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DEPARTMENT OF MINES

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BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF SUTTON No. 103 SASKATCHEWAN

BY

B. R. MacKay, H. H. Beach & J. M. Cameron

Water Supply Paper No. 114

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF SUTTON, NO. 103, SASKATCHEWAN

INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Sutton covers an area of 324 square miles in the central part of southern Saskatchewan. The municipality consists of nine townships described as tps. 10, 11, and 12, ranges 1, 2, and 3, W. 3rd mer. The village of Mazenod in the south-central part of the municipality lies approximately 37 miles south and 29 miles west of Moose Jaw and about 15 miles east of Gravelbourg. The Swift Current-Avonlea branch of the Canadian National railways, on which are situated the villages of Ettington, Mazenod, and Palmer, runs in an east-west direction across the southern part of the area. The Moose Jaw-Assiniboia branch of the Canadian Pacific railway enters the municipality in the northeast corner of township 10, range 1, and runs roughly parallel to the eastern boundary of this township and leaves the area in the southern border of the same township in section 2. Vantage is the only village situated on this line in the municipality.

The greater part of the municipality is a gently rolling plain area, which is broken by a belt of highlands that extend from its northwest corner in a southeasterly direction through the central part of the area. The plain in the northeast corner is the southwestern part of a basin that was formerly occupied by a large lake of which Johnstone lake is a remnant. The land surface rises from lake level at approximately 2,200 feet above sea-level in the extreme northeast corner to 2,250 feet along the base of the highlands area. The flat area in the southwest corner of the municipality lies in the eastern part of an extinct glacial lake basin that many thousands of years ago occupied a large area the approximate centre of which lies at the village of Bateman. The flat extends at an elevation 2,300 feet above sea-level over the low-lying swamp land to include the southeast corner of township 11, range 2. From here it rises to over 2,400 feet in the southeastern corner of the township. The surface rises more abruptly to the north to elevations of over

2,400 feet in the irregularly rolling uplands area of the central parts. These hills attain their highest summits with an elevation of 2,500 feet on a hill on the southern boundary of township 12, range 3.

The municipality has no well-developed drainage system. Swamps occupy several low-lying areas. The southwestern margin of Johnstone lake, a large "alkali" lake, cuts northwesterly across the northern half of sec. 36, tp. 12, range 1. A smaller, "alkali" lake occurs in the east-central part of township 12, range 2. Many of the small lakes, ponds, and sloughs that lie in depressions have as a result of the prolonged drought become dry or nearly so. In others, the concentation of mineral salts in the water has become so high that it can not be used even for watering stock. Dams have been placed across coulées, and dugouts excavated to conserve surface water in many places. These reservoirs, where carefully located and well made, provide a year round water supply for stock. The wells in the municipality obtain water from the various kinds of glacial deposits that mantle the area.

Throughout many parts of the municipality considerable difficulty has been experienced in obtaining adequate water supplies. So marked has been the effect of the drought on the supplies of underground water, especially when coming from shallow sources, that residents in areas where deep drilling has proved unproductive must seriously consider the conservation of the surface water by dams and dugouts, and the collecting and retention of rainfall by eave-troughs and cisterns.

Water-bearing Horizons in the Unconsolidated Deposits

Glacial deposits mantle the entire area as a blanket of varying thickness from 50 to over 150 feet. This drift was deposited by a great continental ice-sheet that many thousands of years ago advanced and retreated over Saskatchewan, and by the waters that issued from the melting ice. During its advance the ice-sheet

probably deposited a layer of compact, bluish grey boulder clay over the bedrock surface throughout this entire municipality. Upon the gradual melting and retreat of the ice front further layers of boulder clay were deposited, and in places where the ice front paused in its retreat a considerable thickness of drift was deposited. Such accumulations are termed "moraine", and are characterized by a general lack of continuity in the pockets of sands and gravels occurring interbedded in the boulder clays that comprise the greater part of the moraine, and by the rough, irregular, rolling land surface. Low hills and gravel ridges are common in the moraine-covered areas. In many places sloughs form in the intervening, undrained depressions. Such an area of moraine extends as a belt, 2 or 3 miles wide, from the northeast corner of township 10, range 1, in a northwesterly direction to the central part of the municipality. From there the moraine widens to cover the greater part of the northwestern and north-central townships. The drift is more gently rolling over the lowlands and there is referred to as "till plain". Over the northeast and northwest corners of the municipality the till is covered by still later lake deposits. Waters issuing from the retreating ice front formed several large lakes. One of these, known as lake Gravelbourg, covered a large area extending from Vanguard to Mazenod. Fine sediments washed into this lake settled at the bottom to form lake clays. The presence of these lake clays covering the south-central lowlands area marks the areal extent of this now extinct lake in the municipality. Another large lake basin extended over a smaller area to the northeast and is now occupied in part by Johnstone lake. Sediments washed into this lake were for the most part coarser. Hence, the northeastern lowlands of this municipality are covered by a layer of glacial lake sands, although a small area of glacial lake clays occurs in the eastern part of township 11, range 1. The areal extent of the various types of deposits is shown on Figure 1 of the map accompanying this

report.

The glacial lake sands in the flats of the northeast corner of the municipality have a probable thickness of only 1 or 2 feet along their southern boundary, but thicken towards the north, and in places near the northern boundary of the municipality thicknesses as great as 23 feet occur. Where these sands are sufficiently thick they yield fairly large supplies of water that is generally of good quality. Most wells in the lake sand-covered areas, however, are sunk to tap water-bearing pockets in the underlying boulder clay. The wells are less than 50 feet deep and most of them obtain drinkable water in sufficient quantities for local household and stock needs.

The light bluish grey lake clays have a thickness of 18 to 30 feet over the southwestern parts. These clays are very compact and impervious and yield only small seepages of water. Sand and gravel pockets that are sufficiently porous to be water-bearing occur sparingly below the lake clays at the contact with the underlying boulder clay. Only a very few wells have tapped such pockets in this municipality. The yields from most of them are adequate for stock needs. The water is of good quality and is suitable for domestic use. Most wells in the lake clay-covered areas tap water-bearing beds that occur in the underlying boulder clay. These wells are sunk to depths as great as 144 feet and obtain varying supplies and qualities of water. The variation in yield and quality of water from these aquifers is discussed in the section of the report dealing with the individual townships.

The till and moraine deposits consist of boulder clay which is yellowish brown in its upper 20 to 40 feet comprising the weathered zone, and bluish grey at greater depths. Pockets, and occasionally beds, of well-sorted sands and gravel occur scattered irregularly through the boulder clay and form the only sources of any large supplies of water in these deposits. Their irregular

occurrence makes them difficult to locate in all parts of the municipality covered by the till and moraine; and in certain areas, as the western part of township 10, range 1, the eastern part of township 10, range 2, and in township 12, range 2, where they occur only sparingly, many wells are dry. Wells tapping the pockets range in depth from 10 to 148 feet. The yield obtained depends upon the areal extent, porosity, and thickness of the aquifer penetrated. The mineral salt content in the waters in most places appears to increase with the depth of the productive pocket below the surface. Although shallow pockets generally yield drinkable water many of the deeper aquifers yield water that is so highly mineralized as to be unfit for domestic purposes. Much of the boulder clay below the weathered zone is unproductive, and water appears to be confined to two horizons, one of limited areal extent in the municipality and the other more general. Many wells situated in the southern townships and in the southern part of the central township have located water in beds of dark grey, fine-grained silts, in places underlain by beds of sand or gravels in the lower part of the drift. These beds occur over a considerable range of elevation, but in most places from 80 to 150 feet below the surface. Some of the silts contain interbedded pieces of lignite, twigs and branches of trees, and even fossil shells. When wet the silts have the plasticity of mud and are locally referred to as "sea mud". These deposits are more correctly termed "interglacial deposits" in that they are believed to have been deposited in swamps formed in hollows on the surface of the first till during periods of warmer climate conditions after the retreat of the first ice-sheet. These deposits were subsequently covered by a later deposit of boulder clay. Water obtained from these beds is usually highly mineralized and not always suitable even for watering stock. The yields from individual wells, however, are large. The aquifers appear to be each of limited areal extent

rather than forming a continuous horizon over a large area, and hence it is almost impossible to predict the occurrence or absence of an aquifer in any particular area. The known distribution of these beds is discussed in more detail in the section of the report dealing with the individual townships.

At many places, particularly in the southwestern lowlands, wells have encountered porous beds of sands and more occasionally gravels, at the contact of the boulder clay and the underlying shale bedrock. The water obtained is similar in character to supplies from the interglacial deposits. Here again these intervening beds are not always present and many wells have passed through the boulder clay into the shales or the bedrock without obtaining water.

Shallow wells provide the better quality of drinking water, but in most places it has been found necessary to sink wells to these lower horizons to ensure adequate water supplies for stock.

Water-bearing Horizons in the Bedrock

The glacial drift throughout the municipality is underlain by the Bearpaw formation, except possibly in the north-central part where the Eastend may be present. The Bearpaw consists almost entirely of dark-grey to black, compact marine shales. These shales may be distinguished from the overlying boulder clay by their more soapy feel, their darker colour, their lack of boulders, stones, and pebbles, and the small, roughly cubical fragments into which they crumble upon drying. The shales are generally too compact and impervious to form reservoirs for any large supplies of water, and such supplies as they do contain are usually too highly mineralized to be used for any ordinary farm purpose. Such wells as have been sunk into the Bearpaw formation in this municipality obtained no water. Throughout the area residents should confine prospecting for water supplies to the glacial drift.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 10, Range 1

The ground water supplies in this township are obtained entirely from wells sunk into the glacial drift. The glacial drift is in the form of moraine in the northeast corner and of boulder clay throughout the remainder of the area, as shown on the accompanying map (Figure 1). The thickness of the drift is in no place less than 95 feet.

The moraine and the boulder clay consist in general of a few feet of top soil; 30 to 65 feet of yellow boulder clay; 40 feet or more of blue boulder clay. Small water-bearing sand or gravel pockets occur interspersed at random through the upper 40 feet of the boulder clay. The wells tap these pockets in isolated sections of the township, but obtain only small supplies of water. However, in a few places the pockets are larger or more porous and supplies are adequate for stock requirements. The water from most of these wells is suitable for domestic use.

Sand and gravel pockets also occur at greater depths in the boulder clay, but apparently have not a widespread occurrence, particularly in the western part of the township. Wells from 65 to 148 feet deep, located on sections 3, 9, 10, 16, 23, 24, 25, and 35, obtain adequate stock supplies from the more deeply lying beds. In other sections of the township, wells sunk to similar depths either obtain only small supplies from pockets, or else, failing to reach a productive pocket, are completely dry. Waters from the deeply lying pockets in the boulder clay are usually hard and "alkaline" and in only a few places are they considered to be suitable for household use.

Wells sunk to depths of 116 and 130 feet on sections 34 and 35 struck interglacial beds of "sea-mud", but failed to obtain water.

Careful prospecting of the upper 50 feet of the glacial drift seems advisable in most places in the area. Only when the

supplies obtained are inadequate for local requirements should wells be sunk to greater depths, as there can be no definite assurance that productive "interglacial" beds or sands at the contact of the drift and the bedrock will be found, or that the water if found will be of satisfactory quality for farm use. In farms where holes already sunk to these lower beds have proved to be unproductive residents are well advised to construct dams in coulées or excavate dugouts to conserve surface water for stock.

Wells that have reached the contact of the drift and the bedrock and have failed to obtain water should not be continued farther. Little or no water can be expected from the compact marine shales of the Bearpaw formation which probably underlie the drift throughout the township.

Township 10, Range 2

Wells provide most of the water supplies in this township, but small ponds and dugouts supplement stock water supplies on several of the farms.

The glacial deposits consist of glacial lake clays in the northwestern quarter of the township, and of till or boulder clay throughout the remainder of the area, as shown on the accompanying map (Figure 1). The thickness of the drift varies from 60 feet in places along the western boundary to 100 feet or more in the central and eastern parts of the township. The lake clays themselves are generally too compact to yield any large supplies of ground water, and little success has been had in locating porous beds immediately beneath the clays. Residents of the lake-clay-covered area have been obliged to sink wells to depths of 80 feet or more to porous beds in the underlying drift, or possibly into the Bearpaw bedrock formation. Water suitable for drinking is difficult to obtain in this area. Very shallow seepage wells may yield small supplies in some areas, but it may be necessary to sink wells beside dugouts to ensure an adequate supply. Sand and gravel

pockets occur only sparingly at shallow depths in the glacial till over the southern and eastern parts of the township. Here again difficulty has been experienced in obtaining drinkable water. Careful and systematic prospecting directed to cover as wide an area as possible should, however, find water suitable for domestic use, but it is improbable that the supply obtained will be sufficient for any large number of stock, or be constant over periods of drought.

Providing wells are sunk sufficiently deep, water suitable for stock should be found at nearly all points in the township. The porous beds forming the aquifers are found throughout the area at elevations between 2,240 and 2,190 feet above sea-level or at depths of 85 to 150 feet, depending upon the surface elevation of the selected well site. Still higher surface elevations occurring along the eastern boundary may necessitate drilling to depths of 200 feet, to reach the lower porous beds of the drift. Several deep wells in the western part of the township that adjoins this township on the east failed to get water, and it is probable that residents would have better chances of obtaining water by thoroughly prospecting the upper part of the drift along the eastern boundary of the township. The fine sand aquifers in the lower part of the drift may be "interglacial" deposits, but since in a few places a few feet of shale is reported to occur just above the aquifer and to be present below it, some of the wells are probably producing from a sand bed in the bedrock. In the absence of definite information, however, these wells are listed on the well record sheets as deriving their water from "interglacial" deposits. The water is hard and highly charged with dissolved mineral salts, largely sulphates, and in a few places it is considered satisfactory for domestic use. The water from these beds is under hydrostatic pressure and rises in many of the wells to within 10 to 25 feet from the surface.

On the SW. $\frac{1}{4}$, section 16, a 120-foot well yields a small supply of water from a thin, porous bed at an elevation of 2,220 feet. This supply would probably be increased, if the wells were deepened some 20 or 30 feet, to tap the aquifer struck in wells in adjoining areas. It seems advisable in deep drilling to continue wells until they have penetrated the shales for a depth of 5 or 10 feet, to explore the possibilities of sands occurring at the top of the formation. Still deeper drilling, however, into the compact shales, is not advisable, as any small seepages of water obtained will probably be too highly mineralized to be suitable even for watering stock.

Township 10, Range 3

Even greater difficulty has been experienced in obtaining an adequate ground water supply, and particularly drinkable water, in this township than in other parts of the municipality. This condition may be attributed largely to the impervious nature of the surface deposits and the proximity of the equally impervious bedrock to the surface. Till covers the bedrock throughout the area, but it is covered by 15 to 20 feet of light bluish grey lake clay over all except a narrow belt that extends from the southeast corner to the centre of the township where the till is exposed at the surface.

Sand or gravel pockets occur sparingly in the lake clays and at the contact of these clays with the underlying till. Such pockets as do exist are widely scattered and of limited areal extent and are found only by careful prospecting. The sand and gravel pockets are not appreciably more plentiful in the upper weathered parts of the till. The only possibility of obtaining drinkable water from the lake clays or the till seems to be by sinking seepage wells to depths not exceeding 25 feet. The water enters these wells by seepage from the clays. The water is hard and in many places is so highly charged with sulphate salts in solution that it cannot be used

by persons unaccustomed to highly mineralized waters. No deeper wells in the area have yielded water suitable for domestic use. The supplies from the shallow wells are rarely sufficient for more than a very few head of stock. In order to obtain larger supplies for stock residents are obliged to sink wells to the lower part of the glacial drift, or to the contact of the drift and the underlying bedrock. These lower productive horizons have been reached in most places at depths not less than 50 feet, and not greater than 100 feet. These beds do not always form continuous horizons over large areas, as intervening wells have passed through the drift without obtaining any water. In most places, however, the sinking of two or three widely separated test-holes should locate an adequate supply of highly mineralized water for 10 to 25 head of stock. It would be advisable, in any case, to have water from this horizon analysed before being used for stock, as in some places it tends to cause scour in stock.

A well located on the NW. $\frac{1}{4}$, section 19, reached, at a depth of 49 feet, a porous black sand bed that may be either of interglacial origin or a sandy lens in the Bearpaw formation, and obtains from it a moderately large supply of alkaline water suitable for stock. No wells in adjoining areas of higher land have gone sufficiently deep to determine the areal extent of this horizon, but it is probable that this porous bed occurs in the glacial drift and is confined to lowland area, in which case should wells on the higher land be sunk to this elevation of 2,600 feet, they would penetrate only unproductive shales.

The construction of small dams in coulées and the excavation of dugouts for the conservation of surface waters are strongly recommended in this area. Such reservoirs if sufficiently large will provide enough water for stock throughout the year, and a shallow seepage well sunk beside them will provide household supplies. Two wells on the NW. $\frac{1}{4}$ and SW. $\frac{1}{4}$, section 23, respectively 90 and 110 feet

deep, have found small supplies of water in the upper few feet of the Bearpaw shales, but from neither well was the water suitable for watering stock. Deep drilling into the bedrock will not yield water suitable for any farm use in this township. The bedrock will be encountered at depths not exceeding 100 feet in any part of the area and probably at considerably lesser depths in the central and southeastern parts. Wells sunk to depths of 400 and 500 feet on section 14 were entirely dry.

Township 11, Range 1

Glacial deposits overlie the bedrock throughout the entire township. Over much of the northeastern half, and in the southwestern corner, of the township, the drift is in the form of a till plain, but between these areas in a belt 2 to 3 miles wide the drift blanket is much more irregular and forms a rolling moraine. In the northeastern lowlands the till is overlain by some 10 to 20 feet of glacial lake clays. These clays become more sandy over sections 35 and 36, and parts of sections 34, 26, and 25. The areal distribution of each of these types is shown on the accompanying map (Figure 1).

The glacial lake sands in the flats area of the northeast corner of the township are generally too thin to yield any large supplies of water. One well, however, dug 8 feet deep on the NE. $\frac{1}{4}$, section 23, obtains a supply sufficient for 60 head of stock. The water is moderately hard and iron-bearing, but suitable for domestic use. All other wells in this area tap sand beds lying at depths between 50 and 96 feet in the underlying boulder clay. These wells obtain large supplies of water that are adequate for stock needs and only the water from the well on the NE. $\frac{1}{4}$, section 35, is unsuitable for household use. In one well sunk to a depth of 60 feet on the NE. $\frac{1}{4}$, section 14, the water has derived sufficient hydrostatic pressure in percolating from the hills to the west to rise to the

surface. No such pressure is noted in wells in adjoining areas and it is improbable that this well indicates any widespread artesian basin.

The deposit of glacial lake clays covering the flats area in the east-central part of the township has a maximum thickness of 20 feet. The clays are impervious and are not a source of water supplies. Wells in this area, 35 to 60 feet deep, tap sand pockets in the underlying boulder clay and most of them obtain adequate stock supplies. The water is hard and somewhat "alkaline", but only from the 40-foot well located on the NE. $\frac{1}{4}$, section 24, is it considered to be unsuitable for household use.

The moraine and till deposits consist largely of boulder clay that is yellowish brown in its upper 30 feet of weathered zone, and bluish grey at greater depths. Sand and gravel pockets interspersed in the boulder clay provide the only source of water supplies in these deposits. Throughout most sections in the northern uplands parts of the moraine-covered district, porous sand and gravel beds are sufficiently plentiful and widespread to ensure the locating of large supplies of generally drinkable water at depths not exceeding 50 feet. One 20-foot well located on the NE. $\frac{1}{4}$, section 17, yields a soft water of particularly good quality. On the SW. $\frac{1}{4}$ of the same section, however, it was found necessary to sink to a depth of 95 feet before an adequate supply was obtained. The pockets are evidently less plentiful in the moraine in the central and southeastern sections, as a considerable amount of prospecting is required to locate water suitable for household use at shallow depths, and many residents have been obliged to sink wells to sand beds in the lower part of the drift in order to obtain sufficient water for stock. In the central sections, these beds are encountered at depths of 70 to 100 feet, but farther south in sections 2 and 3 it was found necessary to extend borings to depths of 127 and 144 feet to reach

this horizon. The quality of the waters from these deeper wells varies considerably, depending somewhat upon the thickness and the porosity of the aquifer. In general, however the shallower wells yield a water that is more satisfactory for domestic use than the deeper ones.

It is probable that careful prospecting at shallow depths in the till-covered regions will ultimately provide a satisfactory household water-supply. Here again, however, residents find it necessary to sink wells to the deeper horizons to ensure sufficient water for stock needs. On sections 33 and 34, wells ranging between 75 and 104 feet in depth yield moderately large supplies of drinkable water, and water of similar quality is found at depths not exceeding 60 feet in sections 15, 21, and 22. The 54-foot well on section 15 yields enough water for 100 head of stock.

Should no water be found within 100 feet of the surface over the greater part of the township, or within 150 feet in the south-central sections, drilling should be discontinued, as at approximately these depths wells will enter the compact dark shales of the Bearpaw formation from which no water suitable for farm requirements can be expected.

Many of the coulées provide good sites for small dams or dugouts. Residents not prepared to go to the expense of sinking wells to the lower horizons in the drift, where the locating of water cannot always be assured, will find that reservoirs for surface water if constructed sufficiently large, will provide adequate supplies for stock.

Township 11, Range 2

The southern section of the area is a lowland flat with a large area of undrained marsh in sections 1, 2, and 3. Throughout the remainder of the township the land is irregularly rolling and hilly and a belt of moraine extends across the central part and into the northwest corner. To the north and south, the moraine

passes into a till plain. In the southern lowlands the till is covered by a thin mantle of lake clays.

In the moraine-covered areas several small springs that derive their supplies by seepage from the hills occur in the intervening depressions. Two such springs located on the NE. $\frac{1}{4}$, and SE. $\frac{1}{4}$, section 31, flow throughout the year, and provide water suitable for both domestic use and for stock. Throughout the remainder of the township wells form the main source of supply, but on some farms the yields are supplemented by surface water collected in excavated dugouts.

Better possibilities of obtaining ground water exist in this area than in the southern townships. The glacial lake clays occurring in the flats in the southern part of the township have a thickness that probably does not exceed 20 feet in any place. The clays are impervious and do not form a source of water supplies. It has been found necessary, therefore, to sink wells into the underlying boulder clay. One such well, located on the SW. $\frac{1}{4}$, section 6, obtains a supply of hard, slightly "alkaline" water that is adequate for household and stock needs, from a gravel bed in the boulder clay at a depth of 44 feet from the surface. The other wells in this area, located on sections 6 and 7, tap water-bearing "interglacial" beds of sand, designated locally as "sea-mud", at depths of 85 to 134 feet. The supplies obtained from these beds vary considerably; the bed of "sea-mud" encountered in a well on the SW. $\frac{1}{4}$, section 6, yields no water, whereas the supply of water from a similar bed on the NE. $\frac{1}{4}$ of this section is very strong and the water has sufficient hydrostatic pressure to rise 134 feet in the well and flow at the surface. The other beds yield adequate stock supplies. The water from the beds is hard and "alkaline", and only from the 123-foot well on the SW. $\frac{1}{4}$, section 7, is it suitable for household use. Residents are obliged to depend

for domestic supplies upon shallow seepage wells in the lake clays or sunk beside dugouts. It is believed that wells sunk to depths of 80 to 135 feet should obtain adequate supplies of satisfactory quality for stock watering at most places. Still deeper drilling, however, will enter the non-productive bedrock.

The till and moraine consist of 80 to 130 feet of boulder clay that is yellowish brown in its upper 20 or 30 feet or weathered zone, and bluish grey at greater depths. Sand and gravel pockets, and in the southern part of the area beds of interglacial "sea-mud", occur in the boulder clay, and provide the only source of any large supplies of ground water from these deposits. Wells tap these water-bearing pockets or beds at depths ranging from 15 to 110 feet, and most of them obtain adequate supplies for stock. The waters vary considerably in the amount of mineral salts they contain in solution. The amount as a rule increases with the depth of the productive bed, and from the deeply lying interglacial beds and sand and gravel pockets the water is mostly unsuitable for domestic use. Shallow prospecting is recommended in all parts of the moraine and till-covered areas. Wells sunk to depths of 110 feet would perhaps find water in most places, but as this is uncertain it is probably more advisable for residents of limited means to obtain water supplies by excavating dugouts or constructing dams across small coulées rather than to undertake deep drilling.

Drilling below the base of the glacial drift in any part of the township is not advisable, as the compact and unproductive shales of the Bearpaw will be encountered. Holes, located on the SW. $\frac{1}{4}$, section 6, the NE. $\frac{1}{4}$, section 7, and the SW. $\frac{1}{4}$, section 9, have been sunk into the shales and obtained no water.

Township 11, Range 3

Water supplies derived from wells in many places in this township are not adequate for local stock needs. Ponds, excavated dugouts, and in a few places dams constructed across coulées are

used to provide additional supplies.

A deposit of glacial lake clays varying in thickness from about 15 to 30 feet covers the boulder clay throughout the southern lowland sections of the township. A narrow till plain extends diagonally from section 13 to the northwest corner of the township, bordering the lake clay-covered area on the north. This till grades northward into an irregularly rolling area of moraine that covers the northeastern part of the township.

Considerable difficulty is experienced in obtaining an adequate ground water supply throughout the lake clay-covered areas. Only small seepages of water are obtainable from the lake clays, and sand beds at the contact of the lake clays and the underlying boulder clay are of limited areal extent and are entirely absent over much of the area. For drinking water, residents must depend upon very shallow seepage wells or wells sunk beside dugouts. On some farms, rain water collected in cisterns forms the only available supply for domestic purposes. Since the shallow seepage wells do not yield sufficient water for more than one or two head of stock, deeper wells must be sunk or dugouts constructed to ensure adequate supplies. Pockets of sands and gravels and interglacial beds, "sea-mud", have been encountered on many sections at elevations varying between 2,230 and 2,190 feet above sea-level and are penetrated by wells ranging in depth from 60 to 85 feet. The supplies obtained from individual wells depend upon the thickness and areal extent of the pocket encountered, but are generally sufficient for 10 to 25 head of stock. The water is almost invariably too highly charged with dissolved sulphate salts to be used for domestic purposes. As many of the farms in this glacial lake clay-covered region report an insufficiency of water from the existing deep wells, it is questionable if residents of limited means are well advised to sink wells to this horizon rather than to construct dugouts, particularly as it may ultimately be found necessary to

collect surface water by this means. Wells sunk deeper than 100 feet will enter the shales of the Bearpaw bedrock from which usable water cannot be expected.

In the till-covered area along the lower southern slopes of the northern uplands, fairly continuous beds of water-bearing sands and gravels occur beneath layers of boulder clay, generally within 50 feet of the surface. Dug wells near the bases of slopes in this area generally yield large supplies of moderately hard, drinkable water. Careful prospecting within 50 feet of the surface seems advisable rather than sinking deep wells into the lower part of the till in this area, where a more highly mineralized water probably occurs.

The moraine consists largely of boulder clay, which is yellowish brown in the upper 20 or 30 feet of weathered zone, and greyish blue at greater depths. Sand and gravel pockets that occur scattered through the boulder clay provide water supplies. The pockets most commonly occur at depths of 40 to 70 feet below the surface, but some fairly extensive pockets occur within a depth of 30 feet. Although many of these pockets yield fairly large supplies of water, some residents whose wells have tapped thin pockets find two wells necessary, and even require a dugout if a large number of stock are to be watered. The water from the pockets is hard, slightly "alkaline", but in most cases suitable for household use.

No deep wells have been sunk in the moraine-covered areas, and the depth to the bedrock has not been determined. It appears probable, however, that the water of better quality is confined to the upper 70 feet of the drift, and that careful prospecting of this zone is preferable to sinking wells down to the top of the bedrock where a more highly mineralized type of water is expected to occur.

Drilling into the bedrock is not advisable in this area, as it is questionable if the compact, dark grey shales form reservoirs

of more than small supplies of unusable bitter water.

Township 12, Range 1

Water supplies in this township are being obtained from a spring on the SW. $\frac{1}{4}$, section 23, which flows throughout the year and yields an excellent supply that in dry years is used by many of the nearby residents for both their household and stock needs. In other parts of the township the supplies are derived from wells sunk into the glacial till that covers the western half of the township, and from the glacial lake sands that overlie the till in the eastern parts of this area. The distribution of each type of deposit is shown on the accompanying map (Figure 1).

The glacial lake sands in the flats area extending away from Johnstone lake have a thickness of 25 feet or more in the vicinity of the lake, but are only a few feet in thickness along the southern boundary of the township. Wells, less than 25 feet deep, located on the SW. $\frac{1}{4}$, section 21, the NW. $\frac{1}{4}$, section 22, and the SE. $\frac{1}{4}$, section 35, obtain supplies of water for stock from the sands. Only the water from the well on the NW. $\frac{1}{4}$, section 22, is reported to be unsuitable for household use. The above-mentioned spring is also believed to draw its supply from the sand. On farms where the lake sands prove to be insufficiently productive for stock requirements, residents have sunk wells to depths of 30 or 40 feet to tap water-bearing sand and gravel pockets in the upper part of the boulder clay that underlies the lake sands. These wells obtain supplies of hard water of good quality that are adequate for household and stock needs. It is believed that wells located almost anywhere in the lake sand-covered areas would obtain similar supplies of water from porous pockets within 40 feet of the surface.

The till consists, in general, of a few feet of sandy soil; 40 to 60 feet of sandy clay containing scattered pockets of sand or gravel; and thin interglacial beds of sand, quicksand, gravel ("sea-mud") which form a fairly continuous water-bearing horizon in the

lower part of the glacial drift. Wells in this area range in depth from 20 to 65 feet and with few exceptions obtain supplies adequate for stock needs. The amount of "alkali" salts in the water varies, but from most wells the dissolved salt content of the water is not excessive, and consequently the water is suitable for household use. In those places where supplies are insufficient, further prospecting should find adequate supplies in most places. The productive beds are so irregularly distributed through the boulder clay that at one locality they may be encountered at shallow depths and in an adjacent area at depths of over 50 feet below the surface. One well located on the S. ½, section 15, passed through 90 feet of clay before striking a sand bed that yielded a satisfactory supply of water. It is believed that no difficulty should be experienced in obtaining water within 90 feet of the surface anywhere in the till-covered area. Drilling should be discontinued in all parts of this township at the base of the glacial drift as below this lie the compact and generally unproductive shales of the Bearpaw formation.

Township 12, Range 2

Glacial drift covers this entire township, forming a gently rolling till plain over the southeastern half of the area, and a more irregularly rolling, hillocky area of moraine over the remaining parts of the township. A small lake occupies parts of sections 23, 24, 25, and 26, but the water it contains has an excessive amount of mineral salts in solution, and cannot be used even for stock. Continually flowing seepage springs are located in the moraine-covered area in the SW. ¼, section 16, the NE. ¼, section 21, and the SE. ¼, section 28. The flow from the springs on sections 16 and 28 is directed into dugouts, and that from the spring on section 21 is conserved by means of a small dam constructed across a small coulée below the spring. The water thus conserved is used to water stock in the vicinity.

Throughout the till-covered area residents are obtaining water from beds of sands and gravel scattered irregularly through the boulder clay. These pockets are generally encountered between 15 and 40 feet below the surface, although in the extreme southeast corner wells have gone to depths of 60 and 70 feet before reaching the productive beds. At some places the sands are entirely absent, but the clay is sufficiently sandy to yield small seepage supplies. These pockets vary widely in thickness and porosity and in the elevations at which they occur. Some wells yield adequate supplies for 25 or more head of stock, whereas in other localities, four such wells may be necessary to satisfy the local water requirements. The shallower wells are more affected by the drought conditions than are wells over 50 feet in depth. The supplies obtainable may be appreciably "alkaline" in some places, particularly where they are derived as seepage from the clay, but they are not too highly mineralized to be unsuitable for domestic use.

No deep drilling to bedrock has been done in the till-covered area. Water probably occurs at the contact of the boulder clay, and the bedrock. From the findings in adjoining townships, however, it may be necessary to sink wells to depths of 100 to 150 feet before production is obtained, and there can be no definite assurance that the supply will be adequate or that the water will not be too highly charged with dissolved sulphate salts to be used even for watering stock. Prospecting within 50 feet of the surface in most parts of the till-covered area and within 80 feet in the southeast corner should yield satisfactory water supplies.

In the moraine-covered areas the pockets have the same random occurrence as in the boulder clay of the till-covered areas. A few shallow wells yield small supplies suitable for domestic use. The majority of the wells, however, have been sunk to depths between 50 and 85 feet. The supply obtainable from individual wells is

generally adequate for domestic requirements, and for watering 10 to 25 head of stock. The quality of the water is similar to that of the water from the till. In this area, as in the till-covered areas, there should be little necessity to sink deep wells.

No wells have reached the bedrock, but there is reason to believe that it consists of dark grey to black shales of the Bearpaw formation that will not yield satisfactory water supplies.

Township 12, Range 3

As in adjoining townships, wells provide the greater part of the supplies in this area. A few springs occur in the township and yield "alkaline" water that supplements supplies for stock that are available from wells. Small ponds occurring in depressions and dugouts conserve surface water, and are also used for watering stock.

Wells in the township are sunk into the glacial drift that consists of the moraine throughout the entire area except for a small area of till plain occurring along the western border of the township. The moraine consists of 50 to 150 feet of boulder clay through which are scattered sand and gravel pockets. These porous pockets are the only source of large supplies of water in the drift. Wells tap the pockets within 70 feet of the surface and in most places obtain adequate stock supplies. Shortages in other places are made up from additional wells, ponds, or dugouts. The water from the pockets is hard, slightly "alkaline", but generally suitable for household use. In places where the water is too highly mineralized for this purpose, shallow seepage wells sunk beside surface water reservoirs are used.

Prospecting for water in this township should be confined to the upper 70 feet of the glacial moraine or till, and it is believed that in most places in the area such prospecting will be successful. Should it not, however, residents are advised to rely

on supplies obtainable by constructing dams or dugouts rather than considering drilling to greater depths.

A 50-foot well on the NE. $\frac{1}{4}$, section 17, is sunk through the glacial drift into the shales of the underlying Bearpaw bedrock formation, but does not obtain any water. As these compact and unproductive shales immediately underlie the glacial drift in all other parts of the township, drilling in no place should be continued below the base of the glacial drift.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF SUTTON, NO. 103, SASKATCHEWAN

Township	10	10	10	11	11	11	12	12	12	Total No. in municipality
West of 3rd meridian Range	1	2	3	1	2	3	1	2	3	
Total No. of Wells in Township	37	41	53	47	48	54	40	54	39	413
No. of wells in bedrock	3	3	12	1	1	3	0	0	1	24
No. of wells in glacial drift	34	38	41	46	47	51	40	54	38	389
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	23	34	41	42	43	42	36	35	33	329
No. with intermittent supply	5	2	3	2	2	8	4	13	4	43
No. dry holes	9	5	9	3	3	4	0	6	2	41
Types of Wells										
No. of flowing artesian wells	0	0	0	0	1	0	1	0	0	2
No. of non-flowing artesian wells	11	21	18	29	18	13	11	13	12	146
No. of non-artesian wells	17	15	26	15	26	37	28	35	25	224
Quality of Water										
No. with hard water	28	36	43	43	44	48	35	47	28	352
No. with soft water	0	0	1	1	1	2	5	1	9	20
No. with salty water	0	2	0	1	0	0	0	0	0	3
No. with "alkaline" water	14	24	19	15	24	16	17	17	13	159
Depths of Wells										
No. from 0 to 50 feet deep	14	11	25	20	30	33	30	40	30	233
No. from 51 to 100 feet deep	9	17	21	21	13	19	10	14	9	133
No. from 101 to 150 feet deep	14	12	3	6	4	2	0	0	0	41
No. from 151 to 200 feet deep	0	0	1	0	0	0	0	0	0	1
No. from 201 to 500 feet deep	0	1	2	0	1	0	0	0	0	4
No. from 501 to 1,000 feet deep	0	0	1	0	0	0	0	0	0	1
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0
How the Water is Used										
No. usable for domestic purposes	28	33	40	40	45	50	33	40	31	340
No. not usable for domestic purposes	0	3	4	4	0	0	7	8	6	32
No. usable for stock	28	36	40	43	45	50	40	48	37	367
No. not usable for stock	0	0	4	1	0	0	0	0	0	5
Sufficiency of Water Supply										
No. sufficient for domestic needs	23	31	35	39	40	41	34	30	31	304
No. insufficient for domestic needs	5	5	9	5	5	9	6	18	6	68
No. sufficient for stock needs	15	24	24	35	34	32	24	26	30	244
No. insufficient for stock needs	13	12	20	9	11	18	16	22	7	128

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

Calcium and magnesium salts impart hardness to water. Hardness of water is commonly recognized by its soap-destroying powers as shown by the difficulty of obtaining lather with soap. The total hardness of a water is the hardness of the water in its original state. Total hardness is divided into "permanent hardness" and "temporary hardness". Permanent hardness is the hardness of the water remaining after the sample has been boiled and it represents the amount of mineral salts that cannot be removed by boiling. Temporary hardness is the differance 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 caldium 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 Sutton, No. 103, Saskatchewan

LOCATION						Depth of well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS									Source of water
No.	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alkalinity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1	NE.	9	10	1	3	110	3,320	1,900	1,900	nil	105	90	250	356	2,009	617	3,016	90	486		1,061		1,206	173		x1
2	SW.	16	10	1	3	114	6,440	3,000+	3,000+	n.d.	375	145	410	695	3,612	1,220	5,686	145	799		2,071		2,052	619		x1
3	NE.	31	10	2	3	130	4,400	2,200	1,000	1,200	236	620	120	389	2,202	[illegible]	[illegible]	215		341	674		2,461	389		x1
4	SW.	35	10	3	3	32	346											(1)	(4)	(2)					(3)	x1
5	SE.	33	11	1	3	96	1,580	900	850	50	46	225	40	205	890	390	1,515	72	130		432		805	76		x1
6	NE.	16	11	2	3	134	5,560	2,000	900	1,100	222	770	50	241	2,981	2,163	5,457	90		504		85	4,412	366		x1
7	SW.	10	11	2	3	90	2,880	2,000	1,900	100	27	535	300	248	1,583	662	2,787	535			739		1,468	45		x1
8	SE.	11	11	2	3	72	7,840	3,000+	3,000+	n.d.	75	315	[illegible]	731	5,191	1,216	7,606	315	2,246		2,178		2,743	124		x1
9	NE.	10	12	3	3	50	2,477																			x1
10	SW.	21	12	3	3	38	2,066											(4)	(3)		(2)		(1)	(5)		x1
11	Johnstone lake																6,356		126		1,288		4,842			

Water samples indicated thus, x 1, are from glacial drift.
Analyses are reported in parts per million; where numbers (1), (2), (3), (4), and (5) are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).
Analyses Nos. 4, 9, and 10, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

An analysis of water from Johnstone lake made by the Mines Branch, Department of Mines, Ottawa, is listed as No. 11, on the accompanying table of analyses. The excessive amounts of sodium sulphate (Na_2SO_4), and magnesium sulphate ($MgSO_4$), which this water contains, 4,842 and 1,288 parts per million, respectively, render it unfit for either household or stock uses.

Six samples of ground water from various sources in the glacial drift were collected and analysed by the Geological Survey. The results of three other analyses of waters from similar sources made by the Provincial Analyst of Saskatchewan are available and included in the accompanying table. The following generalizations are based upon these analyses, observations at the well sites, and from analyses of waters from similar sources in adjoining municipalities.

Water contained in the lake sands bordering lake Johnstone is generally more highly mineralized than other near-surface water. It is presumable that the same processes of evaporation and consequent concentration of salts that have affected the water in the lake have caused the large amounts of salts to be present in the sediments of the bordering lowlands. This condition is particularly noticeable in undrained depressions, and in places where the lake sands fill depressions in the surface of the more impervious underlying boulder clay.

Water is obtained only in very small amounts by seepage from lake clays and nearly all the water supplies in the areas covered by these deposits are obtained from the boulder clay. The waters in the lake clay-covered areas are, therefore, not essentially different in quality from those in the moraine and till-covered areas.

Large variations in the character of the waters from the glacial till and moraine are noted throughout the region, and many

are within small areas. One well may yield a moderately hard, drinkable water, whereas another well sunk to a similar depth only a few hundred feet away may give a supply too highly charged with dissolved sulphate salts to be fit even for watering stock. It is not to be inferred, therefore, that if water of poor quality is found in one well, such conditions must of necessity exist over an extensive area. The type of material from which the water comes is important in relation to the amount of mineral salts the water contains. The boulder clay is regarded as being the chief source of the sulphate salts found so commonly in waters from the drift. Hence, waters derived from wells sunk entirely in boulder clay contain the largest amount of dissolved salts and may be unfit for farm use. Waters from sands and gravels as a rule contain lesser amounts, although the amount is largely dependant upon the thickness, porosity, and depth of the porous beds below the surface. Of these, the depth is possibly the most important factor as it usually represents the thickness of overlying boulder clay through which the water must percolate before reaching the gravel and sand bed. Analyses Nos. 4 and 10 may be considered as fairly typical of waters from sand or gravel beds lying under only a few feet of boulder clay. Analysis No. 4 is of a water that has dissolved only very small amounts of mineral salts during its contact with drift materials. It has a total salt content of only 346 parts per million, consisting of small amounts of calcium and magnesium salts. Analysis No. 10 is a more highly mineralized water, and of the type most commonly derived from shallow beds in the boulder clay. It contains 2,066 parts per million of dissolved salts, the order of their relative abundance being: sodium sulphate, magnesium sulphate, calcium sulphate, calcium carbonate, and sodium chloride. The individual salts are not in large concentration in the water, and it is used for domestic purposes without harmful effects. Waters obtained from shallow sources are easily polluted,

however, and care should be exercised in keeping the catchment area free from decaying animal and vegetable matter.

Analyses Nos. 1, 2, 5, 7, and 9, on the table, are of waters from porous beds under greater thicknesses of clays. The total dissolved salt content of these waters ranges from 2,477 to 6,444 parts per million. The total is made up largely of sulphate salts of which sodium sulphate is in the greatest concentration, followed by magnesium sulphate and calcium sulphate. Calcium carbonate and sodium chloride are also present, but in lesser amounts. The generally accepted limit of the combined sodium and magnesium sulphate salt content in water for domestic use is 1,000 parts per million. However, with the possible exception of sample No. 9, these waters all contain these salts in amounts greater than this, but samples Nos. 1, 5, and 9 are used for the household. It is believed that persons unaccustom to the use of such water as indicated by analysis No. 1 would experience decided laxative effects upon drinking it. The waters are all used for stock, but the 6,440 parts per million of salts that sample No. 2 contains is excessive. Waters with lesser amounts of sulphate salts in solution are reported to have caused marked scouring effects in stock.

Analyses Nos. 3, 6, and 8 are of waters from interglacial "sea-mud" beds. Analyses Nos. 3 and 8 are similar to analyses of waters from deeply lying porous beds in the boulder clay. They show a total salt content of 4,400 and 7,840 parts per million, made up predominately of sodium and magnesium sulphate. The waters are used for stock, but cannot be considered suitable even for this purpose, and stock are reported to have died from drinking water from the well from which the third analysis was taken. Analysis No. 6 differs from Nos. 3 and 8, in that magnesium sulphate is absent and increased amounts of sodium sulph to and some sodium carbonate are present. The magnesium sulphate is the most harmful of the sulphate salts to stock, and with its absence this water is probably better

for stock use than the other two analysed waters from the inter-glacial "sea-mud" beds. Water containing sodium carbonate (black "alkali") is harmful to vegetation, and should not be used for garden irrigation. Although this water contains only a small amount of this salt, it is combined with a large amount of sodium sulphate which is also somewhat harmful to vegetation, and the prolonged use of the water would gradually have injurious effects.

Iron forms an objectionable impurity in many waters from the deeper sources in the glacial deposits in this municipality. Much of this iron may be removed by allowing the water to stand for a period of time in a trough or container having a large water surface exposed to the air. Agitation of the water is also helpful in removing iron. One method that has proved successful is to allow the water to pass over a sheet of corrugated galvanized iron, suspended between the pump and the trough.

Water from the Bedrock

Any small seepages of water obtained from the shales of the Bearpaw formation that forms the bedrock beneath the glacial deposits throughout the entire township would probably contain salts in excess of 5,000 parts per million made up largely of sodium sulphate or sodium chloride. As a rule waters from this source are unfit for any ordinary farm purpose.

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, 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	S.½	3	10	1	3	Bored	110	2,360	- 30	2,330	110	2,250	Glacial sand	Hard, clear, mineralized	42	D, S	Abundant supply.
2	NE.	5	"	"	"	Dug	45	2,370	- 35	2,335	35	2,335	Glacial sandy clay	Hard, clear, "alkaline"		S	Insufficient for local needs.
3	NE.	5	"	"	"	Bored	96	2,360									Dry hole; Bearpaw soapstone at base; also several seepage wells.
4	NW.	6	"	"	"	Bored	35	2,360	- 18	2,342	20	2,340	Glacial sand and gravel	Hard, clear.	42	D, S	Intermittent supply.
5	SE.	7	"	"	"	Bored	75	2,380									Dry hole; glacial blue clay at base.
6	NE.	9	"	"	"	Bored	110	2,370	- 40	2,330	110	2,260	Glacial sand	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs; #.
7	SW.	10	"	"	"	Bored	104	2,365	- 30	2,335	104	2,261	Glacial sand	Hard, clear, iron	42	D	Abundant supply.
8	E.½	12	"	"	"	Bored	125	2,410	-125	2,285	125	2,285	Glacial red clay	Hard, clear, "alkaline", iron		S	Intermittent supply.
9	SE.	13	"	"	"	Bored	148	2,390	-138	2,252	138	2,252	Glacial sand	Hard, "alkaline"		S	Insufficient; well now filled in.
10	SW.	13	"	"	"	Bored	40	2,380	- 20	2,360	40	2,340	Glacial sand and gravel	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
11	NE.	14	"	"	"	Dug	38	2,400	- 28	2,372	34	2,366	Glacial gravel	Hard, clear	42	D, S	Intermittent supply.
12	SE.	15	"	"	"	Bored	40	2,360	- 20	2,340	40	2,320	Glacial red gravel	Hard, clear, "alkaline", iron		S	Sufficient for local needs; also a 10-foot seepage well used for household needs.
13	SW.	15	"	"	"	Bored	70	2,360									Dry hole; glacial clay at base; also a shallow seepage well for household needs.
14	SE.	16	"	"	"	Dug	22	2,370	- 20	2,350	20	2,350	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
15	SW.	16	"	"	"	Bored	114	2,360	- 34	2,326	114	2,246	Glacial sand(?)	Hard, clear, "alkaline"	42	S	Sufficient for local needs; #.
16	NE.	17	"	"	"	Bored	65	2,365	- 40	2,325	65	2,300	Glacial sand	Hard, clear		D, S	Insufficient; was good supply but filled up with quicksand.
17	SE.	19	"	"	"	Dug	14	2,375	- 11	2,364	11	2,364	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
18	E.½	20	"	"	"	Dug	21	2,360	0	2,360			Glacial clay	Hard, clear	42	D, S	Intermittent supply.
19	SE.	21	"	"	"	Bored	65	2,360									Dry hole; glacial blue clay at base.
20	SE.	23	"	"	"	Bored	45	2,410	- 30	2,380	45	2,365	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
21	SW.	23	"	"	"	Bored	110	2,360									Dry hole; glacial blue clay at base.
22	NW.	24	"	"	"	Bored	100	2,400	- 60	2,340	100	2,300	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs.
23	N.½	24	"	"	"	Bored	100	2,395	- 40	2,355			Glacial sand	Hard, clear, "alkaline"		D, S	Intermittent supply.
24	NW.	25	"	"	"	Bored	64	2,390	- 40	2,350	65	2,325	Glacial red, sandy clay	Hard, clear, iron	42	D, S	Sufficient for local needs.
25	SE.	27	"	"	"	Bored	145	2,370									Many dry holes; Bearpaw shale at base.

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

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

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
26	NE.	30	10	1	3	Bored	150	2,340									Dry hole; Bearpaw shale(?) at base.
27	SW.	31	"	"	"	Bored	100	2,340									Dry hole; glacial blue clay at base; also a sha shallow seepage well.
28	N.½	32	"	"	"	Bored	148	2,355	-100	2,255			Glacial clay	Hard, clear, "alkaline"	42	S	5 barrels a day.
29	SE.	34	"	"	"	Bored	150	2,365									Dry hole; glacial clay at base.
30	NE.	34	"	"	"	Bored	116	2,365	-110	2,255	110	2,255	Interglacial "sea-mud"	Hard, clear, iron, "alkaline"		D, S	Insufficient for local needs.
31	SE.	35	"	"	"	Bored	148	2,355	- 70	2,285	148	2,207	Glacial gravel	Hard, clear, iron		D, S	Sufficient for local needs.
32	SW.	35	"	"	"	Bored	130	2,365	-120	2,245			Glacial fine white sand	Hard, clear, "alkaline", iron		D, S	Insufficient for local needs.
33	NW.	36	"	"	"	Bored	100	2,340	- 90	2,250			Glacial sand	Hard, clear, "alkaline"	42	S	Insufficient for local needs.
1	NE.	1	10	2	3	Drilled	300	2,340									Eight dry holes; Bearpaw soapstone at base.
2	NE.	3	"	"	"	Bored	100	2,330	- 20	2,310	100	2,330	Interglacial "sea-mud"	Hard, clear, "alkaline"	42	S	Sufficient for local needs.
3	SE.	4	"	"	"	Bored	90	2,330	- 22	2,308	90	2,240	Interglacial "sea-mud"	Hard, clear, "alkaline", iron	42	S	Sufficient for local stock needs; an 18-foot seepage well used for household needs.
4	N.½	4	"	"	"	Bored	138	2,300	- 4	2,296	138	2,162	Interglacial "sea-mud"	Hard, clear, "alkaline"	42	S	Sufficient for local stock needs; also a seepage well for household needs.
5	SE.	6	"	"	"	Dug	24	2,340	0	2,340	6	2,334	Glacial gravel	Hard, clear, "alkaline"	45	D	Intermittent supply; many similar wells.
6	SE.	7	"	"	"	Bored	70	2,360	- 50	2,310			Glacial clay(?)	Hard, clear, "alkaline", iron	42	S	Sufficient for local needs.
7	NE.	7	"	"	"	Bored	65	2,330	- 35	2,295	65	2,265	Glacial sand	Hard, clear, soda	44	D, S	Sufficient for local needs; also 2 shallow seepage wells, not used.
8	NE.	8	"	"	"	Bored	60	2,330	- 6	2,324	60	2,270	Glacial sand	Hard, clear, "alkaline"	42	S	Sufficient for 40 head stock; also a 14-foot seepage well.
9	NW.	10	"	"	"	Bored	143	2,330	- 12	2,318	143	2,187	Interglacial "sea-mud"	Hard, clear, "alkaline"	42	S	Sufficient for local stock needs.
10	NW.	12	"	"	"	Dug	32	2,365	- 29	2,336	29	2,336	Glacial sand and gravel	Hard, clear	43	D, S	Sufficient for local needs.
11	SE.	16	"	"	"	Bored	143	2,335	- 20	2,315	143	2,192	Interglacial "sea-mud"	Hard, "alkaline", brown sediment	43	S	Sufficient for local needs.
12	SW.	16	"	"	"	Bored	120	2,340	-100	2,240			Interglacial deposits	Hard, clear, "alkaline"	42	S	Intermittent supply; laxative.
13	NW.	16	"	"	"	Bored	100	2,340	- 10	2,330			Glacial drift	Hard, clear, "alkaline", iron, brown sediment	42	S	Sufficient for 25 head stock; also a 25-foot seepage well with a small supply.
14	SW.	17	"	"	"	Bored	85	2,355	- 20	2,335	85	2,270	Glacial drift	Hard, clear, "alkaline", iron	42	S	Sufficient for 15 head stock.

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

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, 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
15	NE.	19	10	2	3	Bored	90	2,335	- 20	2,315	90	2,245	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local stock needs; drinking water hauled.
16	NW.	21	"	"	"	Bored	115	2,330					Glacial drift	Hard, cloudy		S	Sufficient for local needs.
17	NW.	22	"	"	"	Bored	110	2,330	- 20	2,310	110	2,220	Glacial sand and gravel	Hard, clear, "alkaline", iron	43	S	Sufficient for local needs.
18	NE.	22	"	"	"	Bored	100	2,320									Dry hole; Bearpaw shale at base.
19	NW.	24	"	"	"	Bored	80	2,338	- 70	2,268			Glacial clay	Hard, clear, "alkaline"	42	S	
20	SW.	26	"	"	"	Bored	100	2,320									Dry hole; Bearpaw shale at base.
21	NW.	27	"	"	"	Bored	86	2,330	- 14	2,316	86	2,244	Glacial gravel	Hard, clear, "alkaline", red sediment iron	43	S	Sufficient for stock needs; 12 barrels a day.
22	NW.	28	"	"	"	Bored	105	2,330	- 8	2,322	105	2,225	Glacial grey sand	Hard, clear, "alkaline", iron	42	S	Sufficient for local needs.
23	NE.	28	"	"	"	Bored	80	2,325	- 20	2,305	80	2,245	Glacial sand	Hard, clear, iron		S	Sufficient for local needs.
24	S.½	30	"	"	"	Bored	114	2,340	- 24	2,316	114	2,226	Glacial sand	Hard, clear, "alkaline", black sediment	42	S	Oversufficient for 20 head stock; a 22-foot well, with intermittent supply; used for drinking.
25	NW.	30	"	"	"	Bored	105	2,360	- 25	2,335	105	2,255	Glacial grey sand	Hard, clear, "alkaline"	42	S	Sufficient for local needs.
26	SE.	31	"	"	"	Bored	80	2,365	- 38	2,327	80	2,285	Glacial grey sand	Hard, clear, "alkaline"	42	S	Sufficient for local needs.
27	NE.	31	"	"	"	Bored	130	2,340	- 20	2,320	130	2,210	Interglacial deposits	Hard, clear, "alkaline", iron	42	S	Sufficient for 100 head stock; but of poor quality; a shallow seepage well used for household needs; #.
28	SE.	32	"	"	"	Bored	110	2,325	- 10	2,315	110	2,215	Glacial sand	Hard, clear, "alkaline", iron, salty, brown sediment	42	S	Sufficient for local needs; also a 29-foot well with poor supply and poor quality, and a 10-foot well used for household needs.
29	NE.	33	"	"	"	Bored	120	2,320	- 7	2,313	120	2,200	Interglacial deposits	Hard, clear, mineralized		S	Sufficient for local needs.
30	N.½	34	"	"	"	Bored	67	2,320	- 67	2,253	67	2,253	Glacial clay	Hard, clear, iron, brown sediment, "alkaline"	43	S	Sufficient for local needs; drinking water hauled 6 miles; also a 20-foot dry hole.
31	N.½	35	"	"	"	Bored	80	2,290	- 6	2,284	80	2,210	Glacial sand	Hard, clear, iron, salty, "alkaline" red sediment	42	S	Insufficient for local needs; domestic water hauled.
32	N.½	36	"	"	"	Bored	20	2,315	- 16	2,299	16	2,299	Glacial sand	Hard, clear	44	D, S	Insufficient; 6 barrels a day; also a 90-foot dry hole.
1	SW.	2	10	3	3	Dug	22	2,390	- 20	2,370	20	2,370	Glacial clay	Hard		D	Insufficient for local needs; 3 dry holes 40 feet, 70 feet and 45 feet deep.
2	NE.	2	"	"	"	Bored	60	2,360	- 10	2,350	60	2,300	Glacial sand	Hard, clear	43	S	Oversufficient for local needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
3	NE.	4	10	3	3	Bored	85	2,350	- 15	2,335	80	2,270	Glacial sand	Hard, clear, "alkaline"	42	S	Sufficient for local needs; a 20-foot seepage well is used for household needs.
4	NE.	5	"	"	"	Dug	10	2,385	- 5	2,380	5	2,380	Glacial clay	Hard, clear		D	
5	SW.	6	"	"	"	Bored	32	2,355	- 28	2,327	28	2,327	Glacial sandy clay	Hard, clear	44	D, S	Insufficient for local needs.
6	NW.	6	"	"	"	Bored	30	2,340									Dry hole; glacial drift at base.
7	SW.	10	"	"	"	Bored	65	2,365	- 58	2,307	65	2,300	Glacial sand and gravel	Hard, clear, "alkaline"	42	S	Sufficient for local needs.
8	NW.	10	"	"	"	Dug	17	2,370	- 10	2,360	10	2,360	Glacial sand	Soft, clear		D, S	Insufficient for local needs; also a seepage well beside a pond.
9	NW.	12	"	"	"	Bored	65	2,350	- 15	2,335	65	2,285	Glacial sand	Hard, clear, iron		S	Sufficient for local needs.
10	SE.	13	"	"	"	Bored	100	2,365	- 60	2,305	100	2,265	Interglacial "sea-mud"	Hard, "alkaline"		N	Unfit for use; so filled in. A seepage well used for household needs.
11	SW.	14	"	"	"		400	2,360									Dry hole; also another dry hole 60 feet deep; Bearpaw soapstone at base.
12	NW.	14	"	"	"	Drilled	500	2,310									Dry hole; Bearpaw shale at base.
13	NW.	15	"	"	"	Bored	60	2,350	- 40	2,310	90	2,260	Bearpaw sand	Hard, clear, "alkaline", red sediment, iron		S	Sufficient for local needs; a 15-foot seepage well is used for domestic needs.
14	SE.	16	"	"	"	Bored	60	2,340	- 24	2,316	60	2,280		Hard, "alkaline"		S	Sufficient for local needs; also two 90-foot dry holes with base in Bearpaw soapstone.
15	SW.	16	"	"	"	Bored	70	2,330									Six dry holes; Bearpaw soapstone at base.
16	SW.	17	"	"	"	Bored	35	2,340	- 20	2,320	-35	2,305	Glacial sand			N	Unfit for use; so filled in; also an 18-foot seepage well beside a slough.
17	SE.	18	"	"	"	Drilled	700	2,325									Dry hole; Bearpaw soapstone at base; also a seepage well beside dugout.
18	NW.	19	"	"	"	Bored	49	2,310	- 6	2,304	49	2,261	Interglacial "sea-mud"	Hard, clear, iron	44	S	Sufficient for local needs; also a well beside dugout.
19	SW.	20	"	"	"		65	2,360									Four dry holes; Bearpaw soapstone at base.
20	NW.	20	"	"	"	Bored	65	2,375	- 9	2,366	65	2,310	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs; also a seepage well for household needs.
21	NE.	20	"	"	"	Bored	70	2,380	- 30	2,350	70	2,310	Glacial sand(?)	Hard, clear, "alkaline", iron		S	Sufficient for local needs; a 20-foot well is used for domestic purposes.
22	SE.	21	"	"	"	Dug	25	2,360	- 6	2,354	25	2,335	Glacial sand	Hard, clear		D	Sufficient for local needs; other wells 100 feet deep have poor supply of mineralized water from Bearpaw shale(?).
23	SW.	21	"	"	"	Dug	20	2,365					Glacial clay				Intermittent supply.
24	NW.	22	"	"	"	Bored	30	2,380	- 15	2,365	30	2,350	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs.
25	SW.	23	"	"	"	Bored	90	2,350	- 40	2,310	90	2,260	Bearpaw shale	Hard, clear, "alkaline"		S	Insufficient for local needs; one barrel a day.
26	NW.	23	"	"	"	Bored	110	2,360	- 60	2,300	110	2,250	Bearpaw shale	Hard, "alkaline"		N	Unfit for use; also 2 seepage wells in pasture 18 feet and 30 feet deep.
27	SE.	24	"	"	"	Bored	85	2,360	- 20	2,340	85	2,275	Glacial gravel	Hard, clear, "alkaline"		S	

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	NE.	24	10	3	3	Bored	170	2,360									Dry hole; Bearpaw soapstone at base.
29	NE.	24	"	"	"	Bored	80	2,360	- 30	2,330	80	2,280	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for local needs; also a seepage well for domestic needs.
30	SW.	25	"	"	"	Bored	60	2,360	- 57	2,303	57	2,303	Glacial gravel	Hard, "alkaline"		D	Intermittent supply; several similar wells.
31	SE.	26	"	"	"	Bored	110	2,360	- 60	2,300	110	2,250	Bearpaw shale(?)	Hard, "alkaline"		N	Unfit for use.
32	NW.	27	"	"	"	Bored	92	2,400	- 50	2,350	92	2,308	Glacial gravel	Hard, clear, "alkaline", red sediment, iron		S	Intermittent supply; also a 20-foot seepage well for domestic needs.
33	SW.	28	"	"	"	Bored	70	2,300	- 35	2,265	35	2,265	Glacial clay	Hard, clear, "alkaline"		N	Intermittent supply.
34	SE.	30	"	"	"	Dug	12	2,380	- 4	2,376	4	2,376	Glacial clay	Hard, clear		D	Sufficient for local needs.
35	NE.	30	"	"	"	Bored	40	2,410	- 30	2,380	30	2,380	Glacial clay	Hard, clear, "alkaline"		S	Sufficient for local needs.
36	SW.	33	"	"	"	Dug	20	2,395	- 14	2,381	14	2,381	Glacial clay	Hard, clear, "alkaline"		D, S	Sufficient for local needs; 4 families and school in town of Palmer used this well.
37	NW.	33	"	"	"	Bored	90	2,405	- 70	2,335	70	2,335	Glacial drift	Hard, clear, "alkaline", red sediment, iron	42	S	Sufficient for local needs; a shallow well is used for domestic needs.
38	SW.	35	"	"	"	Bored	95	2,380	- 40	2,340			Glacial yellow clay	Hard, clear, "alkaline", iron, brown, sediment		S	Sufficient for 6 head stock; a 32-foot well is used for domestic needs; #.
39	NW.	36	"	"	"	Dug	24	2,360	- 12	2,348	12	2,348	Glacial clay	Hard, clear		D, S	Sufficient for local needs.
40	SW.	36	"	"	"	Bored	130	2,350	- 40	2,310	130	2,220	Glacial sand and gravel	Hard, clear, "alkaline", red sediment, iron	43	S	Sufficient for local needs; a 9-foot seepage well is used for domestic needs.
1	SW.	2	11	1	3	Bored	127	2,380	-107	2,273	127	2,253	Glacial gravel	Hard, iron, "alkaline"	42	D, S	Sufficient for local needs.
2	NE.	2	"	"	"	Bored	59	2,280	- 39	2,241	59	2,221	Glacial sand	Hard, iron, "alkaline"	42	S	Sufficient for local needs; a 13-foot well supplies household needs.
3	SE.	3	"	"	"	Bored	144	2,365					Interglacial "sea-mud"	Hard, iron, "alkaline"		N	Not used due to plugging.
4	N.½	5	"	"	"	Bored	148	2,385	-142	2,243			Glacial clay	Hard, clear, "alkaline"	42	S	Intermittent supply; several similar wells.
5	N.½	6	"	"	"	Dug	35	2,300	- 25	2,275			Glacial clay	Hard, clear	42	D	Intermittent supply; also many dry holes.
6	NE.	7	"	"	"	Bored	60	2,370	- 40	2,330	60	2,310	Glacial sand	Hard, clear, iron	43	S	Sufficient for local needs.
7	NE.	12	"	"	"	Bored	126	2,300	- 66	2,234	126	2,174	Glacial gravel	Hard, clear, soda, iron, red sediment	42	S	Sufficient for 40 head stock; a 20-foot well is used for domestic needs.
8	E.½	14	"	"	"	Bored	60	2,275	0	2,275			Glacial drift	Hard, cloudy, "alkaline", black sediment	43	S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
9	NW.	15	11	1	3	Bored	54	2,290	- 37	2,253	54	2,236	Glacial gravel	Hard, clear, iron	42	D, S	Sufficient for 100 head stock.
10	NW.	16	"	"	"	Bored	70	2,320	- 45	2,275	70	2,250	Glacial sand	Hard, clear, iron	42	D	Sufficient for local needs.
11	NE.	16	"	"	"	Bored	75	2,295	- 40	2,255	75	2,220	Glacial sand	Hard, clear, iron	42	D, S	Sufficient for local needs.
12	S.½	17	"	"	"	Bored	95	2,325	- 80	2,245	95	2,230	Glacial gravel(?)	Hard, clear, red sediment, iron	42	D, S	Sufficient for local needs.
13	NE.	17	"	"	"	Dug	20	2,345	- 18	2,327	18	2,327	Glacial yellow sand	Soft		D, S	Sufficient for local needs; also many dry holes.
14	SW.	18	"	"	"	Dug	30	2,340	- 15	2,325	30	2,310	Glacial sand	Hard, clear		D, S	Sufficient for 60 head stock.
15	NW.	18	"	"	"	Dug	25	2,375	- 17	2,358	25	2,350	Glacial gravel	Hard, clear	43	D, S	Sufficient for local needs.
16	NW.	19	"	"	"	Bored	48	2,355	- 33	2,322			Glacial sand	Hard, clear, "alkaline", sulphur		S	Insufficient for local needs.
17	NE.	20	"	"	"	Bored	70	2,315	- 35	2,280	70	2,245	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs; another well 45 feet deep is used for domestic needs.
18	SE.	21	"	"	"	Bored	60	2,275	- 20	2,255	60	2,215	Glacial fine gravel	Hard, clear	42	D, S	Sufficient for 40 head stock.
19	SE.	22	"	"	"	Bored	35	2,240	- 17	2,223	35	2,205	Glacial sand	Hard, clear, "alkaline", iron	42	D, S	Sufficient for local needs.
20	SW.	22	"	"	"	Bored	67	2,275	- 47	2,228	67	2,208	Glacial sand	Hard, clear	42	D, S	Sufficient for local needs; another similar well.
21	NE.	23	"	"	"	Bored	43	2,260	- 18	2,242	43	2,217	Glacial sand	Hard, clear, salty	42	D, S	Sufficient for local needs.
22	SW.	24	"	"	"	Bored	60	2,260	- 30	2,230	60	2,200	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for local needs.
23	NE.	24	"	"	"	Bored	40	2,265	- 32	2,233	40	2,225	Glacial sand	Hard, clear, "alkaline"	43	S	Sufficient with aid of another similar well.
24	NE.	26	"	"	"	Dug	8	2,255	- 6	2,249	6	2,249	Glacial sand	Hard, iron	43	D, S	Sufficient for 60 head stock.
25	E.½	27	"	"	"	Drilled	118	2,280	- 30	2,250	118	2,162	Glacial sand	Hard, clear, iron, "alkaline"	42	D, S	Insufficient due to plugging; also a 16-foot seepage well.
26	S.½	30	"	"	"	Bored	46	2,370	- 16	2,354	46	2,324	Glacial coarse sand	Hard, clear, "alkaline", iron	43	S	Sufficient for 60 head stock.
27	NW.	30	"	"	"	Bored	100	2,370									Dry hole; Bearpaw soapstone at base.
28	S.½	31	"	"	"	Bored	72	2,340	- 48	2,292	72	2,268	Glacial gravel	Hard, clear, iron	42	D, S	Sufficient for local needs.
29	NE.	31	"	"	"	Bored	58	2,340	- 38	2,302	58	2,282	Glacial coarse gravel	Hard, clear, "alkaline", iron	42	D, S	Sufficient for local needs.
30	NW.	32	"	"	"	Bored	95	2,330	- 44	2,286	95	2,235	Glacial gravel	Hard, clear, "alkaline"	42	D, S	Sufficient for local needs.
31	E.½	32	"	"	"	Bored	74	2,325	- 66	2,259	74	2,251	Glacial gravel	Hard, clear, red sediment, iron	43	D, S	Sufficient for local needs.
32	SE.	33	"	"	"	Bored	96	2,275	- 66	2,209	96	2,179	Glacial sand	Hard, clear iron	42	D, S	Sufficient for local needs; #.

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

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

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, 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	NE.	33	11	1	3	Bored	104	2,275	- 64	2,211	104	2,171	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for local needs.
34	W.½	34	"	"	"	Bored	75	2,270	- 40	2,230	75	2,195	Glacial coarse sand	Hard, clear, "alkaline", iron	42	D, S	Sufficient for local needs.
35	SW.	35	"	"	"	Bored	96	2,250	- 25	2,225	96	2,154	Glacial sand	Hard, clear, iron	42	D, S	Sufficient for local needs.
36	NE.	35	"	"	"	Bored	50	2,245	- 40	2,205			Glacial drift	Hard, clear, iron	43	D	Sufficient for local needs.
37	NE.	36	"	"	"	Bored	75	2,265	- 30	2,235	75	2,190	Glacial coarse sand	Hard, clear, iron		D, S	Sufficient for 100 head stock.
1	NW.	1	11	2	3	Bored	80	2,320	- 16	2,304	80	2,240	Glacial sand	Hard, clear, "alkaline"	43	D, S	Sufficient for local needs.
2	NE.	4	"	"	"	Bored	90	2,335	- 30	2,305	90	2,245	Glacial sand	Hard, clear, "alkaline", iron		S	Sufficient for local needs; a shallow well is used for domestic needs.
3	SE.	6	"	"	"	Bored	85	2,330	- 2	2,328	85	2,245	Glacial sand	Hard, clear, "alkaline"	43	S	Sufficient for local needs.
4	SW.	6	"	"	"	Drilled	300	2,320									Dry hole; Bearpaw soapstone at base.
5	SW.	6	"	"	"	Bored	44	2,320	- 20	2,300	44	2,276	Glacial sand and gravel	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
6	NE.	6	"	"	"	Bored	134	2,320	+ 1	2,321	134	2,186	Interglacial "sea-mud"	Hard, clear, mineralized	42	S	Sufficient for local needs; also a seepage well for domestic needs; #.
7	SW.	7	"	"	"	Bored	123	2,330	- 63	2,267	123	2,207	Interglacial deposits	Hard, clear, "alkaline"	42	D, S	Sufficient for 90 head stock.
8	NW.	7	"	"	"	Bored	80	2,365	- 50	2,315	80	2,285	Interglacial "sea-mud"	Hard, clear, "alkaline"	42	S	Sufficient for local needs.
9	NE.	7	"	"	"	Bored	112	2,385									Dry hole; Bearpaw soapstone at base; also several seepage wells.
10	NE.	8	"	"	"	Bored	30	2,400	- 20	2,380	30	2,370	Glacial sand and gravel	Hard, clear, "alkaline"	43	S	Sufficient for 25 head stock.
11	SW.	9	"	"	"	Dug	30	2,360	- 15	2,345	15	2,345	Glacial clay	Hard, clear		D	Sufficient for domestic needs; stock watered at pond.
12	SW.	10	"	"	"	Bored	90	2,395	- 50	2,345	90	2,305	Glacial sandy clay	Hard, rusty, "alkaline", iron		S	Sufficient for local needs; #.
13	SE.	11	"	"	"	Bored	72	2,350	- 20	2,330	72	2,278		Hard, clear, "alkaline"		S	Sufficient for local needs; #.
14	SW.	12	"	"	"	Bored	40	2,350	- 8	2,342			Glacial sandy clay	Hard, "alkaline"		S	Insufficient for local needs.
15	NE.	13	"	"	"	Dug	15	2,390	- 12	2,378	12	2,378	Glacial drift	Hard, clear, lime	45	D, S	Sufficient for 17 head stock.
16	SW.	14	"	"	"	Bored	110	2,390	- 40	2,350	90	2,300	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs; also a spring in the pasture with soft water.
17	SE.	15	"	"	"	Dug	80	2,390	- 70	2,320			Glacial clay	Hard, "alkaline"		D, S	Intermittent supply; also other shallow wells dug in sloughs.
18	SW.	15	"	"	"	Dug	18	2,410	- 8	2,402	12	2,398	Glacial sand	Hard, clear	42	D, S	Sufficient during wet seasons; also a number of similar wells.
19	SW.	16	"	"	"	Dug	28	2,410	- 18	2,392			Glacial sand				Sufficient for local needs.
20	SW.	17	"	"	"	Bored	55	2,440	- 25	2,415	55	2,385	Glacial sand	Hard, clear		S	Sufficient for local needs; drinking water hauled.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, 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
21	NW.	18	11	2	3	Bored	55	2,465	- 45	2,420	45	2,420	Glacial sand	Hard, clear, "alkaline"	42	S	Sufficient for local needs; also a 15-foot well used for domestic needs.
22	SE.	21	"	"	"	Bored	75	2,450	- 20	2,430	78	2,372	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
23	NW.	23	"	"	"	Bored	90	2,465	- 85	2,380			Glacial clay	Hard, clear, "alkaline"	42	D, S	Intermittent supply; also many dry holes.
24	NE.	24	"	"	"	Bored	48	2,355	- 33	2,322			Glacial black sand	Hard, clear, "alkaline", sulphur		S	Insufficient for local needs.
25	SW.	25	"	"	"	Bored	30	2,380	- 10	2,370	21	2,359	Glacial yellow clay and sand	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
26	NW.	27	"	"	"	Bored	38	2,410	- 20	2,390	38	2,372	Glacial sandy clay	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
27	SE.	30	"	"	"	Bored	110	2,440	- 65	2,375	110	2,330	Glacial gravel	Hard, clear	42	S	Sufficient for local needs; a shallow well is used for domestic needs.
28	NW.	30	"	"	"	Bored	35	2,450	- 19	2,431	35	2,415	Glacial coarse gravel	Hard, clear		D, S	Sufficient for local needs.
29	SE.	31	"	"	"	Dug	4	2,410	- 3	2,407	3	2,407	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for local needs; also a spring on farm.
30	NW.	31	"	"	"	Dug	19	2,455	- 10	2,445	10	2,445	Glacial gravel	Hard, clear, "alkaline", iron	42	D	Sufficient for local needs.
31	NE.	31	"	"	"	Spring		2,415	0	2,415	0	2,415	Glacial gravel	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
32	SE.	33	"	"	"	Bored	30	2,360	- 20	2,340	20	2,340	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 75 head stock; also another similar well.
33	SW.	33	"	"	"	Dug	10	2,340	- 8	2,332	8	2,332	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
34	SW.	35	"	"	"	Bored	25	2,375	- 10	2,365	20	2,355	Glacial sand	Hard, clear, iron		S	Sufficient for local needs.
35	SW.	35	"	"	"	Bored	35	2,320	- 10	2,310	30	2,290	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs.
36	NE.	36	"	"	"	Bored	70	2,350	- 40	2,310	70	2,280	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs; also a seepage well beside slough for domestic needs.
1	SW.	1	11	3	3	Bored	150	2,350									Dry hole; Bearpaw shale at base.
2	NW.	2	"	"	"	Bored	18	2,340	- 9	2,331	9	2,331	Glacial sand	Hard, clear		D	Insufficient for local needs; a 48-foot well with mineralized water; is used for stock in winter.
3	SE.	3	"	"	"	Bored	33	2,345	- 12	2,333	12	2,333	Glacial clay	Soft, clear		D	Insufficient for local needs.
4	SE.	3	"	"	"	Bored	84	2,370	- 50	2,320	50	2,320	Glacial clay	Hard, clear, "alkaline"	42	S	Intermittent supply
5	N.½	5	"	"	"	Bored	70	2,380	- 35	2,345			Glacial sand	Hard, clear, "alkaline"	43	S	Intermittent supply; also a 90-foot well with poor water from Bearpaw shale(?). A 16-foot well is used for domestic needs.
6	SW.	6	"	"	"	Bored	135	2,385									Dry hole; Bearpaw shale at base(?). An 18-foot well is used for domestic needs.
7	W.½	9	"	"	"	Bored	70	2,360	- 35	2,325	70	2,290	Glacial sand	Hard, clear, "alkaline", iron	43	S	Sufficient for 20 head stock; a 15-foot well is used for domestic needs.

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

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

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, 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
8	NE.	9	11	3	3	Bored	85	2,355	- 50	2,305	85	2,270	Glacial sand	Hard, clear, "alkaline", iron	42	S	Sufficient for local needs; a shallow seepage well is used for domestic needs.
9	NW.	10	"	"	"	Bored	65	2,350	- 60	2,290			Glacial sandy clay	Hard, clear, "alkaline"	42	S	Intermittent supply; a shallow seepage well is used for domestic needs.
10	NE.	10	"	"	"	Bored	78	2,360	- 58	2,302				Hard, clear, "alkaline"	42	S	Intermittent supply.
11	SE.	14	"	"	"	Dug	12	2,375	- 4	2,371	4	2,371	Glacial clay	Hard, clear, lime		D	Intermittent supply; also a 21-foot well with mineralized water; used for stock.
12	NW.	14	"	"	"	Dug	25	2,380	- 15	2,365	25	2,355	Glacial sand and gravel	Hard, clear	42	D, S	Intermittent supply.
13	NW.	15	"	"	"	Bored	60	2,385	- 40	2,345			Glacial sand	Hard, clear, "alkaline", iron	43	S	Sufficient for local needs; also a 25-foot seepage well.
14	SE.	16	"	"	"	Bored	85	2,360	- 40	2,320	85	2,275	Interglacial "sea-mud"	Hard, clear, "alkaline", red sediment, iron	43	S	Sufficient for local needs.
15	W.½	16	"	"	"	Bored	65	2,385	- 20	2,365	65	2,320	Glacial sand	Hard, clear, "alkaline", iron	42	S	Sufficient for local needs; also a seepage well.
16	SE.	17	"	"	"	Bored	85	2,360	- 45	2,315	85	2,275	Glacial gravel	Hard, clear, "alkaline"	42	S	Sufficient for 10 head stock; also 2 other wells 16 feet and 40 feet deep.
17	SW.	18	"	"	"	Bored	46	2,350	- 10	2,340	46	2,304	Glacial sand	Soft, clear	43	D	Sufficient for local needs.
18	NW.	18	"	"	"	Bored	70	2,360	- 35	2,325	70	2,290		Hard, clear, "alkaline", red sediment, iron	42	S	Sufficient for local needs; also a 25-foot seepage well.
19	SE.	19	"	"	"	Bored	60	2,375	- 30	2,345	30	2,345	Glacial clay	Hard, clear		D, S	Sufficient for 10 head stock.
20	SW.	19	"	"	"	Bored	50	2,370	- 30	2,340	30	2,340	Glacial drift	Hard, clear, "alkaline"	44	S	Sufficient for local needs.
21	SW.	20	"	"	"	Bored	45	2,320	- 38	2,282			Glacial sand	Hard, clear, iron	42	D, S	Intermittent supply.
22	NE.	20	"	"	"	Bored	30	2,394	- 4	2,390	4	2,390	Glacial clay	Hard, clear	42	D, S	Sufficient for 25 head stock; 2 other similar wells.
23	NW.	21	"	"	"	Bored	30	2,450	- 10	2,440	10	2,440	Glacial clay	Hard, clear	42	D, S	Sufficient for 20 head stock.
24	NW.	23	"	"	"	Bored	30	2,480									2 dry holes; glacial drift at base.
25	E.½	23	"	"	"	Bored	73	2,470	- 10	2,460	10	2,460	Glacial clay	Hard, clear, iron		S	Intermittent supply.
26	SE.	27	"	"	"	Bored	70	2,470	- 60	2,410	70	2,400	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for local needs.
27	N.½	27	"	"	"	Bored	60	2,485	- 40	2,445	40	2,445	Glacial gravel	Hard, clear, iron, red sediment		D, S	Insufficient; 4 barrels a day; also another well 30 feet deep.
28	S.½	28	"	"	"	Bored	40	2,485	- 15	2,470	40	2,445	Glacial gravel	Hard, clear	43	D, S	Another similar well 30 feet deep.
29	N.½	28	"	"	"	Bored	20	2,480	- 17	2,463	17	2,463	Glacial sand(?)	Hard, clear, iron	43	D	Sufficient for local needs; another well 105 feet deep used for stock.

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

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, 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
30	SE.	32	11	3	3	Bored	42	2,460	- 29	2,431	42	2,418	Glacial gravel	Hard, clear, "alkaline"	42	D, S	Sufficient for 50 head stock; also another well 12 feet deep.
31	NE.	32	"	"	"	Bored	70	2,450	- 12	2,438	70	2,380	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
32	SW.	35	"	"	"	Bored	30	2,500	- 20	2,480	30	2,470	Glacial gravel	Hard, clear, iron		D, S	Abundant supply; also a 30-foot seepage well.
33	NE.	35	"	"	"	Dug	21	2,465	- 19	2,446	19	2,446	Glacial gravel	Hard, clear	43	D, S	Sufficient for local needs with the aid of another similar well.
34	NW.	36	"	"	"	Bored	45	2,460	- 22	2,438	45	2,415	Glacial gravel	Hard, cloudy, "alkaline", iron	42	D, S	Sufficient for local needs.
1	SE.	2	12	1	3	Bored	40	2,255	- 9	2,246	40	2,215	Glacial sand	Hard, clear, "alkaline", yellow sediment, sulphur	43	S	Sufficient for local needs.
2	NE.	3	"	"	"	Bored	35	2,280	- 33	2,247	33	2,247	Glacial sand	Hard, clear	42	S	Insufficient; enough for only 10 head stock.
3	SE.	5	"	"	"	Bored	45	2,320	- 25	2,295			Glacial drift	Soft, clear	42	D, S	Sufficient for local needs.
4	SW.	6	"	"	"	Bored	30	2,370	- 12	2,358	12	2,358	Glacial sand	Soft, clear		D, S	Insufficient for local needs; 2 other similar wells.
5	NW.	10	"	"	"	Bored	64	2,340	- 34	2,306	64	2,276		Hard, clear, "alkaline", red sediment, iron		D, S	Sufficient for local needs.
6	S.½	15	"	"	"	Bored	90	2,330	- 60	2,270	90	2,240	Glacial sand	Hard, clear	43	D, S	Sufficient for local needs.
7	N.½	15	"	"	"	Bored	40	2,310	- 24	2,286	30	2,270	Glacial blue sand	Hard, clear, "alkaline"	42	D, S	Sufficient for local needs.
8	N.½	16	"	"	"	Bored	37	2,320	- 33	2,287	33	2,287	Glacial gravel	Clear, "alkaline"	43	D, S	Insufficient for local needs.
9	NE.	17	"	"	"	Dug	33	2,310	- 23	2,287	23	2,287	Glacial sand and gravel	Hard, clear		S	Sufficient for local needs; neighbours haul from here.
10	SE.	19	"	"	"	Bored	65	2,330	- 48	2,282	65	2,265	Glacial gravel	Hard, clear, "alkaline"	42	S	Sufficient for local needs; a 30-foot well is used for household needs.
11	SW.	19	"	"	"	Bored	60	2,328	- 36	2,292	60	2,268	Glacial sandy gravel	Hard, clear, "alkaline"	42	S	Intermittent supply; a 13-foot well is used for household needs.
12	SE.	19	"	"	"	Dug	20	2,280	- 18	2,262	18	2,262	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
13	NE.	20	"	"	"	Bored	40	2,340	- 36	2,304	36	2,304	Glacial sand	Hard, yellow, "alkaline"		D, S	Barely sufficient for local needs; 2 other similar wells.
14	E.½	21	12	1	3	Bored	28	2,320	- 14	2,306	20	2,300	Glacial gravel	Hard, clear, "alkaline"	43	S	Sufficient for local needs; a 20-foot well is used for household needs.
15	SW.	21	"	"	"	Bored	32	2,320	- 29	2,291	29	2,291	Glacial sand	Hard, clear, iron, "alkaline"	42	D, S	Sufficient for local needs.
16	SW.	21	"	"	"	Dug	15	2,310	- 5	2,305	5	2,305	Glacial sandy clay	Soft, clear		D, S	Sufficient for local needs; neighbours haul from here.
17	NW.	22	"	"	"	Bored	25	2,300	- 15	2,285	15	2,285	Glacial sandy clay	Hard, clear, "alkaline"		S	Sufficient for local needs; domestic water hauled.
18	SW.	23	"	"	"	Spring		2,220	+ 6	2,226			Glacial gravel	Hard, clear		D, S	Sufficient for local needs; neighbours haul from here.

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 SUTTON, NO. 103, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
19	NW.	23	12	1	3	Dug	14	2,220	- 10	2,210	10	2,210	Glacial sand	Soft, clear	43	D, S	Sufficient for local needs.
20	E.½	28	"	"	"	Bored	66	2,310	- 30	2,280			Glacial drift	Hard, clear, "alkaline"	42	S	Sufficient for local needs; a 17-foot well is used for domestic needs.
21	SW.	30	"	"	"	Bored	60	2,330	- 50	2,280	60	2,270	Glacial sandy gravel	Hard, clear, "alkaline"		S	Intermittent supply.
22	NE.	30	"	"	"	Bored	37	2,360	- 25	2,335	37	2,323	Glacial gravel	Hard, clear, "alkaline", iron	43	D, S	Sufficient for local needs.
23	NW.	31	"	"	"	Bored	60	2,355	- 50	2,305	50	2,305	Glacial sandy clay	Hard, clear, iron		D, S	Barely sufficient for local needs.
24	NE.	31	"	"	"	Bored	62	2,335	- 58	2,277	58	2,277	Interglacial "sea-mud"	Hard, clear, "alkaline"		S	Intermittent supply; a 22-foot well is used for domestic needs.
25	NW.	32	"	"	"	Bored	65	2,330	- 61	2,269	61	2,269	Interglacial "sea-mud"	Hard, clear, "alkaline"		D, S	Intermittent supply.
26	NE.	32	"	"	"	Bored	53	2,310	- 33	2,277	53	2,257	Glacial gravel	Hard, clear, "alkaline"	43	S	Sufficient for 25 head stock; a shallow seepage well is insufficient for domestic needs.
27	SW.	33	"	"	"	Dug	20	2,300	- 18	2,282	18	2,282	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
28	NE.	34	"	"	"	Dug	30	2,310	- 25	2,285	25	2,285	Glacial fine sand	Hard, clear	44	D, S	Sufficient for 40 head stock.
29	SE.	35	"	"	"	Dug	23	2,245	- 20	2,225	20	2,225	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
30	S.½	36	"	"	"	Dug	24	2,235	- 14	2,221	24	2,211	Glacial gravel	Hard, clear, "alkaline"	42	D, S	Sufficient; 1,600 gallons an hour.
1	SE.	1	12	2	3	Bored	79	2,360	- 54	2,306	79	2,281	Glacial sand	Hard, "alkaline"		S	Sufficient for stock needs; a 25-foot well is used for domestic needs.
2	SE.	2	"	"	"	Bored	60	2,360	- 55	2,305	55	2,305	Glacial yellow clay	Hard, clear, "alkaline"			Insufficient for local needs.
3	NW.	2	"	"	"	Bored	43	2,360	- 33	2,327	33	2,327	Glacial clay	Hard, clear	42	D, S	
4	SW.	3	"	"	"	Bored	28	2,360	- 12	2,348	24	2,336	Glacial gravel	Hard, clear, iron, "alkaline"		D, S	Sufficient for local needs.
5	SE.	4	"	"	"	Bored	40	2,380	- 16	2,364	40	2,340	Glacial gravel	Hard, clear	42	D, S	Sufficient for local needs.
6	SW.	4	"	"	"	Bored	38	2,380	- 33	2,347			Glacial clay	Hard, clear	42	D, S	Intermittent supply.
7	NE.	5	"	"	"	Dug	25	2,350	- 20	2,330			Glacial clay	Hard, clear	44	D, S	Intermittent supply; 3 other similar wells.
8	SE.	6	"	"	"	Bored	30	2,400	- 10	2,390	12	2,388	Glacial gravel	Hard, clear		D, S	Insufficient for local needs; also another well 11 feet deep.
9	NE.	7	"	"	"	Bored	55	2,455	- 25	2,430	55	2,400	Glacial gravel	Hard, clear	42	D, S	Sufficient for 14 head stock.
10	SW.	10	"	"	"	Dug	12	2,335	- 6	2,329	10	2,325	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for local needs; several 20-foot dry holes.
11	NW.	10	"	"	"	Bored	42	2,360	- 34	2,326	34	2,326	Glacial sand	Hard, clear	43	D, S	Insufficient for local needs due to plugging with sand.
12	NW.	12	"	"	"	Bored	80	2,300									Dry hole; glacial clay at base.
13	NW.	12	"	"	"	Bored	50	2,300	- 20	2,280	50	2,250	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
14	SE.	14	"	"	"	Bored	30	2,320	- 12	2,308	12	2,308	Glacial clay	Hard, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, 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
15	NE.	14	12	2	3	Bored	60	2,310					Glacial clay	Hard, clear, "alkaline"		S	Intermittent supply; also an 18-foot well with good water.
16	SW.	16	"	"	"	Dug	15	2,400	- 12	2,388	12	2,388	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; also a spring on farm.
17	NE.	16	"	"	"	Bored	40	2,400					Glacial clay	Hard, clear, "alkaline"		S	Intermittent supply; 2 other similar wells.
18	SE.	17	"	"	"	Dug	24	2,420	- 20	2,400	22	2,398	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
19	W.½	17	"	"	"	Bored	70	2,430	- 60	2,370	68	2,362	Glacial sand	Hard, clear, iron	43	D, S	Insufficient for local needs; another 15-foot well aids supply.
20	NW.	18	"	"	"	Dug	12	2,440	- 7	2,433	7	2,433	Glacial sand and gravel	Hard, clear		D, S	Intermittent supply.
21	SE.	19	"	"	"	Bored	60	2,415	- 35	2,380	60	2,355	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs; a seepage well is used for domestic needs.
22	NW.	21	"	"	"	Dug	22	2,370	- 18	2,352			Glacial clay	Hard, clear	42	D, S	Intermittent supply; also some dry holes.
23	NE.	21	"	"	"	Dug	5	2,325	- 4	2,321	4	2,321	Glacial gravel	Hard, clear	43	D, S	Sufficient for local needs.
24	NW.	22	"	"	"	Bored	70	2,305	- 50	2,255	70	2,235	Glacial sand and gravel	Hard, clear	42	D, S	Sufficient for 27 head stock.
25	SE.	22	"	"	"	Bored	65	2,280					Glacial sand	Hard, clear, "alkaline"		S	Intermittent supply.
26	SW.	23	"	"	"	Dug	15	2,290	- 10	2,280	10	2,280	Glacial sand	Soft, clear		D, S	Sufficient for local needs; also a 55-foot dry hole.
27	SW.	25	"	"	"	Bored	65	2,365	- 50	2,315	65	2,300	Glacial sand and gravel	Hard, clear	43	D, S	Sufficient for local needs.
28	SE.	27	"	"	"	Bored	80	2,330	- 45	2,285	80	2,250	Glacial gravel	Hard, clear, "alkaline", red sediment, iron		D, S	Sufficient for local needs.
29	SE.	28	"	"	"	Spring		2,330	0	2,330	0	2,330	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for local needs.
30	SW.	28	"	"	"	Dug	28	2,350	- 12	2,338	28	2,322	Glacial gravel	Hard, clear, "alkaline"	43	D, S	Sufficient for local needs.
31	NE.	28	"	"	"	Dug	20	2,330	- 17	2,313			Glacial sand	Hard, clear, "alkaline"		D, S	Supply intermittent.
32	SW.	31	"	"	"	Dug	17	2,390	- 7	2,383	17	2,373	Glacial sand	Hard, clear		D, S	Sufficient for local needs; neighbours haul from here in dry seasons.
33	NW.	34	"	"	"	Bored	50	2,367	- 38	2,329	50	2,317	Glacial gravel	Hard, clear, "alkaline"	43	S	Sufficient for 20 head stock; also a 16-foot well, with intermittent supply, is used for domestic needs.
34	NE.	34	"	"	"	Bored	50	2,360	- 38	2,322	59	2,310	Glacial sandy gravel	Hard, clear, "alkaline"	43	D, S	Sufficient for local needs.
35	NW.	35	"	"	"	Bored	50	2,360	- 38	2,322	50	2,310	Glacial sand	Hard, iron, "alkaline", cloudy	42	S	Intermittent supply.
36	SW.	36	"	"	"	Bored	60	2,350	- 40	2,310	40	2,310	Glacial sandy clay	Hard, clear		D, S	Sufficient for local needs.
37	NE.	36	"	"	"	Bored	65	2,340	- 25	2,315	25	2,315	Glacial sandy clay	Hard, iron, "alkaline"		S	Sufficient for 16 head stock.
1	NW.	1	12	3	3	Dug	14	2,440	- 9	2,431	9	2,431	Glacial clay	Soft, clear	48	D, S	Sufficient for local needs.
2	NE.	1	"	"	"	Bored	60	2,485	- 50	2,435	60	2,425	Glacial gravel	Hard, clear, iron, "alkaline"		S	Sufficient for local needs; a 12-foot well is used for domestic needs.

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

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
3	SE.	2	12	3	3	Bored	36	2,445	- 26	2,419	26	2,419	Glacial clay	Hard, clear		D, S	Sufficient for local needs.
4	NW.	3	"	"	"	Bored	50	2,490	- 30	2,460	30	2,460	Glacial clay	Soft, clear		D, S	Insufficient for local needs.
5	SW.	4	"	"	"	Bored	65	2,460	- 35	2,425	65	2,395	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for local needs.
6	NW.	4	"	"	"	Bored	70	2,465	- 65	2,400	65	2,400	Glacial clay	Hard, clear		D, S	Sufficient for local needs.
7	NE.	4	"	"	"	Dug	18	2,480									Dry hole; glacial sand at base.
8	SW.	5	"	"	"	Dug	25	2,400	- 22	2,378	22	2,378	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs; also a spring in the pasture.
9	NW.	5	"	"	"	Bored	60	2,415	- 57	2,358	57	2,358	Glacial sand	Soft, clear		D, S	Insufficient for local needs.
10	NE.	5	"	"	"	Bored	65	2,460	- 62	2,398	62	2,398	Glacial clay	Hard, cloudy, "alkaline"		D, S	Intermittent supply; also a spring with mineralized water in pasture.
11	SE.	6	"	"	"	Bored	12	2,440	- 6	2,434	6	2,434	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for local needs.
12	SE.	8	"	"	"	Bored	45	2,450	- 40	2,410	40	2,410	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
13	NE.	8	"	"	"	Dug	17	2,480	- 14	2,466	14	2,466	Glacial sand	Hard, clear	42	D, S	4 barrels a day.
14	SE.	9	"	"	"	Bored	45	2,480	- 38	2,442	38	2,442	Glacial sand	Hard, clear	42	D, S	Sufficient for local needs.
15	NW.	9	"	"	"	Bored	18	2,470	- 12	2,458	12	2,458	Glacial gravel	Soft, clear		D, S	Intermittent supply.
16	NE.	10	"	"	"	Bored	50	2,465	- 48	2,417	48	2,417	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 20 head stock; #.
17	NE.	12	"	"	"	Bored	65	2,460	- 55	2,405	65	2,395	Glacial gravel	Hard, clear, "alkaline", iron	42	D, S	Sufficient for local needs.
18	SE.	13	"	"	"	Bored	50	2,450	- 45	2,405	45	2,405	Glacial clay	Hard, clear, "alkaline"	43	S	Intermittent supply; also a shallow seepage well for domestic needs.
19	SW.	14	"	"	"	Bored	36	2,455	- 25	2,430	36	2,419	Glacial sand and gravel	Hard, clear, "alkaline", red sediment, iron		D, S	Sufficient for local needs.
20	NW.	14	"	"	"	Bored	30	2,450	- 12	2,438	30	2,420	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs; a 15-foot well is used for domestic needs.
21	SE.	15	"	"	"	Dug	35	2,445	- 14	2,431	35	2,410	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
22	SW.	15	"	"	"	Bored	45	2,450	- 10	2,440	45	2,405	Glacial sand	Hard, clear		S	Sufficient for local needs.
23	SE.	16	"	"	"	Bored	28	2,455	- 25	2,430	25	2,430	Glacial sand	Soft, clear	42	D, S	Sufficient for local needs.
24	NW.	16	"	"	"	Bored	28	2,435	- 22	2,413	28	2,407	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock.
25	NE.	17	"	"	"	Bored	50	2,402									Many dry holes; Bearpaw shale at base.
26	SE.	20	"	"	"	Bored	45	2,400	- 25	2,375	45	2,355	Glacial sand	Hard, clear	42	D, S	Sufficient for 50 head stock.
27	SW.	21	"	"	"	Bored	38	2,400	- 14	2,386	38	2,362	Glacial sand and gravel	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.

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

WELL RECORDS—Rural Municipality of SUTTON, NO. 103, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	N.½	21	12	3	2		35	2,395	− 20	2,375	20	2,375	Glacial clay	Hard, iron		D, S	Sufficient for local needs.
29	NE.	22	"	"	"	Bored	60	2,450	− 40	2,410	60	2,390	Glacial sand	Hard, cloudy, "alkaline", iron		S	Sufficient for local needs; a shallow well is used for domestic needs.
30	SW.	24	"	"	"	Bored	30	2,465	− 20	2,445	30	2,435	Glacial gravel	Hard, clear, iron	42	D, S	Sufficient for local needs; four families haul from here during dry seasons.
31	NW.	24	"	"	"	Dug	8	2,435	− 3	2,432			Glacial sandy clay	Soft, clear			Intermittent supply.
32	NW.	25	"	"	"	Dug	15	2,400	− 10	2,390	10	2,390	Glacial gravel	Soft, clear		D, S	Insufficient for local needs.
33	NE.	25	"	"	"	Dug	15	2,400	− 10	2,390			Glacial caly	Soft, clear		D, S	Intermittent supply.

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

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