sands and silts which comprise the Eastend formation. A single well in the NW.$\frac{1}{4}$, section 15, drilled to a depth of 248 feet or to an elevation of 2,100 feet above sea-level, produced large supplies of hard water with a high iron content from the latter formation. It is probable that both the blue sand beds of the Ravenscrag and the sands of the Eastend may be productive at depths nowhere exceeding 250 feet from the surface throughout the greater part of the township. The Marine Shale underlies the Eastend at an elevation between 2,100 and 2,075 feet above sea-level. The small quantities of water derived from this formation is adjoining areas is salty and "alkaline", and as a rule unfit for use. It is improbable that the shale will be more productive in this area. Drilling should be confined to the upper formations.

Township 10, Range 27

Ground water supplies of this township are derived from three general horizons: the glacial deposits, the Ravenscrag formation, and the coarse sand bed that lies at the top of the Eastend formation.

The glacial deposits overlie the entire area with an average thickness of 25 to 50 feet. The southwest and northeast corners are covered by moraine composed of yellow and blue clay interspersed with small isolated pockets of sand and gravel. This material grades imperceptibly into till plain which covers a broad belt extending through the central part of the township. The till is composed almost entirely of yellow and blue blay with very few sand pockets. Shallow wells sunk into the moraine yield hard, clear, slightly "alkaline" water in sufficient quantities for household use and for about 25 or more head of stock. Similar types of wells dug in the till-covered area, however, are usually dry or yield only small amounts of highly mineralized water. In the till-covered areas it is advisable to sink wells through the till into the underlying bedrock.

The Ravenscrag formation underlies the entire township down to an elevation of approximately 2,200 feet above sea-level. It is in turn underlain by 25 to 40 feet of coarse grey sand, under which is found the fine grey sands and silts of the Eastend. At about 2,175 feet the Eastend grades downward into the Marine Shale.

Throughout the greater part of the township water in sufficient quantities for local stock requirements is found in the Ravenscrag at elevations between 2,300 and 2,275 above sea-level. In the northwestern quarter of the township it is found beneath a thin coal seam, and in other parts of the area it occurs in a bed of bluish grey sand. The water is as a rule quite soft, but its high iron content in many cases makes it unfit for household use.

The bed of coarse grey sand lying at the top of the Eastent formation, at an elevation between 2,220 and 2,185 feet, is productive throughout the whole southwestern half of the township. It may also extend into the northeast half, but no wells have been put down to a sufficient depth to encounter this horizon. The supply from this horizon is quite variable, although in most cases sufficient for 50 to 150 head of stock, and the water is low enough in iron and mineral salts to be used in the household. Smaller supplies of water of much poorer quality are to be found in the lower Eastend sands down to an elevation of about 2,190 feet. Wells drilled below this elevation encounter the Marine Shale, which yields a salty water with so high a content of Glauber's salt as to render it unfit for farm use. Drilling below this elevation in any part of the township is not recommended.

Part of Township 10, Range 28, East of the Lake of the Rivers

The water conditions of this area are similar to those of the township to the east. Glacial deposits cover the area and have a thickness varying from a few feet along lake of the Rivers to about 25 feet over the rest of the area. In the southern moraine-covered part of the area shallow wells encountering sand pockets in the drift can be expected to yield hard, drinkable water in quantities sufficient for local farm requirements. The remainder of the area is covered by till composed almost entirely of yellow and blue clay without extensive sand layers. Due to the general lack of water in the till it is advisable to sink wells through it into the more productive horizons in the underlying bedrock. Two such horizons are known. One is found in the blue sand of the Ravenscrag, in most cases underlying a coal seam at elevations between 2,305 and 2,270 feet above sea-level. The other is the bed of coarse grey sand that lies at the top of the Eastend formation at elevations between 2,210 and 2,185 feet. The water derived from these two horizons is as a rule soft or medium hard, and with varying amounts of iron. Coal seams in many cases impart a brownish colour and an unpleasant taste to the water, but unless the iron content is very high the water is suitable for household use. No wells have been sunk into the lower part of the Eastend formation in this area, but it is probable that it will yield small supplies of water suitable for stock. Drilling below an elevation of 2,170 feet into the Marine Shale is not recommended, as the water derived from this formation is nearly always unsuitable, both in quantity and quality, for farm use.

Township 11, Range 25

The ground water used in this township at the present time is derived entirely from the thick layer of glacial moraine that lies as a blanket of varying thickness over the entire area, and consists of yellow and blue clay interspersed with pockets of sand and gravel of limited areal extent and occurring at varying depths. The supply obtainable from wells dug to shallow depths depends upon the size of the area to dig several wells to obtain a sufficient supply for farm requirements. The water although quite "alkaline", is usually drinkable. A zone of springs occurs along the northern slope of the highland area in the vicinity of Spring valley and northeastward at an approximate elevation of 2,400 feet above sea-level. These springs yield large quantities of hard, slightly "alkaline" water.

No wells have as yet been sunk through the glacial drift into the underlying bedrock. Information obtained from wells in adjoining townships indicates that fairly large supplies of drinkable water are to be expected from the extensive beds of blue sand in the Ravenscrag, at depths not greater than 125 feet from the surface throughout the southern and central parts of the area and at depths not exceeding 50 feet in the northern sections, where the drift is thinner.

Township 11, Range 20

A mantle of moraine of unknown thickness covers both the central and northeastern lowland areas of the township and the high, crescent-shaped ridge that extends along the southern, western, and northern boundaries. Extensive beds of sand occur at shallow depths in the valley lying between the northern and western ridges in the vicinity of the town of Galilee. Fairly large supplies of soft to medium hard water are obtainable in this area at depths not exceeding 50 feet. In the northeastern lowlands the boulder clay contains very little sand and gravel, with the result that considerable difficulty is experienced in obtaining satisfactory water supplies. Shallow wells sunk into the clay yield small seepages of slightly "alkaline" water which is suitable for domestic use. Several such wells may be necessary, however, to ensure sufficient supplies for stock watering, as continuous pumping has caused many wells to go dry after short periods of use. Deeper drilling into the bedrock might provide more constant supplies, but in the absence of any tests, no definite information regarding the quality or quantity of water to be expected can be given. If water is not found within 150 to 200 feet from the surface in the lower part of the valley, drilling should be discontinued as little or no water can be expected from the dark grey shales occurring below this depth.

Many springs occur along the eastern and southern slopes of the ridges. The consistency with which those in sections 16, 21, 28, and 26 have been found to lie at elevations of approximately 2,400 feet above sea-level would suggest that an impervious layer in the Ravenscrag bedrock formation lying beneath a comparatively thin layer of drift has tended to concentrate at a definite horizon waters percolating from the higher land. Many of these springs flow continuously, and if properly cleaned out and cribbed would form satisfactory sources of water for residents in their vicinity. Isolated springs have been found at higher elevations in the hills. It is probable that shallow wells in section 30 supplying the town of Galilee derive their water from the uplands, and that careful prospecting might develop flowing wells at some points at or near the base of the hill-slopes.

No information in regard to ground water conditions in the bedrock underlying the drift of the uplands was obtainable. Wells sunk on the uplands to the elevation of the spring horizon might produce water, but no such tests have been made in this township.

Township 11, Range 27

A thin mantle of glacial drift, composed largely of yellow and blue clay with occasional pockets of sand and gravel, covers the western half of this township. In the eastern parts and particularly on the higher slopes along the eastern border, the drift is considerably thicker and contains a greater amount of sand and gravel. Shallow wells located on the eastern highlands generally yield medium hard water in sufficient quantities for local farm requirements, whereas similar wells in the lower, central part of the township, where the drift is predominantly boulder clay, yield much smaller seepages and frequently become dry during periods of drought. Ground water seeping downward through the porous drift of the highlands becomes concentrated on the top of an impervious bed and appears as a line of springs on the slopes of hills along the eastern border at an approximate elevation of 2,450 feet above sea-level, and springs have been noted in sections 2, 11, 14, 23, and 35. Most of these springs yield fairly soft, drinkable water in sufficient quantities for 30 to 75 head of stock, and are the best source of water in the central part of the township. The glacial drift is underlain by the Ravenscrag formation throughout the township except in the southwest corner where the Eastend underlies the drift. Several springs yielding large supplies of soft, drinkable water occur at a number of localities where the Ravenscrag bedrock comes to the surface, in the southwestern quarter of the township. Although no wells have been sunk into the bedrock in this township, it is quite probable that fairly large supplies of water are to be obtained at depths not exceeding 40 feet throughout the western half of the township. Due to an increased thickness of the drift over the eastern half of the area, it may be necessary to sink wells to depths of 100 to 150 feet on the lower slopes of the eastern highlands, and possibly to much greater depths on the top of the ridge. Water from the bedrock is usually quite soft, but contains varying amounts of mineral salts and iron which occasionally render it unfit for household use.

Township 12, Range 25

The northern half of the township is a fairly level lowland area with an elevation of somewhat less than 2,200 feet above sea-level. The ground surface rises uniformly to the west and south to form the high morainic ridges of the adjoining townships. A mantle of glacial drift covers the entire area. Fairly extensive beds of gravel are encountered at depths of 15 to 25 feet from the surface in the northeast corner of the township. To the west and south the gravels are replaced by gradually thinning layers of sand. Shallow wells in the northeastern part of the area give medium hard, drinkable water in sufficient quantities for 30 or more head of stock. South and west the yield becomes materially less. Most of the water is quite "alkaline" and in many places it becomes necessary to dig several wells in order to obtain sufficient supplies for farm requirements. The drift of the southeastern, upland part of the township is underlain by the Eastend sands down to an elevation of approximately 2,175 feet above sea-level, and the Eastend may be capped by a thin layer of Ravenscrag sands in the extreme southeast corner. Although no wells in this area are definitely known to have been sunk through the drift into the Eastend, information from wells sunk into this horizon in townships to the east indicates that there is a good possibility of obtaining at least fair supplies of drinkable water from this horizon. The Eastend grades downward into Marine Shale at an approximate elevation of 2,150 feet. In the northwestern half of the township the Marine Shale immediately underlies the glacial drift. It is exposed at the surface in section 29, and is encountered at increasing depths in an easterly direction to a maximum depth of about 50 feet from the surface in the northeast corner of the township. Small supplies of water are to be found in the shale, but it is so highly "alkaline" or salty as to be unfit for household use, and in most cases unfit for stock. Deeper drilling into the shale in any part of the township probably will not yield suitable supplies of water.

Township 12, Range 26

A northerly trending morainic ridge, rising to a maximum elevation of 2,800 feet above sea-level, occupies the greater part of this township. The sides of the ridge slope uniformly down to an elevation of about 2,300 feet in the northwest corner and along the eastern edge of the township. The entire area is covered by a layer of glacial moraine which is probably of much greater thickness on the highlands than on the lower slopes. The drift is composed largely of yellow boulder clay with small, irregular pockets of sand and gravel interspersed through it. All ground water used in this area at the present time is derived from dug wells not more than 25 feet deep, located on the lower slopes of the western and eastern parts of the area. These wells give hard, "alkaline" water which although generally drinkable is not usually in sufficient quantities for more than few head of stock. The yield becomes less in winter and is also materially affected by drought conditions. Practically all the productive wells obtain their supplies from sand pockets. Wells encountering only blue clay are either dry or give very small seepages of highly "alkaline" water. Several springs giving fair supplies of "alkaline" water occur at an approximate elevation of 2,050 feet above sea-level along the southern slope of the ridge. This spring horizon marks the outcrop of an impervious bed upon which the water seeping through the more porous material of the upper part of the ridge is concentrated. As no wells in the area are definitely known to have penetrated through the drift into the underlying Ravenscrag formation, no information in regard to the water conditions of the bedrock was obtainable. One well bored to a depth of 61 feet in the NW.$\frac{1}{4}$, sec.31, gave only a small supply and wells 75 feet deep in section

30 were dry. The coarse sand bed lying at the top of the Eastend formation will be encountered at an approximate elevation of 2,200 above sea-level in the township. This horizon is productive in areas adjoining this township on the west, but whether it is productive in this area has not been ascertained.

Township 12, Range 27

Glacial drift composed of boulder clay and many irregular beds and pockets of sand and gravel overlies the western third of the township to an approximate depth of 40 feet. Many wells sunk to depths of 20 to 40 feet yield sufficient supplies of hard, slightly "alkaline" water for domestic needs and for watering 20 to 30 head of stock, from the sand and gravel pockets in the drift or from a sandy bed that in many places occurs at the contact between the drift and the bedrock. The drift becomes thicker in an easterly direction to form the broad-topped, morainic ridge along the eastern boundary of the township. The sandy beds of the western part of the area do not appear to extend over the rest of the township, which is covered by boulder clay with only occasional sand pockets. Many wells sunk in the clay are dry and others yield only sufficient seepages for a few head of stock. The water is in most cases too "alkaline" for domestic use. A few wells in the northeast corner of the township yield good supplies of drinkable water from isolated sand pockets at depths not exceeding 25 feet. A number of springs form a fairly continuous horizon at an approximate elevation of 2,375 feet along the western slope of the eastern morainic ridge. These springs yield fairly large quantities of good water. The glacial deposits are underlain by the Ravenscrag bedrock formation throughout the entire township. This formation is known to extend downward to an approximate elevation of 2,200 feet. Many sandy beds exist both in the Ravenscrag and immediately underlying it. It is quite probable that wells sunk to depths not exceeding 140 feet throughout the western lowland area will yield adequate supplies of water for local stock requirements. The water from the Ravenscrag in many cases contains considerable amounts of iron and is not always suitable for household use. Due to the greater thickness of the glacial drift over the eastern half of the township it may be necessary to drill to depths of 300 to 350 feet before an adequate supply is obtained.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF TERRELL, NO. 101, SASKATCHEWAN

West of 2nd mer. — Township / Range	10 / 25	10 / 26	10 / 27	10 / 28	11 / 25	11 / 26	11 / 27	12 / 25	12 / 26	12 / 27	Total No. in Municipality
Total No. of Wells in Township	23	25	53	14	26	68	39	71	26	43	388
No. of wells in bedrock	3	1	12	10	0	0	5	2	0	1	34
No. of wells in glacial drift	20	23	41	4	26	68	34	69	26	41	352
No. of wells in alluvium	0	1	0	0	0	0	0	0	0	1	2
Permanency of Water supply											
No. with permanent supply	17	19	29	12	24	56	28	65	19	26	295
No. with intermittent supply	3	0	2	2	1	4	2	3	2	1	20
No. dry holes	3	6	22	0	1	8	9	3	5	16	73
Types of Wells											
No. of flowing artesian wells	1	2	0	1	2	5	4	0	1	0	16
No. of non-flowing artesian wells	8	7	15	7	10	5	8	25	8	9	102
No. of non-artesian wells	11	10	16	6	13	50	18	43	12	18	197
Quality of Water											
No. with hard water	15	17	29	10	21	55	21	64	20	25	277
Nol with soft water	5	2	2	4	4	5	9	4	1	2	38
No. with salty water	0	0	0	0	0	0	0	0	0	0	
No. with "alkaline" water	12	5	6	5	12	9	2	21	4	7	83
Depths of Wells											
No. from 0 to 50 feet deep	20	19	39	7	26	68	28	68	21	35	304
No. from 51 to 100 feet deep	1	5	9	5	0	0	8	2	5	6	41
No. from 101 to 150 feet deep	2	1	3	2	0	0	2	0	0	1	11
No. from 151 to 200 feet deep	0	0	2	0	0	0	1	1	0	0	4
No. from 201 to 500 feet deep	0	1	0	0	0	0	0	0	0	0	1
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0
How the Water is Used											
No. usable for domestic purposes	15	17	25	11	18	55	26	62	20	24	273
No. not usable for domestic purposes	5	2	6	3	7	5	4	6	1	3	42
No. usable for stock	19	19	31	14	24	60	30	68	21	27	313
No. not usable for stock	1	0	0	0	1	0	0	0	0	0	2
Sufficiency of Water Supply											
No. sufficient for domestic needs	19	19	31	14	25	58	30	68	21	17	312
No. insufficient for domestic needs	1	0	0	0	0	2	0	0	0	0	3
No. sufficient for stock needs	16	13	25	7	12	43	25	48	13	24	226
No. insufficient for stock needs	4	6	6	7	13	17	5	20	8	3	89

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 ban 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 Terrell, No. 101, Saskatchewan

No.	LOCATION Qtr.	Sec.	Tp.	Rge.	Mer.	Depth of Well, Ft.	Total dis'vd solids	HARDNESS Total	Perm.	Temp.	CONSTITUENTS AS ANALYSED Cl.	Alkalinity	CaO	MgO	SO_4	Na_2O	CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	Source of Water
1	NW.	15	10	26	2	248	2,020	600	450	150	43	815	150	137	799	682	2,026	269		286		218	1,182	71	x 2
2	SW.	1	11	26	2	Spring	880	280	160	120	46	455	100	54	266	300	913	179		113		151	394	76	x 1
3	NW.	7	12	25	2	30	5,297											(2)			(3)	(4)	(1)	(5)	x 1
4	NW.	36	12	25	2	11	1,120	700	700	nil	24	355	170	94	500	231	1,087	304		43	218		482	40	x 1

Water samples indicated thus, x 1, are from glacial drift or other unconsolidated deposits.
Water samples indicated thus, x 2, are from bedrock, Eastend formation.
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. 3, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

As only three samples of ground water were collected from this municipality and analysed the following discussion of the character of the water derived from the unconsolidated deposits and the bedrock formations is based on generalizations made from analyses of water collected in several adjoining municipalities in which the Recent and glacial deposits and bedrock formations show a close similarity.

As marked variations in the character of the glacial deposits occur within very small areas, correspondingly large variations are frequently found to occur in the quality of waters from wells sunk to similar depths, and only 50 feet apart. It must not be inferred, therefore, that if undesirable water is struck in one well, poor water conditions must necessarily exist over a large area in the drift-covered districts. Ground water derived from extensive sand and gravel deposits in the drift is usually very hard, but the sulphate and common salt content as a rule is low, and the water if not contaminated by surface water containing sewage material is considered quite suitable for household use. Small pockets of sand or gravel in the boulder clay and the boulder clay itself yield a water that is exceedingly hard, having a total hardness in some instances of nearly 2,000 parts per million. The sulphate salt content is also very high. The third analysis given in the accompanying table is of water from a small gravel pocket in boulder clay, and has a total solid content of 5,297 parts per million, of which the greater amount is Glauber's salt (Na_2SO_4). This water is unfit for human or stock consumption due to its laxative effect. Other analyses of waters from boulder clay show an excess of 2,000 parts per million of combined sulphates of sodium and magnesium. Water so highly mineralized should not be used if better supplies are available either in the underlying bedrock or within reasonable hauling distance.

The springs that occur on the slopes of the high ridge form the main source of water for large districts in the municipality. The water is fairly hard, but contains only relatively small amounts of mineral salts, and, as compared with supplies derived from wells sunk into the sand and gravel deposits in the glacial drift, is of excellent quality for household use. The second analysis given in the table is believed to be typical of waters derived from this extensive spring horizon.

Water from the Bedrock

Water from the Ravenscrag formation shows considerable variation in quality, depending both upon the depth of the horizon from the surface and the character of the source beds; the aquifer is frequently a coal seam. The water is of two general types; one, hard, and containing large amounts of Glauber's salt and the other soft and soda-bearing. The Glauber's salt content averages 450 parts per million, but exceeds 1,000 parts per million in several wells. Soda (Na_2CO_3) in the softer water ranges from negligible amounts to over 100 parts per million, and common salt rarely exceeds 60 parts per million. In general, the water from the greater depths in the formation is soft, whereas the water from shallower wells is moderately to excessively hard. There are, however, several exceptions to this generalization, as very hard water has been obtained at depths of 250 feet in the Ravenscrag. Water from this formation is as a rule drinkable, but it is less desirable for household use that supplies from springs or gravels.

The Eastend formation yields a water that is very soft, but contains on an average 500 to 600 parts per million of soda, giving the water a flat taste. The amounts of Glauber's salt present increase with depth in the formation, and occasionally exceed 3,000 parts per million. Supplies from the lower part of this formation are not usually suitable for human consumption, but water from shallow wells sunk into the Eastend, particularly in the northeastern part of the municipality, are used in the households. The first analysis given in the table is of water from the upper coarse sand bed of the Eastend, and this water resembles supplies from the lower part of the Ravenscrag.

Less variation exists in the quality of water from the Marine Shale series than in supplies from the unconsolidated deposits and either of the overlying bedrock formations. This is due to the fact that the shale itself is consistently uniform wherever encountered in the municipality, whereas the overlying deposits show marked variation in character over small areas. Water from the shale has a very high mineral salt content. Analyses of eight samples of water taken from the shale at widely separated localities all show an excess of 2,000 parts per million of total solids, and in one instance 4,120 parts per million. The combined sulphate salts of sodium and magnesium (Glauber's salt and Epsom salts) vary in quantity between 1,000 and 3,100 parts per million. The common salt content varies from 500 to 1,400 parts per million, giving the water a distinctly salty taste. A much greater variation is noted in the hardness of waters from the shale. Several samples are slightly to moderately hard, i. e., the total hardness is less than 200 parts per million, whereas in other instances the water is excessively hard, having a total hardness of 1,000 to 3,000 parts per million.

Ground water from the Marine Shale has a strong laxative effect and is quite unsuitable for domestic use. It has a tendency to produce scour in stock.

WELL RECORDS—Rural Municipality of TERRELL NO.101, 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	HEIGHT TO WHICH WATER WILL RISE Elev.	PRINCIPAL WATER-BEARING BED Depth	PRINCIPAL WATER-BEARING BED Elev.	PRINCIPAL WATER-BEARING BED Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SE.	1	10	25	2	Bored	40	2,420	- 32	2,388	36	2,384	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 75 head stock; dry hole 111 feet deep in blue clay.
2	NE.	1	"	"	"	Bored	115	2,400					Ravenscrag blue clay ?				Dry hole. Poor water conditions in bedrock in this district.
3	SW.	1	"	"	"	Dug	38	2,450	- 3	2,447	38	2,412	Glacial sand	Medium hard, clear		D, S	Sufficient for 40 head stock.
4	NW.	9	"	"	"	Dug	10	2,350	- 7	2,343	10	2,340	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock; spring fed.
5	NW.	12	"	"	"	Bored	32	2,350	- 16	2,334	32	2,318	Glacial sand	Hard, clear "alkaline"		S	Sufficient for 30 head stock; drinking water hauled.
6	SW.	13	"	"	"	Dug	25	2,330	- 13	2,317	25	2,305	Glacial sand	Hard, clear		D, S	Sufficient for 22 head stock.
7	SW	14	"	"	"	Dug	25	2,340	- 20	2,320	25	2,315	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 32 head stock.
8	SE.	16	"	"	"	Dug	16	2,360	- 11	2,349	16	2,344	Glacial sand	Medium hard, clear		D, S	Sufficient for 20 head stock; similar well gives soft water.
9	NW.	18	"	"	"	Dug	16	2,340	- 8	2,332	16	2,324	Stream sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 50 head stock; spring also used.
10	NE.	21	"	"	"	Dug	40	2,350	- 0	2,350	40	2,310	Glacial sand and gravel	Hard, clear, "alkaline"		S	Sufficient for 50 head stock.
11	NW.	23	"	"	"	Dug	30	2,360					Glacial clay				Dry hole. Several other attempts gave small seepages of "alkaline" water.
12	NE.	23	"	"	"	Dug	10	2,340	- 8	2,332	10	2,330	Glacial clay	Hard, clear, "alkaline"	42	D	Sufficient for household needs only.
13	SE.	25	"	"	"	Dug	8	2,330	- 4	2,326	8	2,322	Glacial sand	Soft, clear		D, S	Sufficient for 10 head stock; located near slough.
14	NW.	25	"	"	"	Dug	32	2,340	- 31	2,309	32	2,308	Glacial sand and clay	Hard, clear, "alkaline"			Used only for chickens; poor supply.
15	SW.	26	"	"	"	Dug	20	2,340	- 17	2,323	20	2,320	Glacial sand	Medium hard, clear		D, S	Small supply; use dugout for stock.
16	SW	27	"	"	"	Bored	80	2,345	- 50	2,295	80	2,265	Ravenscrag sandy clay	Hard, iron, "alkaline"		S	Sufficient for 5 head stock; unfit for humans.
17	NW.	28	"	"	"	Spring		2,400	0	2,400			Ravenscrag sand	Soft, clear, iron		D, S	Sufficient for 30 head stock.
18	SW.	30	"	"	"	Spring		2,420	0	2,420			Glacial sand	Medium hard, clear		D, S	Sufficient for 20 head stock.
19	SE.	33	"	"	"	Spring		2,400	0	2,400			Glacial sand, gravel	Soft, clear		D, S	Sufficient for 15 head stock.
20	NW.	34	"	"	"	Spring		2,400	0	2,440			Glacial sand	Soft, clear		D, S	Sufficient for 45 head stock.
21	SE.	35	"	"	"	Dug	16	2,400	- 14	2,386	16	2,384	Glacial sand	Hard, clear, "alkaline"	46	D, S	Sufficient for 29 head stock.
22	SW.	36	"	"	"	Dug	11	2,340	- 5	2,335	11	2,329	Glacial sandy clay			D, S	Insufficient for local needs.
1	SW.	1	10	26	2	Dug	14	2,330	- 13	2,317	14	2,316	Glacial silt	Hard, slightly "alkaline"		D, S	Insufficient for local needs.
2	SE.	3	"	"	"	Dug	18	2,300	- 10	2,290	14	2,286	Glacial sand	Hard, clear	42	S	Insufficient for local needs.
3	NW.	3	"	"	"	Dug	17	2,290	- 8	2,282	8	2,282	Glacial gravel	Hard, clear	43	S	Sufficient for 14 head stock; drinking water hauled.
4	NW.	4	"	"	"	Dug	12	2,320	- 10	2,310	12	2,308	Stream gravel	Soft, clear	42	D, S	Sufficient for 8 head stock; spring on same ¼ section.
5	SW.	5	"	"	"	Dug	4	2,215	0	2,215	2	2,213	Stream gravel	Hard, clear, "alkaline"	43	D, S	Sufficient for 200 head stock; in winter.

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 TERRELL NO.101, 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
6	SE.	6	10	26	2	Bored	36	2,245	- 14	2,231	36	2,209	Valley sand	Hard,clear, "alkaline"	42	S	Sufficient for 20 head stock.
7	NE.	10	"	"	"	Dug	12	2,330	- 8	2,322	8	2,322	Glacial clay	Hard,clear	42	D, S	Sufficient for local needs.
8	SE.	13	"	"	"	Bored	40	2,370	- 10	2,360	40	2,330	Glacial gravel	Hard,clear	42	D, S	Sufficient for 20 head stock; two dry holes in clay 110 and 80 feet deep.
9	NE.	13	"	"	"	Dug	20	2,360	- 8	2,352	10	2,350	Glacial sand and clay	Hard,clear		D, S	Sufficient for local needs.
10	NW.	15	"	"	"	Drilled	248	2,350	- 33	2,317	248	2,102	Eastend formation	Hard,iron	41	D, S	Very large supply. #
11	NW.	16	"	"	"	Bored	35	2,375	- 33	2,342	34	2,341	Glacial clay	Hard,cloudy		D	Small supply.
12	SE.	17	"	"	"	Dug	10	2,325	- 2	2,323	8	2,317	Glacial gravel	Soft,clear	42	D, S	Sufficient for 8 head stock.
13	NE.	21	"	"	"	Dug	38	2,460	- 35	2,425	35	2,425	Glacial gravel	Hard,clear	42	D, S	Insufficient for local needs; three dry holes 40 to 90 feet deep.
14	NW.	23	"	"	"	Dug	6	2,420	0	2,420	6	2,414	Glacial gravel	Hard,clear		D, S	Sufficient for at least 200 head stock.
15	SW.	24	"	"	"	Dug	14	2,420	- 10	2,410	14	2,406	Stream sand	Hard,clear	41	D, S	Sufficient for 10 head stock; also an 80 feet dry hole.
16	NW.	36	"	"	"	Dug	18	2,650	- 17	2,633	17	2,633	Glacial sand	Hard,clear	42	D	Sufficient for household needs only.
17	SW.	36	"	"	"	Spring		2,560	0	2,560			Stream gravel	Hard,clear	48	D, S	Large supply; similar spring in ravine in SE.¼ section.
18	SE.	36	"	"	"	Dug	12	2,540	- 7	2,533	7	2,533	Glacial sand	Soft,clear		D, S	Caved in.
1	SW.	3	10	27	2	Dug	16	2,340	- 10	2,330	16	2,324	Glacial sand	Hard,clear	41	D, S	Sufficient for 30 head stock; local water conditions good.
2	NW.	4	"	"	"	Dug	30	2,310	- 15	2,295	30	2,280	Glacial sand	Hard,clear, "alkaline"	41	S	Sufficient for 15 head stock; unfit for humans drinking water from 30-foot well on NE.¼.
3	NW.	5	"	"	"	Bored	125	2,310	- 75	2,235	125	2,185	Ravenscrag sand	Hard,clear, "alkaline"	40	S	Sufficient for 20 head stock; unfit for humans 35-foot well, water high in iron unfit for use.
4	NE.	6	"	"	"	Bored	44	2,295	- 20	2,275	44	2,251	Glacial sand	Hard,clear	41	D, S	Very large supply.
5	NE.	7	"	"	"	Bored	118	2,330	- 80	2,250	118	2,212	Ravenscrag sand	Hard,clear	41	D, S	Sufficient for local needs; also 42-foot soft water well.
6	Between 8 and 9		"	"	"	Dug	16	2,310	- 11	2,299	11	2,299	Glacial clay	Hard,clear	42	D, S	Sufficient for 50 head stock; seepage from pond.
7	SE.	9	"	"	"	Dug	26	2,350	- 20	2,330	26	2,324	Glacial gravel	Hard,clear		D, S	Sufficient at present; many wells sunk and all have gone dry in about 6 months.
8	SW.	12	"	"	"	Dug	80	2,280	- 20	2,260	75	2,205	Ravenscrag sand	Hard,clear, iron		D, S	Sufficient for 150 head stock.
9	NE.	12	"	"	"	Bored	80	2,250	- 40	2,210	65	2,185	Ravenscrag sand	Hard,clear	43	D, S	Insufficient for local needs.
10	SE.	13	"	"	"	Dug	24	2,300	- 22	2,278	24	2,276	Glacial sand ?	Soft,clear	41	D, S	Small supply.
11	SW.	14	"	"	"	Bored	70	2,350	- 25	2,325	70	2,280	Ravenscrag sand	Hard,clear iron		D, S	Sufficient for 40 head stock.
12	SE.	17	"	"	"	Bored	125	2,355	- 75	2,280	125	2,230	Ravenscrag sand	Hard,clear	42	D, S	Small supply; also 175-foot well, water too high in iron for use.
13	SW.	17	"	"	"	Bored	100	2,320	- 80	2,240	100	2,220	Ravenscrag sand	Hard,iron, colour	40	D, S	Small supply; sufficient for 6 head stock; five dry holes 20 to 80 feet deep.
14	SE.	19	"	"	"	Bored	58	2,320	- 28	2,292	30	2,290	Glacial gravel	Hard,iron, "alkaline"	41		Sufficient for 20 head stock; several 20-foot dry holes.

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 TERRELL NO.101, 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	HEIGHT TO WHICH WATER WILL RISE: Elev.	PRINCIPAL WATER-BEARING BED: Depth	PRINCIPAL WATER-BEARING BED: Elev.	PRINCIPAL WATER-BEARING BED: Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
15	SW.	20	10	27	2	Dug	20	2,320	- 15	2,305	20	2,300	Glacial sand	Soft,clear	44	D, S	Large supply.
16	NW.	21	"	"	"	Bored	154	2,350	- 64	2,286	154	2,196	Ravenscrag or Eastend sand	Hard,"alkaline"		S	Sufficient for local needs.
17	SW.	22	"	"	"	Bored	100	2,365					Glacial clay			N	Dry hole; several dry holes 20 feet deep.
18	NE.	25	"	"	"	Dug	10	2,390	- 8	2,382	10	2,380	Glacial gravel	Hard,clear, "alkaline"	43	D, S	Sufficient for 25 head stock.
19	SW.	27	"	"	"	Bored	20	2,310	- 20	2,290	20	2,290	Glacial clay	Hard,clear	42	D, S	Sufficient for 20 head stock; 6 to 20-foot dry holes.
20	NW.	28	"	"	"	Bored	90	2,325	- 50	2,275	90	2,235	Ravenscrag sand	Hard,clear iron	42	S	Sufficient for 40 head stock; unfit for man.
21	SW.	29	"	"	"	Bored	42	2,300	- 17	2,283	42	2,258	Ravenscrag coal	Hard,clear, iron	42	S	Sufficient for 10 head stock; unfit for man. Must wells in area striking coal yield good water.
22	SE.	30	"	"	"	Dug	26	2,310	- 24	2,286	25	2,285	Glacial gravel	Hard,clear	42	D, S	Sufficient for local needs; water from bedrock unfit for use.
23	SW.	30	"	"	"	Dug	15	2,290	- 9	2,281	15	2,275	Glacial sand	Hard,clear	42	D, S	Sufficient for 10 head stock.
24	SW.	32	"	"	"	Dug	65	2,289	- 53	2,236	53	2,236	Ravenscrag sand	Hard,clear	43	D, S	Sufficient for 20 head stock.
25	SE.	35	"	"	"	Bored	35	2,376			35	2,341	Glacial clay and sand	Hard,clear, "alkaline"		D	Sufficient for household needs only.
26	NW.	36	"	"	"	Dug	65	2,300	- 53	2,247	53	2,247	Ravenscrag sand	Hard,clear	42	D, S	Sufficient for 20 head stock; 35-foot well also used.
27	NE.	36	"	"	"	Bored	20	2,570	- 17	2,553	20	2,550	Glacial clay	Hard,clear, "alkaline"	41	D, S	Sufficient for household needs only.
1	SE.	1	10	28	2	Bored	68	2,270	- 53	2,217	67	2,203	Eastend sand	Hard,clear	42	D, S	Small supply.
2	SW.	2	"	"	"	Dug	10	2,220	- 8	2,212	10	2,210	Ravenscrag sand	Soft,clear	43	D, S	Sufficient for 16 head stock.
3	NW.	2	"	"	"	Bored	100	2,260	- 92	2,168	100	2,160	Ravenscrag sand	Hard,"alkaline" black sediment	43	S	Sufficient for 6 head stock; 14-foot well at lake edge for household use.
4	NE.	12	"	"	"	Bored	122	2,315	- 62	2,253	116	2,199	Ravenscrag sand	Hard,iron, "alkaline"	43	S	Sufficient or 50 head stock; haul drinking water.
5	SE.	12	"	"	"	Dug	35	2,290	- 32	2,258	22	2,268	Glacial clay	Hard,clear, "alkaline"	43	D, S	Sufficient for 10 head stock.
6	SE.	13	"	"	"	Bored	52	2,305	- 42	2,263	48	2,257	Glacial gravel	Hard,clear, "alkaline"	43	S	Sufficient for 65 head stock.
7	SW.	13	"	"	"	Bored	105	2,320	- 60	2,260	105	2,215	Ravenscrag clay	Medium hard, clear	42	D, S	Sufficient for 10 head stock.
8	SW.	14	"	"	"	Bored	60	2,325	- 51	2,274	60	2,265	Ravenscrag sand	Soft,clear	43	D, S	Sufficient for 8 head stock.
9	NE.	15	"	"	"	Bored	72	2,320	- 60	2,260	72	2,248	Ravenscrag sand	Hard,clear	43	D, S	Sufficient for 27 head stock.
10	SW.	23	"	"	"	Bored	15	2,320	- 10	2,310	15	2,305	Ravenscrag clay	Medium hard, clear,iron	42	D, S	Large supply.
11	SE.	23	"	"	"	Bored	28	2,310	- 16	2,294	28	2,282	Ravenscrag sand	Soft,clear	43	D, S	Sufficient for 16 head stock.
12	SE.	24	"	"	"	Bored	18	2,290	- 15	2,275	18	2,272	Glacial sand	Hard,clear, "alkaline"		D, S	Very small supply.
13	NW.	36	"	"	"	Dug	5	2,215	0	2,215	5	2,210	Ravenscrag sand	Soft,clear	43	D, S	Sufficient for 35 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of TERRELL NO.101, 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.	1	11	25	2	Dug	5	2,425	+ 5	2,430	5	2,420	Glacial gravel	Hard, iron, clear		D, S	Sufficient for 100 head stock.
2	SE.	1	"	"	"	Dug	6	2,400	0	2,400	6	2,394	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
3	NW.	9	"	"	"	Dug	24	2,525	- 22	2,503	24	2,501	Glacial gravel	Hard, clear	43	D, S	Supply decreased yearly; now very small.
4	SW.	14	"	"	"	Spring		2,750	- 0	2,750			Glacial gravel	Hard, iron, "alkaline"	49	D, S	Sufficient for 40 head stock; spring on section 6 also used.
5	NE.	17	"	"	"	Dug	17	2,550	- 12	2,538	17	2,533	Glacial sandy clay	Medium hard, clear	44	D, S	Sufficient for 30 head stock.
6	NW.	18	"	"	"	Dug	9	2,440	- 7	2,433	9	2,431	Glacial gravel	Medium hard, clear	42	D, S	Sufficient for 15 head stock.
7	NW.	19	"	"	"	Dug	7	2,390	- 3	2,387	7	2,383	Glacial sand	Hard, "alkaline"		S	Sufficient for local stock needs; unfit for man.
8	NW.	20	"	"	"	Dug	16	2,440	- 8	2,432	16	2,424	Glacial gravel	Hard, "alkaline"	42	D, S	Sufficient for 20 head stock.
9	NE.	20	"	"	"	Dug	16	2,470	- 10	2,460	16	2,454	Glacial sand	Hard, clear, "alkaline"	47	D, S	Sufficient for 11 head stock; unfit for man.
10	NE.	24	"	"	"	Dug	10	2,600	- 7	2,593	10	2,590	Glacial clay	Hard, clear, "alkaline"		S	Sufficient for a few head stock; unfit for man. Spring also used.
11	SW.	25	"	"	"	Dug	16	2,580	- 8	2,572	11	2,569	Glacial sand	Hard, "alkaline" clear	43	D, S	Sufficient for 66 head stock.
12	NE.	26	"	"	"	Dug	20	2,540	- 14	2,526	20	2,520	Glacial sand	Hard, "alkaline"	44	D	Sufficient for household needs only; two similar wells for stock.
13	NW.	28	"	"	"	Dug	16	2,400	- 8	2,392	16	2,384	Glacial sand	Medium hard, clear	41	D, S	Sufficient for 10 head stock.
14	NE.	29	"	"	"	Dug	10	2,400	- 5	2,395	10	2,390	Glacial clay	Soft, clear	45	D, S	Sufficient for local needs.
15	NE.	30	"	"	"	Dug	18	2,330	- 16	2,314	18	2,312	Glacial clay	Hard, slightly "alkaline"		D, S	Poor supply.
16	NE.	30	"	"	"	Dug	40	2,325	- 36	2,289	40	2,285	Glacial clay	Hard, bitter iron		N	Town well not used because of iron.
17	SW.	30	"	"	"	Dug	17	2,375			17	2,358	Glacial gravel	Hard, clear		N	Caved in.
18	SE.	31	"	"	"	Dug	20	2,350					Glacial clay				Dry hole; small seepage when dug.
19	NW.	31	"	"	"	Dug	9	2,250	- 5	2,245	9	2,241	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
20	SW.	32	"	"	"	Bored	32	2,340	- 15	2,325	32	2,308	Glacial clay	Hard, clear, "alkaline"	41	D	Sufficient for household needs only.
21	SW.	34	"	"	"	Dug	40	2,400	- 37	2,363	40	2,360	Glacial sand	Hard, clear, "alkaline"	41	D, S	Sufficient for 8 head stock.
22	NW.	35	"	"	"	Dug	12	2,400	- 6	2,394	12	2,388	Glacial clay	Soft, clear, "alkaline"	42	D	Sufficient for household needs only. Spring-fed dam on same quarter.
23	NE.	35	"	"	"	Dug	20	2,400	- 17	2,383	20	2,380	Glacial clay	Hard, slightly "alkaline"	47	D	Sufficient for household needs only; use spring for stock.
24	NE.	36	"	"	"	Dug	16	2,450			16	2,434	Glacial clay ?	Hard, clear		D	Sufficient for household needs only.
1	SW.	1	11	26	2	Spring		2,560	0	2,560			Glacial gravel	Hard, iron	45	D, S	Large supply; similar spring nearby. #
2	SE.	4	"	"	"	Dug	24	2,537	- 22	2,515	22	2,515	Glacial clay	Hard, clear	41	D	Sufficient for household needs only.
3	SW.	6	"	"	"	Dug	12	2,400	- 6	2,394	12	2,388	Glacial sand	Soft, "alkaline"	44	D, S	Large supply.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of TERRELL NO.101, 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
4	SW.	10	11	26	2	Dug	16	2,440	- 14	2,426	16	2,424	Glacial clay	Hard,"alkaline"	45	D	Very small supply; 20-foot well gives small supply for stock.
5	NW.	11	"	"	"	Dug	18	2,430	- 16	2,414	16	2,414	Glacial sand	Soft,clear	42	D	Very small supply.
6	SE.	11	"	"	"	Dug	14	2,400	- 11	2,389	12	2,388	Glacial sand	Soft,clear	42	D, S	Sufficient for local needs; dugout for stock.
7	SE.	12	"	"	"	Dug	17	2,550	- 9	2,541	9	2,541	Glacial clay	Hard,clear	42	D, S	Small supply; insufficient for local needs.
8	SE.	13	"	"	"	Dug	27	2,500	- 22	2,478	22	2,478	Glacial clay	Hard,clear	42	D	Sufficient for household needs only; four dry holes 20 feet deep.
9	SW.	13	"	"	"	Dug	17	2,420	- 1	2,419	1	2,419	Glacial clay	Hard,clear	42	D	Insufficient for local needs; use spring on SW.¼. Section 1.
10	NE.	14	"	"	"	Dug	11	2,420	- 7	2,413	7	2,413	Glacial sand	Hard,clear, "alkaline"	42	D, S	Sufficient for local needs.
11	SE.	16	"	"	"	Dug	6	2,430	- 5	2,425	6	2,424	Glacial gravel	Hard,clear, "alkaline"	56	D, S	Large supply; seepage from creek.
12	SW.	16	"	"	"	Dug	20	2,525					Glacial clay			N	Dry hole.
13	SE.	17	"	"	"	Dug	20	2,530	- 15	2,515	15	2,515	Glacial clay	Hard,stagnant odour			Very small supply; spring on SW.¼.
14	SW.	19	"	"	"	Dug	25	2,525	- 20	2,505	23	2,502	Glacial clay	Hard,clear	40	D, S	Sufficient for local needs.
15	SE.	20	"	"	"	Dug	14	2,481	- 12	2,469	12	2,469	Glacial clay	Hard,clear "alkaline"	42	D, S	Sufficient for household needs only.
16	SW.	20	"	"	"	Dug	25	2,530	- 23	2,507	23	2,507	Glacial clay	Hard,clear	43	D	Sufficient for household needs; several 20-foot dry holes.
17	NW.	21	"	"	"	Dug	20	2,498					Glacial clay			N	Dry hole.
18	SE.	21	"	"	"	Dug	16	2,389	- 14	2,375	14	2,375	Glacial clay	Hard,clear	41	D	Small supply. Good spring nearby.
19	NE.	24	"	"	"	Dug	15	2,379	- 8	2,371	8	2,371	Glacial clay	Hard,clear	42	S	Very small supply.
20	SE.	25	"	"	"	Dug	32	2,380	- 30	2,350	32	2,348	Glacial gravel	Hard,clear bitter	42	S	Very small supply.
21	NW.	26	"	"	"	Dug	20	2,370	- 17	2,353	17	2,353	Glacial clay	Hard,clear "alkaline"	42	D	Sufficient for household needs only.
22	SW.	28	"	"	"	Spring	3	2,415	0	2,415	3	2,412	Glacial gravel	Hard,"alkaline" clear	57	D, S	Large supply; thirty similar springs nearby.
23	NW.	28	"	"	"	Spring	3	2,500	0	2,500	3	2,497	Glacial gravel	Hard,clear	50	D, S	Large supply.
24	SW.	30	"	"	"	Dug	14	2,490	- 10	2,480	14	2,476	Glacial gravel	Soft,clear	43	D, S	Sufficient for local needs; located in valley; good spring nearby; supplies town of Galilee.
25	NW.	31	"	"	"	Dug	12	2,485			12	2,473	Glacial sand	Soft,clear		N	Caved in.
26	NW.	32	"	"	"	Dug	40	2,600	- 30	2,570	40	2,560	Glacial gravel	Hard,clear	42	S	Sufficient for local needs in summer; dry in winter.
27	NE.	35	"	"	"	Dug	28	2,407	- 8	2,399	24	2,383	Glacial sand	Hard,clear	42	D, S	Sufficient for local needs; 18-foot well for house.
28	SW.	36	"	"	"	Dug	18	2,310	- 1	2,309	1	2,309	Glacial sandy clay	Soft,clear	44	D	Sufficient for household needs only; 10-foot well for stock.
29	SE.	36	"	"	"	Dug	23	2,300	- 20	2,280	23	2,277	Glacial clay	Hard,clear	42	D	Sufficient for household needs only; dugout for stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of TERRELL NO.101, 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	HEIGHT TO WHICH WATER WILL RISE: Elev.	PRINCIPAL WATER-BEARING BED: Depth	PRINCIPAL WATER-BEARING BED: Elev.	PRINCIPAL WATER-BEARING BED: Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	NE.	1	11	27	2	Dug	20	2,395	- 16	2,379	20	2,375	Glacial sand	Hard, clear	42	D, S	Sufficient for 15 head stock; 25-and 60- foot dry holes.
2	SW.	2	"	"	"	Dug	18	2,334	- 15	2,319	18	2,316	Glacial sand	Hard, clear	43	D, S	Sufficient for 10 head stock; spring on NE.½ section 2 ?.
3	SW.	6	"	"	"	Spring		2,227	0	2,227			Ravenscrag sand	Soft, clear	43	N	Believed to have been drained when mine was opened.
4	NE.	7	"	"	"	Soring	3	2,220	- 0	2,220			Ravenscrag sand	Soft, clear	42	D, S	Sufficient for 32 head stock.
5	NE.	8	"	"	"	Spring		2,206	0	2,206			Ravenscrag sand	Soft, clear	43	D, S	Sufficient for 22 head stock.
6	NE.	12	"	"	"	Spring		2,544	0	2,544			Ravenscrag sand	Soft, clear	43	D, S	Sufficient for 150 head stock.
7	NW.	14	"	"	"	Dug	13	2,290	- 9	2,281	11	2,279	Glacial? sand	Soft, clear	45	D, S	Sufficient for 39 head stock; four springs on section 11, sufficient for 60 head stock.
8	NW.	17	"	"	"	Dug	34	2,335	- 18	2,317	20	2,315	Glacial blue clay	Hard, clear	40	D, S	Sufficient for 18 head stock; spring on NE. ¼, also used; also spring on SE.¼, section 21,
9	NW.	19	"	"	"	Bored	30	2,320	- 18	2,302	30	2,290	Glacial clay ?	Hard, clear	43	S	Sufficient for 6 head stock; hauls drinking water.
10	SE.	23	"	"	"	Dug	7	2,390	- 6	2,384	7	2,383	Glacial gravel	Soft, clear	42	D, S	Sufficient for 30 head stock; flowed at one time.
11	SW.	24	"	"	"	Dug	24	2,430	- 15	2,415	22	2,408	Glacial gravel	Hard, clear	43	D, S	Sufficient for 18 head stock.
12	SE.	25	"	"	"	Dug	8	2,520	- 5	2,515	6	2,514	Glacial sand	Hard, clear, "alkaline"	45	D, S	Sufficient for local needs.
13	SW.	27	"	"	"	Dug	22	2,390	- 14	2,376	14	2,376	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 20 head stock.
14	SE.	28	"	"	"	Dug	16	2,410	- 8	2,402	8	2,402	Glacial clay	Soft, clear	45	D, S	Sufficient for 7 head stock during summer only.
15	SW.	30	"	"	"	Dug	14	2,350	- 9	2,341	14	2,336	Glacial clay	Soft, clear	49	S	Sufficient for 15 head stock; haul drinking water; 151foot well now dry.
16	NW.	30	"	"	"	Bored	150	2,360					Glacial blue clay			N	Dry hole; all water hauled.
17	SE.	31	"	"	"	Bored	120	2,340	- 95	2,245	120	2,220	Ravenscrag sand	Hard, iron, sulphur	42	S	Sufficient for 12 head stock; unfit for man; seepage well for drinking; six 70- to 80-foot dry holes.
18	NE.	34	"	"	"	Dug	12	2,390	- 8	2,382	11	2,379	Glacial gravel	Hard, clear	43	D, S	Sufficient for 8 head stock.
19	SW.	35	"	"	"	Dug	16	2,390	- 13	2,377	16	2,374	Glacial sand	Soft, clear	41	D, S	Sufficient for 4 head stock; springs on same quarter.
20	NW.	35	"	"	"	Dug	8	2,450	- 6	2,444	6	2,444	Glacial gravel	Hard, clear	43	D, S	Sufficient for household needs only; spring on same ¼ gives large supply.
21	SE.	36	"	"	"	Dug	16	2,481	- 10	2,471	13	2,468	Glacial sand	Medium hard, clear	44	D, S	Sufficient for local needs.
1	SE.	1	12	25	2	Dug	11	2,435	- 3	2,432	11	2,424	Glacial clay	Hard, "alkaline"	44	D, S	Sufficient for household needs only; similar well and a dam for stock.
2	SW.	2	"	"	"	Dug	18	2,370	- 14	2,356	18	2,352	Glacial sand	Hard, clear	44	D, S	Sufficient for 20 head stock; three similar well used.
3	NW.	2	"	"	"	Dug	16	2,385	- 8	2,377	16	2,369	Glacial gravel	Hard, clear, "alkaline"	44	D, S	Sufficient for 30 head stock; use pond for stock.
4	SW.	4	"	"	"	Bored	20	2,290	- 15	2,275	20	2,270	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 50 head stock; similar well too "alkaline" for stock.
5	NW.	4	"	"	"	Dug	21	2,290	- 18	2,272	21	2,269	Glacial gravel	Soft, clear	44	D, S	Sufficient for local needs only; 22-foot well gives "alkaline" water.
6	NW.	5	"	"	"	Dug	16	2,200	- 10	2,190	16	2,184	Glacial sand	Soft, clear	41	D, S	Sufficient for 6 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 TERRELL NO.101, 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
7	SE.	6	12	25	2	Spring	8	2,230	0	2,230			Glacial sand	Hard, clear, "alkaline"	44	S	Sufficient for 12 head stock; 16-foot well for house use.
8	NW.	6	"	"	"	Dug	10	2,210	- 5	2,205	10	2,200	Glacial gravel	Hard, clear, "alkaline"	44	S	Sufficient for 6 head stock; unfit for man; fifteen similar wells all "alkaline".
9	NW.	7	"	"	"	Dug	30	2,190	- 25	2,165	30	2,160	Glacial gravel	Hard, clear, "alkaline"	44	S	Sufficient for local stock needs; 12-foot well for house "alkaline" water. #
10	NW.	8	"	"	"	Bored	95	2,180	- 65	2,115	95	2,085	Glacial gravel	Hard, clear, "alkaline"	42	D, S	Sufficient for 20 head stock; 18-foot dry hole.
11	NW.	10	"	"	"	Dug	18	2,240	- 10	2,230	18	2,222	Glacial clay	iron Soft, clear		D, S	Sufficient for local needs.
12	SE.	10	"	"	"	Bored	200	2,370					Marine shale			N	Dry hole; all water hauled; also 77-foot dry hole.
13	SW.	12	"	"	"	Dug	21	2,320	- 15	2,305	21	2,299	Glacial clay	Medium hard, clear	45	D, S	Sufficient for 16 head stock.
14	SE.	12	"	"	"	Dug	12	2,400	- 8	2,392	12	2,388	Glacial sand	Medium hard, clear	45	D, S	Sufficient for 20 head stock.
15	NE.	13	"	"	"	Dug	16	2,350	- 10	2,340	16	2,334	Glacial sand	Medium hard, "alkaline"	42	D, S	Sufficient for 20 head stock.
16	NE.	14	"	"	"	Dug	16	2,210	- 12	2,198	16	2,194	Glacial sand	Hard, clear	46	D, S	Sufficient for 10 head stock; 12-foot well waters 20 head stock.
17	SW.	15	"	"	"	Bored	12	2,240	- 6	2,234	12	2,228	Glacial gravel	Medium hard, clear	47	D, S	Sufficient for household needs only; 16-foot well yields "alkaline" water.
18	NW.	15	"	"	"	Dug	10	2,130	- 2	2,128	10	2,120	Glacial gravel	Medium hard, clear	48	D	Sufficient for household needs only; use pond for stock.
19	SW.	17	"	"	"	Dug	20	2,170			20	2,150	Glacial clay	Hard, clear		N	Small supply.
20	NE.	18	"	"	"	Dug	20	2,150	- 16	2,134	20	2,130	Glacial sand	Medium hard, clear	43	D, S	Small supply; 10-foot well used for stock.
21	NW.	20	"	"	"	Dug	20	2,150	- 16	2,134	20	2,130	Glacial sand	Medium hard, clear	43	D, S	Sufficient for household needs only; also a dam.
22	SE.	20	"	"	"	Dug	13	2,170	- 10	2,160	13	2,157	Glacial sand and gravel	Medium hard, clear	45	D, S	Sufficient for household needs only; also a dam.
23	NE.	20	"	"	"	Dug	18	2,150	- 15	2,135	18	2,132	Glacial clay	Medium hard, clear	45	D	Sufficient for household needs only; also a dam.
24	SE.	21	"	"	"	Dug	16	2,1[illegible]0	- 8	2,182	16	2,174	Glacial sand	Medium hard, clear	47	D, S	Sufficient for local needs; also a dam.
25	NE.	21	"	"	"	Dug	28	2,130	- 20	2,110	28	2,102	Glacial clay	Medium hard, "alkaline"	45	D, S	Insufficient for local needs.
26	NE.	22	"	"	"	Dug	16	2,170	- 10	2,160	16	2,154	Glacial sand	Medium hard, "alkaline"	44	D, S	Sufficient for 12 head stock.
27	NW.	24	"	"	"	Dug	16	2,205	- 14	2,191	16	2,189	Glacial gravel	Medium hard, "alkaline"	42	D, S	Sufficient for 30 head stock; also use pond for stock.
28	NE.	24	"	"	"	Dug	9	2,175	- 5	2,170	9	2,166	Glacial sand	Hard, clear	44	S	Sufficient for 13 head stock; haul drinking water from Bayard.
29	SE.	25	"	"	"	Dug	16	2,165	- 8	2,157	16	2,149	Glacial quick-sand	Hard, clear	44	D	Town well; sufficient for 35 persons.
30	NE.	26	"	"	"	Drilled	50	2,190	- 15	2,175	50	2,140	Marine shale	Hard, clear, "alkaline"		N	Caved in.
31	SE.	27	"	"	"	Dug	20	2,170	- 14	2,156	20	2,150	Glacial sand	Medium hard, clear	45	D, S	Sufficient for 15 head stock.
32	NE.	27	"	"	"	Dug	12	2,140	- 4	2,136	12	2,128	Glacial gravel	Hard, "alkaline"	46	D, S	Sufficient for 10 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 TERRELL NO.101, 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
33	SE.	28	12	25	2	Dug	13	2,130	- 9	2,121	13	2,117	Glacial gravel	Hard, clear, "alkaline"	47	D	Sufficient for household needs only; pond for stock.
34	NE.	28	"	"	"	Dug	12	2,090	- 8	2,082	12	2,078	Glacial clay	Hard, clear, "alkaline"	47	D, S	Sufficient for 6 head stock.
35	SE.	30	"	"	"	Dug	20	2,150	- 17	2,133	20	2,130	Glacial sand	Hard, clear, "alkaline"	47	S	Sufficient for 4 head stock; unfit for man.
36	SE.	32	"	"	"	Dug	24	2,120	- 19	2,101	24	2,096	Glacial gravel	Hard, clear	43	D, S	Sufficient for 6 head stock; lake for stock.
37	SW.	33	"	"	"	Bored	14	2,090	- 7	2,083	14	2,076	Glacial gravel	Soft, clear	46	D	Sufficient for household needs only; 22-foot stock well.
38	NW.	34	"	"	"	Bored	36	2,110	- 18	2,092	26	2,084	Glacial gravel	Hard, clear	43	D, S	Sufficient for 18 head stock.
39	SE.	34	"	"	"	Dug	16	2,130	- 15	2,115	16	2,114	Glacial blue clay	Medium hard, clear	43	D, S	Sufficient for 12 head stock; 18-foot stock well.
40	SE.	36	"	"	"	Dug	10	2,190	- 5	2,185	10	2,180	Glacial clay	Hard, clear		D, S	Sufficient for local needs.
41	NW.	36	"	"	"	Dug	11	2,120	- 8	2,112	11	2,109	Glacial sand	Medium hard, clear	44	D, S	Sufficient for local needs. #
1		2	12	26	2	Dug	16	2,500	- 8	2,492	16	2,484	Glacial yellow clay	Hard, clear, "alkaline"		D	Very small supply.
2	SE.	6	"	"	"	Dug	20	2,619					Glacial blue clay				Dry hole; all water hauled.
3	NE.	7	"	"	"	Dug	7	2,619	0	2,619	5	2,614	Glacial gravel	Hard, clear	58	N	Sufficient for local needs.
4	SW.	8	"	"	"	Dug	15	2,619	- 7	2,612	11	2,608	Glacial clay	Hard, clear	41	D, S	Sufficient for local needs; spring on SE.¼ section 8.
5	SE.	13	"	"	"	Dug	15	2,230	- 8	2,222	12	2,218	Glacial sand	Hafd, clear	42	D, S	Sufficient for local needs.
6	NE.	13	"	"	"	Dug	12	2,210	- 3	2,207	12	2,198	Glacial sand ?	Hard, clear	44	D, S	Sufficient for local needs.
7	NW.	16	"	"	"	Dug	12	2,615	- 6	2,609	12	2,603	Glacial gravel	Hard, clear	41	D, S	Sufficient for local needs.
8	SW.	16	"	"	"	Dug	8	2,715	- 5	2,710	8	2,707	Glacial gravel	Hard, clear	44	D, S	Sufficient for local needs; also use ponds for stock.
9	SE.	18	"	"	"	Dug	10	2,600	- 7	2,593	10	2,590	Glacial gravel	Hard, clear	42	D	Sufficient for household needs only; spring for stock.
10	SW.	18	"	"	"	Dug	20	2,564	- 16	2,548	18	2,546	Glacial gravel	Hard, clear, iron	42	D, S	Sufficient for local stock needs.
11	NW.	19	"	"	"	Dug	14	2,475	- 12	2,463	12	2,463	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for household needs only. 35-foot for stock.
12	SE.	19	"	"	"	Dug	45	2,525	- 43	2,482	45	2,480	Glacial clay	Hard, clear, "alkaline"	41	D, S	Insufficient for local needs; unfit for man.
13	NW.	24	"	"	"	Dug	20	2,260	- 10	2,250	10	2,250	Glacial clay	Hard, clear, "alkaline"	42	D, S	Insufficient for local needs.
14	NE.	27	"	"	"	Dug	12	2,580	- 8	2,572	12	2,568	Glacial gravel	Hard, bad odour		S	Water easily obtained at depth of 10 feet in this section.
15	SW.	30	"	"	"	Drilled	75	2,445					Glacial clay			N	Dry hole; several other dry holes 50 to 75 feet.
16	NW.	31	"	"	"	Dug	61	2,375	- 59	2,316	60	2,315	Glacial sand	Hard, clear	41	D, S	Sufficient for local needs in 1935; 42-foot well used for stock.
17	SE.	31	"	"	"	Dug	20	2,409	- 18	2,391	20	2,389	Glacial sand	Soft, clear		D, S	Sand fills well. Not used.
18	NW.	32	"	"	"	Dug	15	2,370	- 3	2,367	12	2,358	Glacial sand	Hard, clear		D, S	Supplies water to surrounding farms.

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

WELL RECORDS—Rural Municipality of TERRELL, NO. 101, 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	SE.	32	12	26	2	Dug	6	2,370	− 2	2,368	6	2,364	Glacial gravel	Hard, clear, "alkaline"	43	S	Sufficient for local stock needs.
1	SW.	4	12	27	2	Bored	113	2,380	− 83	2,297	113	2,267	Ravenscrag ?	Hard, clear, iron	42	D, S	Sufficient for local stock needs; 10-foot soft water well.
2	NW.	5	"	"	"	Dug	14	2,350	− 10	2,340	14	2,336	Glacial gravel	Hard, clear, iron	42	D, S	Sufficient for 12 head stock.
3	NW.	6	"	"	"	Dug	12	2,300	− 8	2,292	12	2,288	Glacial sand	Soft, clear	42	D, S	Sufficient for household needs only; 80-foot dry holes.
4	SW.	7	"	"	"	Dug	22	2,320	− 20	2,300	20	2,300	Glacial sand	Hard, clear	42	D, S	Sufficient for 11 head stock; several shallow dry holes.
5	SE.	13	"	"	"	Dug	14	2,549					Glacial clay			N	Dry hole; drinkihg water hauled.
6	SW.	18	"	"	"	Dug	18	2,310	− 14	2,296	15	2,295	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 30 head stock; unfit for humans.
7	SW.	19	"	"	"	Dug	20	2,300	− 17	2,283	20	2,280	Glacial sand	Hard, clear		D, S	Sufficient for 30 head stock.
8	NW.	19	"	"	"	Dug	27	2,290	− 25	2,265	25	2,265	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock; five 45-foot dry holes.
9	NE.	19	"	"	"	Dug	29	2,300	− 25	2,275			Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 13 head stock.
10	E.½	20	"	"	"	Dug	4	2,305	− 2	2,303	4	2,301	Glacial gravel	Soft, clear		D, S	Sufficient for local needs; two good springs also.
11	SE.	23	"	"	"	Dug	10	2,455					Glacial clay ?			N	Dry hole; others too "alkaline" for use.
12	SW.	23	"	"	"	Dug	55	2,410			55	2,355	Glacial clay	Hard, clear, "alkaline"		S	Very small supply.
13	NE.	25	"	"	"	Dug	20	2,390	− 15	2,375	20	2,370	Glacial sand	Hard, clear	42	D, S	Sufficient for local needs.
14	NW.	25	"	"	"	Dug	10	2,350	− 7	2,343	7	2,343	Glacial sand	Hard, clear, "alkaline"	44	S	Sufficient for stock needs.
15	NE.	26	"	"	"	Dug	15	2,330	− 13	2,317			Glacial clay	Hard, iron, "alkaline"		S	Sufficient for 8 head stock; 20-foot dry hole.
16	SW.	28	"	"	"	Dug	95	2,340					Glacial clay			N	Dry hole; several others dug to 95 feet; spring supply used in NW.¼
17	SW.	29	"	"	"	Dug	12	2,300	− 6	2,294	12	2,288	Glacial gravel	Hard, clear	42	D, S	Large supply of good water.
18	NW.	30	"	"	"	Bored	20	2,305	− 18	2,287	20	2,285	Glacial sand	Hard, clear	41	D, S	Sufficient for 9 head stock.
19	SW.	31	"	"	"	Dug	16	2,294	− 14	2,280	16	2,278	Glacial sand	Hard, clear, "alkaline"	40	D, S	Sufficient for 20 head stock.
20	SW.	32	"	"	"	Dug	18	2,320	− 14	2,306	14	2,306	Glacial sand	Hard, clear	42	D, S	Sufficient for 12 head stock.
21	NE.	35	"	"	"	Dug	20	2,410	− 17	2,393			Glacial clay	Hard, clear	43	D	Sufficient for household needs only; two springs on SE.¼, and one on SW.¼, section 34, water 90 head stock.
22	NW.	36	"	"	"	Dug	14	2,390	− 7	2,383	7	2,383	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 40 head stock in summer, 12 in winter; use springs ½ mile north.

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

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(#) Sample taken for analysis.