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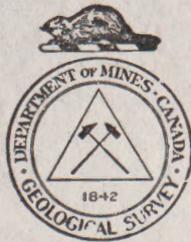
PRELIMINARY REPORT

GROUND-WATER RESOURCES
OF THE
RURAL MUNICIPALITY OF ANTLER
No. 61
SASKATCHEWAN

BY

B. R. MacKay & H. N. Hainstock

Water Supply Paper No. 24



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CONTENTS

	<u>Page</u>
Introduction	1
Glossary of terms used	6
Water-bearing horizons of the municipality	10
Water-bearing horizons in the unconsolidated deposits..	10
Water-bearing horizons in the bedrock	11
Ground-water conditions by townships:	
Township 7, Range 30, west of 1st meridian.....	12
Township 7, Range 31, " " " "	13
Township 7, Range 32, " " " "	14
Township 7, Range 33, " " " "	14
Township 7, Range 34, " " " "	15
Township 8, Range 30, " " " "	16
Township 8, Range 31, " " " "	17
Township 8, Range 32, " " " "	18
Township 8, Range 33, " " " "	19
Township 8, Range 34, " " " "	20
Statistical summary of well information	21
Analyses and quality of water	22
General statement	22
Table of analyses of water samples	27
Water from the unconsolidated deposits	28
Water from the bedrock.....	28
Well records	30

Illustrations

Map of the municipality.

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

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

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY
OF ANTLER, NO. 61,
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 purposes and the smaller supplies of ground water required for domestic and stock-raising purposes by settlers, villages, and Indian reserves. The drought conditions resulted in repeated crop failures, and in a large number of farms in the acute drought areas of Saskatchewan and Alberta being abandoned. In an effort to relieve the serious situation a number of special studies of the water problem were begun by both Federal and Provincial Governments and allied organizations. The Federal Department of Agriculture undertook among other phases of the drought problem an investigation into the existing supplies of surface water, their conservation by means of dams and dug-outs, and how they could be made more generally available for irrigation. The Geological Survey of the Federal Department of Mines began an extensive study of the underground water conditions of southern Saskatchewan, this water being used principally for domestic and stock-raising purposes. For many years past the water problems in this and other provinces of Canada have engaged the attention of the Geological Survey, and considerable information had already been collected. A number of short reports dealing with the ground water conditions of special areas in Manitoba, Saskatchewan and Alberta have been published by both the Federal and Provincial Geological Surveys, but no systematic study of the ground water resources has been made up to the present.

Field Work

The senior author was in charge of this investigation and was instructed to cover as much of the territory as possible in the season. To effect this it was decided to maintain an

office at Regina and to have a large party consisting of twenty-six units, each to consist of three men who would cover their respective areas and visit every farm. In order that the information gathered by these different party units would be as complete and uniform as possible a questionnaire was prepared on which could be tabulated answers to all the essential questions required for a detailed study of the ground water conditions. An effort was made in the field by each party unit to fill in the questionnaire as completely as possible. In many instances, however, it was found that wells had either been abandoned, or the resident had little or no knowledge of the character of the water-bearing horizon and associated beds. When a party unit had completed the survey of a township the set of questionnaires and a report describing the characteristic features pertaining to the underground water conditions were mailed to the field office. Messrs. D.C. Maddox, F.H. Edmunds, H.H. Beach, H.N. Hainstock, R.D. MacDonald, and D.P. Goodall acted as supervisors in inspecting the work of the field units.

During the field season an area of 80,000 square miles, comprising 2,200 townships, was systematically examined, and records of approximately 60,000 wells were obtained, together with water samples for analyses obtained from 720 representative wells. These are systematically classified so that information pertaining to any well may be readily consulted. These records are supplemented by a set of 24 sectional sheets which cover all of southern Saskatchewan north to include township 32. Each sectional sheet comprises 120 townships. On these are indicated by symbol the location, type, and source of water of each of the 60,000 wells.

Publication of Results

The publication of such a great mass of detailed information is out of the question. This forms the permanent record of the Geological Survey. It is highly desirable, however, that a digest of the essential information pertaining to the ground water conditions of each municipality be furnished in convenient form to the municipality offices, to certain Provincial and Federal departments, and to allied organizations, at which centres it will be possible for any resident of the municipality or other party interested in any particular area to consult these reports. Should anyone find that he requires more detailed data than that contained in the report such additional information as the Geological Survey possesses can be procured on application to the Director, Bureau of Economic Geology, Department of Mines, Ottawa. In making such request the applicant should indicate the exact location of the area by giving the quarter section, township, range and meridian.

The reports have been prepared principally for farm residents, municipal bodies, and well drillers who are either contemplating sinking a well for the first time or considering deepening their well to a lower horizon in order to obtain a more abundant supply of water. In describing the water and geological conditions a certain number of technical terms must of necessity be used, and in case the reader should not be familiar with them their meanings have been defined in the glossary.

How to Use the Report

It is advisable that anyone desiring water information pertaining to a particular section of the municipality read over first the section dealing with the municipality as a whole, as by so doing he will be in a much better position to understand the section of the report dealing with the ground water conditions of

the area in which he is particularly interested. As he reads the text he should keep open before him for constant reference the accompanying map of the municipality on which are two figures, one showing the surface and bedrock geology of the area as they affect the ground water supply, and the other the relief and the location and type of water wells. The land relief is shown by means of lines of equal elevation, termed "contours", which lie generally at vertical intervals of 50 feet. The elevation above sea-level of each fourth line is indicated on the map. The statistical summary that follows the text gives at a glance the main characteristics of the wells in each township of the municipality and of the municipality as a whole as listed under the various sub-headings. This is followed by a section dealing with the analyses and quality of the water derived from the unconsolidated deposits and from bedrock. The table of well records gives the detailed information pertaining to each well. In this are tabulated the altitude of the well, its depth, the height to which the water will rise, and the elevation of the water horizon. The wells are grouped in the table by townships and are numbered from the lower right corner of the township westward and northward, and the location of each well by its quarter section is given. The elevations used were determined by aneroid barometer and were checked frequently by elevations on the published maps or by instrument surveys.

Where the ground surface of an area is comparatively flat an effort has been made to indicate the position of the water-bearing horizon in feet below the surface. In rolling country where there is a considerable difference of elevation within short distances a uniform figure for the depth to the water horizon is not generally possible. It then becomes necessary to indicate the position in terms of the elevation of a water-bearing bed in feet above sea-level.

Should one desire to ascertain at any location at which no well has as yet been sunk, the approximate depth at which a particular water-bearing horizon can be reached it is necessary to know two things--first, the elevation of the land surface, and second, the probable elevation of the water-bearing bed, or aquifer. The elevation of the land surface can be obtained by noting the position of the well site on the map, Figure 2, with respect to the two bounding contour lines of known elevation, and estimating either how far above the lower, or how far below the upper, control elevation line the well site lies. The approximate elevation of the water-bearing horizon at the well site can be obtained by noting on the table of well records the elevation of the horizon in the wells adjacent to the proposed location and from the range of elevations given and the relative positions of the wells shown on the map to select what appears to be its most probable elevation at the new well site. Having determined this elevation the depth that it is necessary to sink in order to tap it is the difference between its elevation and the elevation of the land surface. This method is especially applicable when the water-bearing horizon is in bedrock. In unconsolidated deposits the water horizon either conforms to the rolling land surface or occurs in isolated sand beds at various horizons that do not form a continuous water-bearing bed over a large area. Care should be taken in making any calculations for depth of water-bearing horizons to be sure that the elevations selected for the determinations occur in the same geological horizon, that is they should be either all in glacial drift or in the same bedrock formation.

The table of well records also contains notes on the temperature, quality, and quantity of the water being obtained from the various wells, and from this it is possible to draw reasonable conclusions as to the character and quantity of the water likely to be encountered at the proposed well site.

Glossary of Terms Used

Alluvium. Deposits of earth, silt, sand and gravel, and other transported material laid down by rivers, floods, or other causes upon land that has been submerged beneath the waters of lakes or rivers.

Aquifer. Layers or pockets of water-bearing sand or gravel that occur in unconsolidated deposits or as beds forming part of a bedrock formation.

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 deposits of gravel, sand, silt, and marl that have been laid down by the agency of water and which through a long period of time and the weight of the overlying sediments have become cemented into a solid rock.

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 section in a river valley that is 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 exerted by the water at any given point. It is due mainly to the weight of the column of water occurring at higher levels in the same aquifer or water-bearing bed.

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

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

Potable. Suitable for drinking.

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.

Water-bearing Horizon. A layer in either unconsolidated deposits or in bedrock formations that is water-bearing; same as aquifer.

Zone of Saturation. An area in which the permeable rocks are saturated with water that will move under ordinary hydrostatic pressure.

Names and Descriptions of Geological Formations,
Referred to in These Reports

Wood Mountain Formation. The local name given to a series of gravel and thin sand beds which have a maximum thickness of 50 feet, and which occurs as isolated patches on the higher elevations of Wood mountain. They are the youngest of the consolidated rocks and, where present, rest upon the beds of the Ravenscrag formation.

Cypress Hills Formation. The local name given to a series of conglomerates and sand beds occurring in the southwest corner of Saskatchewan, which rests upon the Ravenscrag or older formations. The thickness of this formation varies from 30 to 125 feet.

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

Whitemud Formation. The local name given to a series of white, grey, and buff coloured clays and sands that varies in thickness from 10 to 75 feet. The base of this formation grades in places into a coarse, limy sand having a maximum thickness of 40 feet.

Eastend Formation. The local 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 eastern escarpment of the Missouri coteau. The thickness of the formation seldom exceeds 40 feet.

Marine Shale Formation. The general name given to the thick deposit of incoherent, dark grey to dark brownish grey, plastic shales, which weather light grey to buff in places. It forms the uppermost bedrock formation over the greater part of eastern and central Saskatchewan. In the western part of the province it consists of a series of dark shales termed the Bearpaw formation. This is underlain by a series of sands, shales, and coal seams, known as the Belly River formation.

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Antlor is an area of approximately 312 square miles lying adjacent to the Saskatchewan-Manitoba boundary. It consists of ten townships described as tps. 7 and 8, ranges 30, 31, 32, 33, and 34, W. 1st mer. The village of Redvers located in the south-central part of the municipality lies 56 miles north of the International Boundary and 100 miles east of Weyburn.

The area is covered by a thick mantle of unconsolidated glacial drift that was deposited by the continental ice-sheet and the waters resulting from the melting of it. In the southern part of the municipality the drift attains a thickness of 300 feet, but in the north-central part it thins out to 150 to 180 feet in thickness. In the areas shown as terminal moraine on the map, the upper 30 feet of the drift is composed of yellow clay with pockets of sand and gravel, but in those areas shown as glacial till or boulder clay the yellow clay extends downward for only 5 to 10 feet. Fairly continuous deposits of outwash sand and gravel, indicated as glacial sands and gravels on the map, floor the valleys and small ravines, or occur as gravel ridges in the moraines and glacial till. In places these gravel deposits attain a maximum thickness of 35 feet. This upper 30-foot zone is underlain by a compact blue clay that locally contains small pockets of sand, and extends to a depth of from 200 to 300 feet. In certain localities the blue clay is underlain by a few feet of sand and gravel, whereas in others it rests directly on the bedrock.

Water-bearing Horizons in the Unconsolidated Deposits

This mantle of glacial drift contains three water-bearing horizons. The sand pockets within the yellow clay and the gravel deposits along the creeks form the uppermost water-bearing horizon. It is the source of water for all of the shallow

wells in the municipality and in years of normal rainfall provides an adequate supply of hard, potable water. The elevation of the top of this horizon varies from 1,750 to 1,780 feet in the east, to 2,000 to 2,100 feet in the west and northwest. The sand pockets within the blue clay form the second water-bearing horizon. This horizon is not continuous and has been encountered in a few places only. It is not very likely to yield more than a small supply of water which will doubtless be "alkaline" in character. The sand and gravel deposits lying below the blue clay form the third water-bearing horizon in the glacial drift. This horizon does not appear to be extensive and the sand and gravel appear to have been deposited in depressions in the old preglacial bedrock land-surface. It has been tapped in the following locations SE. $\frac{1}{4}$, sec. 28, tp. 7, range 31; SW. $\frac{1}{4}$, sec. 4, tp. 7, range 31, and NE. $\frac{1}{4}$, sec. 3, tp. 8, range 30, at elevations of 1,561, 1,620 and 1,655 feet, respectively. The water is hard and slightly salty, and rises to within 50 feet of the surface.

Water-bearing Horizons in the Bedrock

The Ravenscrag formation underlies the glacial drift throughout the municipality. It varies in thickness from 180 to 300 feet, thinning out to the north. The upper 20 to 150 feet of the formation is composed of soft, grey shale, that in places contains a small seam of lignite coal. Underlying this shale to a depth of 450 to 600 feet is a harder shale with numerous sandy lenses or layers. These layers apparently do not occur in the formation in the northeastern corner of the municipality.

The sandy layers in the lower part of the Ravenscrag formation form a water-bearing horizon. In general it is pierced at depths of 400 to 500 feet and the best supplies of water are obtained at elevations of from 1,500 to 1,600 feet, and from 1,430 to 1,460 feet. The water is soft and salty, abundant in quantity, and the hydrostatic pressure is sufficient to cause the water to rise to within 10 to 50 feet of the surface in the central and eastern parts of the municipality, and to flow from 2 to 20 feet

above the surface in the western part. The area in which flowing artesian wells occur, or might be expected to occur, is shown on the accompanying map of the municipality. The Marine shale formation underlies the Ravenscrag formation throughout the municipality. It has been pierced to a depth of 400 feet and no water-bearing horizons were encountered.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 7, Range 30

The sand and gravel deposits that occur within the upper 20 feet of the glacial drift at an elevation of from 1,760 to 1,850 feet, form the only water-bearing horizon in the township. The supply of water from this horizon is usually insufficient for local needs and twenty-six farmers in the township have to haul water during the winter months and drought years. Along the creeks in the northwest and southwest corners of the township, where the gravel deposits are fairly extensive, an adequate supply of water can be obtained. Elsewhere the gravel occurs as very small pockets and it is in only very wet seasons that wells tapping these pockets will produce a sufficient supply of water for local needs. The majority of farmers use dugouts for watering stock during the summer months and this method of storing water can be used to advantage throughout the township due to the impervious nature of the clay sub-soil.

Wells have been bored to a depth of 100 feet into the blue clay without encountering any supply of water. Some sand lenses may occur in the clay, but if so they will yield only a small supply of water. In sections 24 and 36, two wells encountered some water in a fine sand at the base of the blue clay, but the sand was so fine that it plugged the casings and the wells had to be abandoned.

Throughout the township, no water has been obtained from the bedrock formation. The sandy, water-bearing beds are entirely

lacking in the formation in this township, and deep drilling is not advisable.

Township 7, Range 31

There are two water-bearing horizons in the glacial drift in this township. The sand and gravel deposits that occur above the blue clay, or within the upper 20 feet of the drift, form the first water-bearing horizon. Its elevation varies from 1,850 feet in the south and southeast to 1,930 feet in the west and northwest, the rise corresponding to the rise in surface elevation. An abundant and permanent supply of water can be obtained from wells dug into the strips of glacial gravels that floor the valleys of Gainborough and Lightning creeks. Elsewhere in the township the gravel occurs as pockets within the till and morainic deposits and wells tapping these pockets yield a fair supply in years of abundant rainfall, but are dry in periods of drought and water has to be hauled for both household and stock use.

A second water-bearing horizon, formed by a sand deposit lying at the base of the blue clay and above the bedrock, was encountered in the SE. $\frac{1}{4}$, section 28, at a depth of 360 feet or at an elevation of 1,561 feet. It yields a fair supply of hard, water this is usable for drinking but the sand is so fine that it plugs the casing and shuts off the water supply. The extent of this horizon is not known due to lack of information, but the writers are of the opinion that it is only of small areal distribution.

One water-bearing horizon is known to occur in the Ravenscrag formation. This is a sandy bed at the base of the formation and it was encountered in the SE. $\frac{1}{4}$, section 6, at a depth of 450 feet, and in the SW. $\frac{1}{4}$, section 28, at a depth of 500 feet, its elevation being 1,430 feet. No water can be expected beyond 500 feet, as at this depth the non-water-bearing Marine shale formation is struck. The water from the horizon in the Ravenscrag formation is fairly soft and salty, and is under sufficient pressure

to rise to within 7 to 50 feet of the surface. An abundant supply of water from this horizon should be obtained throughout the western part of the township.

Township 7, Range 32

In township 7, range 32 the gravel and sand deposits that occur in the upper 20-foot zone of the glacial drift form the only known water-bearing horizon in the unconsolidated glacial deposits. All of the shallow wells derive their supply of hard, water that is used for drinking from this horizon. The best supply is to be obtained from what appears to be a band of glacial gravels located in the eastern part of the township, and from gravel deposits occurring along the creek in the northwestern corner. These areas are shown on the accompanying map. Elsewhere, the supply is poor as only small pockets of water-bearing gravel occur in the morainic material that covers most of the township. Water has to be hauled during the winter months and drought periods.

Throughout the township a sandy shale bed lying near the base of the Ravenscrag formation forms a water-bearing horizon. This horizon is struck at a depth of 350 feet, or at an elevation of 1,610 to 1,670 feet, in the northern part of the township, and at depths of around 500 feet, or at an elevation of from 1,465 to 1,570 feet, in the southern part. The water from it is medium hard to soft and slightly salty, abundant in quantity, and rises to within 20 to 40 feet of the surface. One well located in the SE. $\frac{1}{4}$, section 6, flowed 3 feet above the surface for a number of years after it was drilled. Should other wells be drilled into this horizon an abundant supply of water can be expected.

Township 7, Range 33

The sand and gravel deposits lying above the blue clay form the only water-bearing horizon in the glacial drift in this township. They occur as narrow strips along the two stream valleys

in the eastern part of the township, and as small pockets within the yellow clay. An abundant and permanent supply of hard, usable water can be obtained from shallow wells dug into the gravels that floor the valleys. Elsewhere, several wells may be dug before a pocket of gravel is located within the yellow clay. The wells having these pockets of gravel as their aquifers yield a sufficient supply of water in years of normal rainfall, but during dry years and most winters it is necessary to haul water for stock use.

A number of wells have been bored to a depth of 100 feet into the blue clay without locating any water-bearing horizons.

Two water-bearing horizons occur in the Ravenscrag formation. The uppermost of these is formed by sandy shale, and is encountered at depths of 380 to 475 feet, or at an elevation of from 1,600 to 1,680 feet. The water is soft and salty, and rises to within 20 feet of the surface, or flows to a height of 24 feet above the surface. The lower horizon is formed by a sandy shale bed which is encountered at a depth of 560 feet or at an elevation of 1,475 feet. The water from the well tapping this horizon in the SE. $\frac{1}{4}$, section 28, flows 1 foot above the surface. It is soft and somewhat salty and has a bitter taste, caused probably by a high concentration of magnesium sulphate. Should other wells be drilled into these horizons an abundant supply of water can be expected. It will doubtless prove to be too saline for human consumption but it will be usable for stock. The possibilities of other flowing artesian wells being obtained in this township are very good.

Township 7, Range 34

The sand and gravel deposits lying above the blue clay form the only known water-bearing horizon in the glacial drift in this township. Only a fair supply of water can be expected from this horizon and the best supply is obtained from shallow wells dug into a gravel belt, 150 to 200 yards in width, that floors and parallels a small creek in the southeastern corner of the township.

Throughout the remainder of the township the gravel deposits are in the form of pockets within the yellow clay, and the supply of water obtained from wells tapping these pockets depends upon the size of the pocket and the amount of precipitation.

In the Ravenscrag formation a sandy shale bed at a depth of 500 feet, or at an elevation of 1,515 feet, constitutes a water-bearing horizon. Three wells are drawing an abundant supply of soft, somewhat salty water from this horizon. The hydrostatic pressure is sufficient to cause the water to flow to 20 to 30 feet above the surface when the aquifer is first tapped but due to fine sand plugging the casings the flow decreases rapidly or ceases altogether. A yellow sediment, iron oxide, settles after the water stands for some time. Should this horizon be tapped by other wells an abundant supply of water is to be expected, and the wells will likely be flowing-artesian in character.

Township 8, Range 30

Due to the meagre deposition of sand and gravel in the glacial drift that mantles this township the water-bearing horizons are of small areal extent. A supply of water sufficient for local needs is being obtained from wells dug into gravel pockets lying above the blue clay in the following locations: NE. $\frac{1}{4}$, section 10; NW. $\frac{1}{4}$, section 8; SE. $\frac{1}{4}$, section 17; SE. $\frac{1}{4}$, section 18; NW. $\frac{1}{4}$, section 20; and the SW. $\frac{1}{4}$, section 36. Elsewhere, the gravel pockets encountered are so small that the supply of water derived from them does not last through the winter. This necessitates the hauling of water for stock use in the winter months and drought periods. The best locations in the township for obtaining a fair supply of water from the horizon lying above the blue clay are along the creeks and draws, as it was found in the other townships that the gravel deposits were common in and along the valleys and this may be the case in township 8, range 30. Dugouts can be used to advantage as the sub-soil is quite impervious to water.

A number of wells have been drilled to a depth of 320 feet into the blue clay, and although some sand was encountered no adequate supply of water was obtained. It is improbable that a sufficient supply of water can be obtained from sand deposits in the blue clay throughout the township.

No water-bearing horizons were encountered in the bedrock and the sandy beds of the Ravenscrag formation appear to be absent throughout the township. No supply of water can be obtained from the Marine shale formation which underlies the Ravenscrag sediments.

Township 8, Range 31

The sand and gravel deposits lying above the blue clay at an elevation of from 1,880 to 1,940 feet, or within 10 feet of the surface, form the principal water-bearing horizon in the glacial drift in this township. These deposits are fairly extensive along the ravines that are shown on the map, and yields an abundant supply of hard, usable water where tapped by shallow wells. Some of the water that flows in the ravines in the spring seeps into the gravel and is retained there by the underlying, impervious, blue clay. The reservoirs thus formed are characterized on the surface by marshy hollows locally designated "Buffalo wallows" and an abundant supply can be obtained from them. On the uplands the gravel deposits are in the form of small pockets within the yellow clay and wells dug into them are dry, or yield a small supply of water, sufficient for the summer months only.

A few sand lenses have been encountered in the blue clay at depths of 75 to 100 feet, but they contain little or no water.

In the SW. $\frac{1}{4}$, section 4, a well 320 feet in depth obtains an abundant supply of water from a sand bed overlying the bedrock. This horizon is only of local extent. The sand has apparently been deposited in a hollow in the old bedrock land

surface, as it is over 100 feet in thickness. The water from it is hard, slightly salty, with a high iron content, and rises to within 50 feet of the surface.

A sandy shale bed at the base of the Ravenscrag formation, forms a water-bearing horizon at a depth of from 430 to 500 feet or at an elevation of 1,500 to 1,650 feet. The horizon is confined to the western part of the township, the sandy bed apparently being absent in the east. It yields an abundant supply of soft, slightly salty water in the NE. $\frac{1}{4}$, section 18, but in the NE. $\frac{1}{4}$, section 30 the supply decreased and at the present time the well is dry. A fairly abundant supply of water can be expected from this horizon in the southwestern part of the township, should it be tapped by other deep wells.

Township 8, Range 32

There is only one producing water-bearing horizon in the glacial drift in this township. The sand and gravel deposits that occur in the zone of drift lying above the blue clay form this horizon. In the eastern and southwestern parts of the township these deposits are quite extensive and a fairly abundant supply of hard, usable water can be obtained from them by shallow wells. As is the case elsewhere in the municipality, the best supply occurs in the vicinity of the ravines. The western part of the township is covered by a moraine and the gravel deposits occur as pockets within the yellow clay. In years of abundant rainfall wells tapping these pockets produce a sufficient supply for local needs, but some water usually has to be hauled in dry years and the late winter months.

A sandy shale bed of the Ravenscrag formation forms a water-bearing horizon at a depth of 450 to 500 feet. In the SE. $\frac{1}{4}$, section 3, the water rises to within 40 feet of the surface and is soft and somewhat salty. The horizon was also tapped in SW. $\frac{1}{4}$, section 30, but the casing plugged with fine sand and the

water supply was shut off. To the writers' knowledge no other deep wells have tapped this horizon, but should it be tapped elsewhere in the township, especially in the southern part, a fairly abundant supply of soft, salty water can be expected..

Township 8, Range 33

The sand and gravel deposits lying above the blue clay form the only water-bearing horizon in the glacial drift in township 8, range 33. The elevation of the top of this horizon rises from 2,045 feet in the southwest of the township, to 2,100 feet in the northwest, the rise corresponding to the rise of the surface elevation. It is the source of water for all of the shallow wells. The best supplies can be obtained in the vicinity of the two creeks, shown on the municipality map, and in the western halves of sections 30 and 31. Along the creeks, the gravel deposits are fairly extensive, and in the western part of sections 30 and 31 a gravel ridge occurs trending in a north-south direction. Elsewhere, the gravel is in the form of pockets and yields only a meagre supply of water. In such instances, water has to be hauled from permanent wells during the winter months and drought periods. As a general rule the water is hard and potable, but wells in the NE. $\frac{1}{4}$, section 14, SE. $\frac{1}{4}$, section 16, and the NW. $\frac{1}{4}$, section 22, yielded "alkaline" water.

In the Ravenscrag formation, at depths of approximately 400 to 500 feet, or at elevations of from 1,460 to 1,700 feet, a series of sandy shale beds form a water-bearing horizon. The water is medium hard and salty in character and is under sufficient pressure to rise to within 9 feet of the surface. One well located in the SW. $\frac{1}{4}$, section 16, flowed 10 feet above the surface for a number of years. Wells tapping this horizon in other localities in the township should obtain an abundant supply of water. Below 500 feet in depth no water can be expected, as at that depth the non-water-bearing Marine shale formation occurs.

Township 8, Range 34

The shallow wells in township 8, range 34, derive their water from the sand and gravel deposits lying above the blue clay. The supply from these deposits is as a rule insufficient for local needs, as they occur mainly as small pockets within the yellow clay. The best supply can be obtained along a ravine that runs in a southwesterly direction through sections 24, 14, and 11. In dry years and during most winters, farmers who do not have deep wells are forced to haul water for stock.

In the SE. $\frac{1}{4}$, section 2, a small amount of water was encountered in a sand bed below the blue clay, at a depth of 280 feet. This bed does not appear to have a large areal extent and yields only a small supply of water.

In the Ravenscrag formation sandy shale beds lying at depths of 515 to 610 feet or at elevations of from 1,500 to 1,733 feet, constitute a water-bearing horizon. The water is under pressure and flows 4 feet above the surface in the SE. $\frac{1}{4}$, section 2, and rises to within 50 feet of the surface in a well located in the NW. $\frac{1}{4}$, section 14. The water is soft and slightly salty but is usable for both humans and stock. A well located in the NE. $\frac{1}{4}$, section 36, tapped this water-bearing horizon, but the casing plugged with fine sand and the well was abandoned. This horizon, if tapped elsewhere, should yield a fairly abundant supply of water.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL
MUNICIPALITY OF ANTLER, NO. 61, SASKATCHEWAN

West of 1st meridian	Township Range	7	7	7	7	7	8	8	8	8	8	Total No. in Municipality
		30	31	32	33	34	30	31	32	33	34	
<u>Total No. of Wells in Township</u>		36	27	39	33	6	32	31	22	30	8	264
No. of wells in bedrock		1	2	10	6	3	0	4	2	4	3	35
No. of wells in glacial drift		35	25	29	27	3	32	27	20	26	5	229
No. of wells in alluvium		0	0	0	0	0	0	0	0	0	0	0
<u>Permanency of Water Supply</u>												
No. with permanent supply		9	15	23	20	5	12	20	15	14	5	138
No. with intermittent supply		19	5	11	12	1	10	5	5	11	1	80
No. dry holes		8	7	5	1	0	10	6	2	5	2	46
<u>Types of Wells</u>												
No. of flowing artesian wells		0	0	0	2	3	0	0	0	1	1	7
No. of non-flowing artesian wells		0	3	11	6	0	1	1	2	3	2	29
No. of non-artesian wells		28	17	23	24	3	21	24	18	21	3	182
<u>Quality of Water</u>												
No. with hard water		27	18	31	24	2	21	18	17	22	3	183
No. with soft water		1	2	3	8	4	1	7	3	3	3	35
No. with salty water		0	2	8	5	3	0	2	2	3	2	27
No. with alkaline water		1	0	2	6	1	3	0	0	3	1	17
<u>Depths of Wells</u>												
No. from 0 to 50 feet deep		34	22	27	26	3	29	25	19	26	4	215
No. from 51 to 100 feet deep		1	1	2	1	0	0	2	1	0	1	9
No. from 101 to 150 feet deep		0	1	1	0	0	0	0	0	0	0	2
No. from 151 to 200 feet deep		0	0	0	0	0	1	0	0	2	0	3
No. from 201 to 500 feet deep		1	3	7	3	0	1	4	1	1	0	21
No. from 501 to 1,000 feet deep		0	0	3	3	3	0	0	1	1	3	14
No. over 1,000 feet deep		0	0	0	0	0	0	0	0	0	0	0
<u>How the Water is used</u>												
No. usable for domestic purposes		25	18	31	28	3	16	23	20	17	4	185
No. not usable for domestic purposes		3	2	3	4	3	6	2	0	8	2	33
No. usable for stock		27	20	34	31	6	20	25	20	25	6	214
No. not usable for stock		1	0	0	1	0	2	0	0	0	0	4
<u>Sufficiency of Water Supply</u>												
No. sufficient for domestic needs		22	17	30	30	6	19	24	18	23	5	194
No. insufficient for domestic needs		6	3	4	2	0	3	1	2	2	1	24
No. sufficient for stock needs		10	16	26	22	6	11	19	12	16	3	141
No. insufficient for stock needs		18	4	8	10	0	11	6	8	9	3	77

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 and unless the figure is very high it does not imply that the water is too alkaline for irrigation purposes. The analyses are given in parts per million--that is, in parts by weight of the constituents in 1,000,000 parts by volume of water; for example, 1 ounce of material dissolved in 10 gallons of water is equal to 625 parts per million. The samples were not examined for bacteria, and thus a water that may be termed suitable for use on the basis of its mineral salt content might be condemned on account of its bacteria content. Waters that are high in bacteria content have usually been polluted by surface waters.

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

The calcium (Ca) and magnesium (Mg) content of water is dissolved from practically all rocks, but in larger amounts 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 teakettles 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, and waters that contain a large amount of them cannot be used for irrigation.

Sulphates

Sulphates (SO_4) are one of the common constituents of natural water. The sulphate salts most commonly found are sodium sulphate (Glauber's Salt, Na_2SO_4), magnesium sulphate (Epsom

Salts, $MgSO_4$) and calcium sulphate ($CaSO_4$). Waters that contain these sulphate salts are called "sulphate waters". When the water contains large quantities of the sulphate of sodium ("White Alkali") it is injurious to vegetation and cannot be used for irrigation. According to Thresh and Beale, London, the continued use of water that contains 1,200 parts or more per million of magnesium sulphate and 500 parts or more per million of sodium sulphate causes diarrhoea and scour among stock, and one half this quantity makes the water unfit for domestic use.

Chlorides

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

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 out 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 had been boiled and it represents the amount of mineral salts that cannot be removed by boiling. Temporary hardness is the difference between the total hardness and the permanent hardness and represents the amount of mineral salts that can be removed by boiling. Temporary hardness is due to the bicarbonates of calcium and magnesium, and permanent hardness to the sulphates, and chlorides of calcium and magnesium. The permanent hardness can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. The following table from "The Examination of Water and Water Supplies" by Thresh and Beale, London, 1925, can be used for determining the relative hardness of a water.

<u>Total Hardness</u>	<u>Character</u>
Less than 50 parts per million.	Very soft
50 - 100 " " "	Moderately soft
100 - 150 " " "	Slightly hard
150 - 200 " " "	Moderately hard
200 - 300 " " "	Hard
Over 300 " " "	Excessively hard

Many of the Saskatchewan water samples analysed by the Geological Survey 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.

The term "alkaline" has been applied rather loosely to some ground waters. Its original meaning was a chemical one and it implied that the substance in question would neutralize acids. The carbonates of calcium, magnesium, and sodium are the only compounds found in ground water that would make it alkaline chemically. A later application of the term "alkaline" was to soils that contain sufficient "black alkali" or "white alkali" to make them unfit for vegetation. In the Prairie Provinces a water is usually considered to be alkaline when it contains so much dissolved solids that it is not very suitable for human consumption; except that 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".

WATER FROM THE UNCONSOLIDATED DEPOSITS

As no samples of water from the glacial drift were taken for analysis the following discussion is based upon results of samples analysed from adjoining municipalities.

All water from the glacial drift contains mineral salts in solution. These salts are dissolved out of the clay, sand, and gravel through which the water percolates. It has been found that the purer waters are derived from large deposits of sand and gravel at shallow depth. Waters that are derived from small deposits of sand and gravel that are overlain by thick deposits of clay contain more mineral matter in solution.

Since most of the water from the glacial drift in this municipality is derived from large patches and pockets of sand and gravel at shallow depth it is relatively low in mineral salts. The total dissolved solid content does not often exceed 2,000 parts per million. The waters are generally quite hard and contain fairly large amounts of calcium and magnesium salts. In the waters from a few wells the sulphate salts are abundant, especially the sulphates of magnesium (Epsom Salts) and sodium (Glauber's Salt). These salts render the water laxative, and when they occur in excessive amounts the water is unfit for use.

In summary, the water from the glacial drift is generally usable for all purposes but where the water is being derived from sand pockets within the blue clay, or from the base of the blue clay, it is apt to be too highly mineralized for domestic use.

Water from the Bedrock

One sample of water from the Ravenscrag formation was analysed by the Provincial Analyst, and the results are given in the accompanying table.

In this municipality the water from the bedrock contains a higher total dissolved solid content than the average water from the glacial drift. The water from wells tapping the same horizon at different localities differs somewhat, however. In many cases

it is quite soft, having an excess of sodium salts over the calcium and magnesium. In other cases the reverse is true. The sample analysed is hard in character. Calcium sulphate or gypsum is the most abundant mineral salt present, magnesium sulphate (Epsom Salts) is second, and sodium carbonate (black alkali) third. NaCl (common salt) is fourth in order of abundance and since the water is too salty for human consumption its content is probably in excess of 400 parts per million. The waters that are soft will have sodium carbonate, sodium sulphate, and sodium chloride as the predominant mineral salts present.

The waters from the Ravenscrag formation are suitable for stock use. Due to the high content of sodium chloride, they will doubtless prove to be too salty for domestic use in the majority of cases.

WELL RECORDS—RURAL MUNICIPALITY OF ANTLER NO. 61, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS			
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon							
1	NE.	2	7	30	1	Dug	17	1,785	- 6	1,779	6	1,779	Glacial sand	Hard, clear	48	D,	Sufficient for domestic use, use dugout for stock.			
2	NE.	3	"	"	"	"	16	1,790	- 4	1,786	14	1,776	" gravel	" "	51	D, S	Poor supply, haul water and use dugout for stock.			
3	NE.	4	"	"	"	"	14	1,815	- 3	1,812	11	1,804	" "	" "	50	D,	Use dugout and haul water for stock.			
4	SE.	6	"	"	"	"	10	1,800	- 6	1,794	7	1,793	" "	" "	47	D, S	Waters 50 head stock in wet years.			
5	NE.	6	"	"	"	"	15	1,800	- 7	1,793	7	1,793	" "	" "	47	D, S	" 70 " " .			
6	NW.	6	"	"	"	"	8	1,815	- 4	1,811	4	1,811	" "	" "	48	D, S, I	" 30 " " .			
7	SW.	7	"	"	"	"	20	1,820	- 15	1,805	15	1,805	" "	" "	48	D, S, I	" 30 " " .			
8	SE.	7	"	"	"	"	16	1,815	- 8	1,807	8	1,807	" "	" "	48	D, S	" 30 " " .			
9	SE.	10	"	"	"	"	12	1,785	- 9	1,776	9	1,776	" "	" "	48	D, S	Poor supply, haul water.			
10	NW.	11	"	"	"	"	12	1,785	- 6	1,779	6	1,779	" "	" "	49	D, S	Sufficient for local needs.			
11	SE.	11	"	"	"	"	9	1,765	- 2	1,763	7	1,758	" "	" "	48	D,	Hauls water for stock.			
12	SW.	12	"	"	"	"	23	1,755										Dry hole, use dugout.		
13	NW.	12	"	"	"	"	20	1,750	- 3	1,747	3	1,747	Sandy clay	Hard, clear		D, S	Domestic use only, use dugout and haul water for stock.			
14	SW.	14	"	"	"	"	10-20	1,800	-4,-6	1,794 1,796			Gravels pockets	"alkaline"	48	D, S, I	Town of Antler, poor supply, hauled water in drought.			
15	SE.	15	"	"	"	"	15	1,795	- 12	1,783	12	1,783	Glacial gravel							
16	SE.	16	"	"	"	"	18	1,830					Clay						Dry hole, use dugouts or haul water.	
17	NE.	16	"	"	"	"	30	1,825	- 5	1,820	10	1,815	Glacial sand	Hard, clear	50	D, S	House use only, dugout for stock, haul water in winters.			
18	NW.	16	"	"	"	"		1,840					Clay						Cannot get water.	
19	SE.	17	"	"	"	"							Clay						Use dugout and haul water.	
20	SE.	18	"	"	"	"	12	1,820	- 8	1,812	8	1,812	Glacial sand	Hard, clear	48	D,			Domestic supply only.	
21	SE.	20	"	"	"	"	20	1,840	- 12	1,828	14	1,826	" gravel	" "	48	D, S			Poor supply, haul water in winters.	
22	NE.	21	"	"	"	"	14	1,830	- 5	1,825	5	1,825	" "	" "	48	D, S			Waters 10 head stock in summers.	
23	NE.	21	"	"	"	Drilled	277	1,840					sand							Filled with sand and was abandoned.
24	NE.	22	"	"	"	Dug	8	1,805	- 5	1,800	5	1,800	Glacial gravel	Hard, clear	50	D, S			Sufficient in years of normal rainfall, use dugouts.	
25	SE.	23	"	"	"	"	15	1,795	- 10	1,785	10	1,785		" "		D, S			Haul water for stock and house in winters and dry years.	
26	NW.	24	"	"	"	"	14	1,755	- 2	1,753	2	1,753	Glacial gravel	Hard, clear	50	D, S, I			Sufficient for local needs.	
27	SE.	24	"	"	"	"	7	1,750	- 3	1,747	3	1,747	Glacial gravel	" "	49	D, S			Abundant supply.	

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

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

WELL RECORDS—RURAL MUNICIPALITY OF ANTLER, NO. 61 SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
28	SW.	26	7	30	1	Dug	10	1,805	- 5	1,800	5	1,800	Glacial clay	Hard, clear	D,	Use dugout and haul water, in winters and dry years, for stock and house use.	
29	NW.	27	"	"	"	"	14	1,820	- 6	1,814	6	1,814	" sand	" "	49 D, S	Poor supply; haul water in winters.	
30	SW.	29	"	"	"	"	12	1,855	- 6	1,849	6	1,849	" clay	" "	D,	Use dugout in summers, haul water in winters.	
31	SW.	30	"	"	"	"	8	1,885	- 5	1,880	5	1,880	" gravel	" "	D, S	Poor supply; haul water for house and stock.	
32	SW.	34	"	"	"	Bored	75	1,853								Dry hole.	
33	SE.	34	"	"	"	Dug	23	1,805	- 9	1,796	21	1,784	Gravel streak	Hard, clear	49 S,	Haul water in winters.	
34	NW.	36	"	"	"	"	16	1,775	- 10	1,765	10	1,765	Glacial clay	" "	N,	Haul water and use dugout.	
35	SE.	36	"	"	"	"	12	1,760	- 4	1,756	4	1,756	" "	" "	S,	Haul water in winters.	
36	SE.	36	"	"	"	Drilled	280	1,769								Dry hole.	
1	NE.	3	7	31	1	Dug	10	1,890	- 5	1,885	5	1,885	Glacial gravel	" muddy	D, S	Watered 40 head stock in 1935; usually poor.	
2	NW.	5	"	"	"	"	12	1,885	- 4	1,881	4	1,881	" "	Soft, clear	D, S	Abundant supply.	
3	SE.	6	"	"	"	Drilled	450	1,880	- 50	1,830	450	1,430	Ravenscrag sandy shale	Hard, salty	S,	8 pails a day; flowed until 1925.	
4	NE.	6	"	"	"	Dug	15	1,887					Glacial sand	" clear	D,	Abundant supply.	
5	NE.	11	"	"	"	"	12	1,862	- 2	1,860	4	1,858	" "	" muddy	N,	Hauls water.	
6	NE.	12	"	"	"	"	6	1,838	- 3	1,835	3	1,835	" gravel	" clear	D, S	Waters over 25 head stock.	
7	SE.	14	"	"	"	"	12	1,852	- 5	1,847	5	1,847	" "	" "	D, S	Waters 50 head stock; freezes in winters.	
8	NW.	18	"	"	"	"	12	1,912	- 8	1,904	8	1,904	" "	" "	D, S	Abundant supply.	
9	NW.	19	"	"	"	"	12	1,925	- 8	1,917	8	1,917	" "	" "	D, S, I	Waters 40 head stock.	
10	SW.	20	"	"	"	"	13	1,932								Dry holes; haul water.	
11	NW.	20	"	"	"	"	18	1,929	- 11	1,918	11	1,918	Glacial sand	Hard, clear		Went dry 1 year after dug; hauls water.	
12	SW.	21	"	"	"	"	10	1,921	- 3	1,918	5	1,916	" gravel	" "	D, S	Waters 40 head stock.	
13	SW.	22	"	"	"	"	16	1,910	- 6	1,904	6	1,904	" "	" "	D, S	Poor supply, uses dugout; hauls in winter; dry hole.	
14	NW.	22	"	"	"	"	20	1,908								Dry hole.	
15	NW.	23	"	"	"	"	20	1,879	- 13	1,866	13	1,866	Glacial gravel	Hard, clear	D, S	Abundant supply.	
16	SE.	24	"	"	"	"	14	1,832	- 8	1,824	12	1,820	" "	" "	D, S	Waters 18 head stock.	
17	NE.	25	"	"	"	"	8	1,857								Dry hole.	
18	SW.	26	"	"	"	"	8	1,880	- 6	1,874	6	1,874	Glacial gravel	Hard clear	D, S	Waters 40 head stock, water came from northeast.	

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 ANTLER NO. 61. SASKATCHEWAN

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
19	NE.	26	7	31	1	Dug	9	1,871	- 5	1,866	5	1,866	Glacial gravel	Hard, clear	D, S	Waters 100 head stock.	
20	SE.	28	"	"	"	Drilled	370	1,921			360	1,561	Sand at base of blue clay	" "	D, S	4 bbls. an hour, laxative; well filled with silt now.	
21	SW.	28	"	"	"	"	500	1,924	- 7	1,917	500	1,424	Ravenscrag sandy shale	Soft, salty	D, S	Abundant supply.	
22	SE.	30	"	"	"	Dug	12	1,938								Dry hole, hauled water for 25 years.	
23	NW.	31	"	"	"	"	13	1,942	- 7	1,935	9	1,933	Glacial gravel	Hard, clear	D, S	Waters 180 head stock.	
24	SE.	32	"	"	"	Bored	65	1,939	- 61	1,878	65	1,874	Yellow clay	" "	D, S	Poor supply.	
25	NW.	32	"	"	"	Dug	20	1,940								Dry holes, haul water.	
26	NE.	34	"	"	"	"	20	1,928	- 5	1,823	5	1,923	Glacial sand	Hard, clear	D, S	Waters 50 head stock.	
27	NE.	34	"	"	"	Bored	120	1,928					" blue clay			Dry hole.	
1	NW.	1	7	32	1	Dug	24	1,915	- 10	1,905	10	1,905	Glacial gravel	Hard, clear	48	D, S	Waters 50 head stock.
2	SW.	2	"	"	"	"	13	1,940	- 9	1,931	9	1,931	" "	" "	47	D, S	Sufficient for local needs.
3	NE.	2	"	"	"	"	10	1,935	- 4	1,931	4	1,931	" "	" "	48	D, S	Waters 20 head stock.
4	NW.	2	"	"	"	"	15	1,945	- 10	1,935	10	1,935	" "	" "	48	D, S	Abundant supply.
5	SE.	3	"	"	"	"	12	1,945	-				" clay			Dry hole. Use dugout and haul water.	
6	NE.	3	"	"	"	"	8	1,955					" "			Dry hole.	
7	SE.	4	"	"	"	"	52	1,980	- 1	1,979	51	1,929	" "	Hard, clear	D, S	Poor supply, haul water for 6 years.	
8	SE.	6	"	"	"	Drilled	484	1,990	- 10	1,980	480	1,510	Ravenscrag sandy shale	Soft, salty	41	D, S	Flowed 1920-1927; abundant supply.
9	NE.	8	"	"	"	"	503	2,020	- 20	2,000	475	1,545	Ravenscrag sandy shale	Hard, "	43	S,	Abundant supply, some gas with water.
10	SE.	9	"	"	"	"	501	2,005	- 20	1,985	480	1,525	Ravenscrag sandy shale	Soft, salty	42	S,	Waters 100 head stock.
11	NE.	10	"	"	"	"	487	1,965	- 20	1,945	480	1,485	Ravenscrag sandy shale	Hard, "	43	D, S	Abundant supply. #.
12	SE.	11	"	"	"	Dug	22	1,930	- 5	1,925	5	1,925	Glacial gravel	Hard, clear	48	D, S, I	Waters 100 head stock.
13	NW.	12	"	"	"	"	16	1,930	- 10	1,920	10	1,920	" "	" "	D, S	Sufficient for local needs. 8 foot well gave alkaline water.	
14	NE.	14	"	"	"	"	20	1,955	- 12	1,943	12	1,943	" sand	" "	48	D, S	Sufficient for local needs.
15	SW.	14	"	"	"	"	15	1,945	- 5	1,940	5	1,940	" gravel	" "	D, S	Poor supply; hauls water in winters.	
16	SE.	15	"	"	"	Drilled	500	1,960	- 45	1,915	460	1,500	Ravenscrag sandy shale	Soft, saline	D, S, I	Waters 60 head stock.	
17	SW.	16	"	"	"	"	450	2,020	- 40	1,980	400	1,620	Ravenscrag sandy shale	Soft, salty	42	S, I	Abundant supply; 200 foot well plugged with sand.

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 ANTLER NO. 61 SASKATCHEWAN

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS	
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon					
18	NE.	16	7	32	1	Dug	10	2,025	- 5	2,020	5	2,020	Glacial sand	Hard, clear	50	D, S	Waters 40 head stock.	
19	NE.	17	"	"	"	"	40	2,040	- 5	2,035	5	2,035	" clay	" "	50	D, S	Poor supply.	
20	SW.	18	"	"	"	"	8	2,020	- 3	2,017	3	2,017	" sand	" "		D, S	Poor supply, haul water and use dugout.	
21	SE.	20	"	"	"	Drilled	580	2,040	- 10	2,022	450	1,590	Ravenscrag shandy shale	" salty	42	S,	Abundant supply	
22	SW.	22	"	"	"	Dug	17	1,990	- 10	1,980	16	1,974	Glacial gravel	" clear	47	D,	Haul water for stock.	
23	SW.	23	"	"	"	"	14	1,955	- 9	1,946	9	1,946	" "	" "		D, S, I	Abundant supply.	
24	SE.	24	"	"	"	"	14	1,925					clay	" "			Dry hole.	
25	SW.	25	"	"	"	"	12	1,940	- 4	1,936	4	1,936	Glacial gravel	" "		D, S, I	Abundant supply.	
26	SE.	26	"	"	"	Bored	85	1,960	- 40	1,920	40	1,920	" clay	"alkalino		S,	Waters 20 head stock.	
27	NE.	26	"	"	"	Dug	12	1,965	- 4	1,961	4	1,961	" gravel	" clear	48	D, S	Waters 50 head stock.	
28	NE.	27	"	"	"	"	20	1,970	- 3	1,967	3	1,967	" "	" "		D, S	Sufficient for local needs.	
29	SW.	28	"	"	"	"	12	2,040	- 10	2,030	11	2,029	" "	" "	50	D, S	Poor supply, haul water.	
30	SW.	30	"	"	"	"	12	2,035	- 6	2,029	6	2,029	" sand	" "	45	D, S	Sufficient in summer; haul water in winter.	
31	SE.	32	"	"	"	Drilled	270	2,045										Went dry in 2 weeks.
32	NE.	32	"	"	"	Dug	10	2,065										Dry hole, hauls all water.
33	SE.	33	"	"	"	Drilled	356	2,025	- 30	1,995	356	1,669	Ravenscrag shale	Soft, salty	43	D, S	Abundant supply.	
34	SW.	34	"	"	"	Dug	20	2,000	- 3	1,997	3	1,997	Glacial gravel	Hard, clear	48	D, S, I	Abundant supply.	
35	NW.	34	"	"	"	"	18	1,985	- 3	1,982	3	1,982	" "	" "		D, S	Waters 100 head stock.	
36	SE.	34	"	"	"	"	14	1,975	- 7	1,968	7	1,968	" "	" "	48	D, S	Waters 10 head stock.	
37	NE.	35	"	"	"	"	8	1,953	- 5	1,948	8	1,945	" "	" "		D, S	Sufficient for local needs.	
38	NW.	36	"	"	"	"	15	1,950	- 5	1,945	5	1,945	" "	" "		D, S	Abundant supply.	
39	NE.	36	"	"	"	Drilled	344	1,955	- 18	1,937	344	1,611	Ravenscrag sandy shale	" salty		D, S, I	" "	
1	SE.	2	7	33	1	Dug	17	1,945	- 6	1,939	14	1,931	Glacial sand	Hard, clear		D,	Poor supply.	
2	NW.	3	"	"	"	Drilled	400	2,005	- 20	1,985	400	1,605	Ravenscrag sandy shale	Soft, salty	43	S,	Waters 100 head stock, haul drinking water.	
3	NE.	4	"	"	"	Dug	18	1,995	- 8	1,987	8	1,987	Glacial gravel	Hard, clear	49	D, S	Waters 40 head stock.	
4	NE.	6	"	"	"	"	16	2,005	- 7	1,998	9	1,996	" "	" "		D, S, I	Waters 30 head stock, 35 dry holes.	
5	SW.	7	"	"	"	"	4	2,000	- 2	1,998	2	1,998	" sand	" "		D, S	Abundant supply, 18 dry holes.	

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

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

5
WELL RECORDS—RURAL MUNICIPALITY OF ANTLER NO. 61 SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
6	SW.	8	7	33	1	Dug	15	2,010	- 3	2,007	8	2,002	Glacial gravel	Hard, alkaline [#]	49	D, S	Poor supply, haul water in dry years.
7	SE.	9	"	"	"	"	10	1,985	- 4	1,981	4	1,981	" "	" clear	45	D, S, I	Waters 40 head stock.
8	NE.	11	"	"	"	"	15	1,965	- 11	1,954	11	1,954	" "	" "	46	D, S, I	Waters 50 head stock.
9	NW.	12	"	"	"	"	12	1,970	- 8	1,962	8	1,962	" "	" "	47	D, S	Waters 30 head stock.
10	NE.	14	"	"	"	"	15	1,985	- 6	1,979	6	1,979	" "	" "	45	D, S	Waters 30 head stock.
11	SW.	15	"	"	"	"	14	1,990	- 4	1,986	4	1,986	" "	" "	50	D, S, I	Waters 40 head stock.
12	NE.	16	"	"	"	Bored	90	2,015					Blue clay				Dry hole, no water on farm.
13	NE.	17	"	"	"	Dug	22	2,025	- 5	2,020	5	2,020	Glacial gravel	Hard, clear	45	S,	Abundant supply.
14	NE.	18	"	"	"	"	18	2,030	- 14	2,016	9	2,021	" sand	" "	48	D,	Sufficient for local needs.
15	NE.	19	"	"	"	Drilled	580	2,060	- 24	2,036	380	1,680	Ravenscrag sandy shale	" alkaline [#]		S,	Used to flow, abundant supply.
16	NE.	20	"	"	"	Dug	20	2,035	- 16	2,019	16	2,019	Glacial gravel	" "		D, S, I	Poor supply.
17	NW.	20	"	"	"	"	14	2,040	- 7	2,033	7	2,033	" "	" clear	49	D, S	Sufficient in years of normal rainfall; 25 dry test holes.
18	SE?	21	"	"	"	Drilled	475	2,015	- 6	2,009	360	1,655	Ravenscrag sandy shale	Soft, salty	44	S,	Used to flow; waters 50 head stock.
19	NW.	22	"	"	"	Dug	16	2,010	- 6	2,004	6	2,004	Glacial sand	Hard, clear	45	D, S	Sufficient in years of normal rainfall.
20	NE.	22	"	"	"	"	12	2,055	- 5	2,050	5	2,050	Glacial gravel	" "		D, S	Sufficient for local needs.
21	NW.	24	"	"	"	"	12	2,000	- 6	1,994	6	1,994	" "	" alkaline [#]	48	D, S	Waters 50 head stock.
22	NW.	26	"	"	"	Drilled	600	2,050	- 4	2,046			Ravenscrag shale	Soft, salty	44	D, S	Waters 150 head stock, tastes like iodine.
23	SE.	26	"	"	"	Dug	10	2,000	- 4	1,996	4	1,996	Glacial gravel	Soft, clear	51	D, S	Sufficient for local needs.
24	SW.	28	"	"	"	"	10-20	2,040					" "	Hard, alkaline [#]		D, S, M	Sufficient for town of Wauchope in years of normal rainfall.
25	NE.	28	"	"	"	Drilled	232	2,040			?	?	?			N,	
26	SE.	28	"	"	"	"	560	2,035	+ 1	2,036	560	1,475	Ravenscrag sandy shale	Soft, salty		S,	2 bbls a day; tastes of iodine, gas.
27	NW.	30	"	"	"	Dug	24	2,075	- 18	2,057	18	2,057	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
28	SE.	31	"	"	"	"	16	2,070	- 12	2,058	13	2,057	" gravel	" alkaline [#]	49	D, S	Dry in autumn and winters; hauls drinking water.
29	SE.	33	"	"	"	"	18	2,040	- 14	2,036	14	2,036	" sand	" sand		D, S	Waters 30 head stock in summer; haul water in winter.
30	SE.	35	"	"	"	"	10	2,000	- 7	1,993	7	1,993	" gravel	Soft, clear	51	D,	Poor supply.
31	SE.	35	"	"	"	"	8	2,000	- 2	1,998	2	1,998	" "	Hard, clear	48	D, S, M	Abundant supply.
32	SW.	36	"	"	"	"	15	2,035	- 8	2,027	8	2,027	" "	" "	48	D, S	Waters 50 head stock.

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

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

WELL RECORDS—RURAL MUNICIPALITY OF ANTLER, NO. 61, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
33	NE	24	7	33	1	Dug	15	2,030	- 7	2,023	7	2,023	Glacial gravel	Hard, clear	D, S	Abundant supply.	
1	NE.	1	"	"	"	Dug	14	1,995	- 9	1,986	9	1,986	Glacial gravel	Hard, clear	D, S	Waters 80 head stock.	
2	NW.	2	"	"	"	"	14	2,002	- 6	1,996	6	1,996	" "	" "alkaline"	D, S	Cannot be pumped dry.	
3	NW.	14	"	"	"	Drilled	530	2,040	+ 3	2,043	500	1,540	Ravenscrag sandy shale	Soft, salty	S,	Flowed for 2 years, now 1 bbl. a day.	
4	SW.	24	"	"	"	"	540	2,025	+ 1	2,026	510	1,515	Ravenscrag sandy shale	" "	S,	Abundant supply.	
5	SW.	25	"	"	"	"	600	2,060	+30	2,090	520	1,540	Ravenscrag sandy shale	" "	S,	Abundant supply.	
6	NW.	26	"	"	"	Dug	20	2,050	-10	2,040	10	2,040	Glacial gravel	Soft, clear	D, S	Supply 30 head stock.	
1	SW.	1	8	30	1	Dug	19	1,780					Clay			Dry hole, haul water.	
2	SE.	3	"	"	"	"	8	1,815	- 8	1,807	8	1,807	Glacial gravel	Hard, clear	S,	Haul water in winter and dry years.	
3	SE.	3	"	"	"	Drilled	240	1,815			240	1,575	Sand below blue clay	" "alkaline"	N,	Sand plugged the casing.	
4	NE.	3	"	"	"	"	160	1,815			160	1,655	Sand below blue clay		N,	Plugged with sand; 500 foot dry hole into marine shale.	
5	SE.	4	"	"	"	Dug	16	1,840	- 5	1,835	?		Clay	Soft, clear	S,	Poor supply.	
6	NE.	4	"	"	"	"	12						"			Dry hole, haul water for stock and house.	
7	NW.	5	"	"	"	"	18	1,865	-16	1,849	16	1,849	Glacial gravel	Hard, alkaline			
8	SW.	6	"	"	"	"	10-30	1,860					Clay			Dry holes; haul all water.	
9	SE.	8	"	"	"	"	12	1,865	-10	1,855	10	1,855	Glacial sand	Hard, "alkaline"	D, S	Poor supply, haul water during winters.	
10	NW.	8	"	"	"	"	17	1,800	- 7	1,793	7	1,793	" gravel	Hard, clear	46	D, S	Abundant supply.
11	SE.	9	"	"	"	"	10	1,850	- 5	1,845	5	1,845	" "	" "		D,	Sufficient for local needs.
12	SW.	10	"	"	"	"	16	1,835	- 8	1,827	8	1,827	" clay	" "		D,	" " " " , use large dugout for stock.
13	SW.	10	"	"	"	Drilled	320	1,835									No. water.
14	NE.	10	"	"	"	Dug	16	1,815	- 4	1,811	9	1,806	Glacial gravel	Hard, clear		D, S	Sufficient except in drought years.
15	SE.	12	"	"	"	"	15	1,790	- 9	1,781	9	1,781	" clay	" "	48	S,	Sufficient in summers; haul drinking water.
16	SE.	14	"	"	"	"	16	1,805	- 6	1,789	6	1,789	" "	" "	50	S,	Use dugout; sufficient in years of normal rainfall.
17	NE.	16	"	"	"	"	17	1,855	-11	1,844	11	1,844	" gravel	" "		D, S	Sufficient for household purposes; haul water for stock in winters.
18	SE.	17	"	"	"	"	12	1,860	- 6	1,854	6	1,854	" sand	" "	47	D, S	Abundant supply.
19	SE.	18	"	"	"	"	12	1,880	- 9	1,871	9	1,871	" "	" "		D, S	Sufficient for local needs.
20	SW.	18	"	"	"	"	14	1,885	-11	1,874	6	1,877	" gravel	" "		D, S	Becomes dry in winters.

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 ANTLER, NO. 61, SASKATCHEWAN

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
21	SE.	20	8	30	1	Bored	30	1,865	- 29	1,836	9	1,856	Glacial sand	Hard, clear		Poor supply, use dugout and haul water.	
22	NW.	20	"	"	"	Dug	11	1,872	- 8	1,864	8	1,864	" "	" "	D, S	Poor supply.	
23	SW.	23	"	"	"	"	20	1,825					" clay			Dry hole, haul water.	
24	NE.	24	"	"	"	"	8	1,755	- 6	1,749	6	1,749	" gravel	Hard, clear	S,	Domestic use only; haul water for stock in winters.	
25	NW.	25	"	"	"	"	12	1,800	- 6	1,794	6	1,794	" "	" "	N,	Well filled in; haul drinking water.	
26	SW.	28	"	"	"	"	10	1,860	- 3	1,857	8	1,852	" "	" "	D, S	Waters 25 head stock in summer, haul some water in winter.	
27	NE.	29	"	"	"	"	10	1,867					" clay			Dry since 1930.	
28	SE.	32	"	"	"	"	30	1,857								Dry hole.	
29	NE.	32	"	"	"	"	12	1,865								Dry hole.	
30	SE.	34	"	"	"	"	11	1,845	- 6	1,839	5	1,840	Glacial gravel	Hard, clear	D, S	Sufficient for local needs, use dugout.	
31	NE.	34	"	"	"	"	13						" clay			Dry hole, use dugout for stock in summer.	
32	SW.	36	"	"	"	"	9	1,795	- 6	1,789	6	1,789	" gravel	Hard, clear	D, S	Abundant supply.	
1	NE.	2	8	31	1	Dug	9	1,885	- 4	1,881	4	1,881	Glacial gravel	Hard, clear	D, S	Waters 40 head stock.	
2	NE.	3	"	"	"	"	25	1,898	- 14	1,884			?	" "	S,	Nearly dry; 2 bored wells to 100 feet. No water. Use dugout.	
3	SW.	4	"	"	"	Drilled	320	1,940	- 15	1,925	320	1,620	Ravenscrag sandy phase	Soft, saline	D, S	Excellent supply.	
4	NE.	4	"	"	"	Dug	8	1,912	- 3	1,909	3	1,909	Glacial gravel	" clear	D, S	Waters 40 head stock.	
5	NW.	6	"	"	"	"	10	1,945	- 2	1,943	2	1,943	" "	" "	D, S	Waters 35 head stock.	
6	SW.	7	"	"	"	"	14	1,950	- 2	1,948	2	1,948	" "	Hard, clear	D, S	Dry in drought years.	
7	NE.	10	"	"	"	Bored	20	1,897	- 10	1,887	15	1,882	" "	" "	D, S	Waters 20 head stock in summer and most winters	
8	NE.	11	"	"	"	Dug	10	1,890	- 4	1,886	4	1,886	" "	" "	D, S	Waters 150 head stock.	
9	SE.	12	"	"	"	"	10	1,882	- 5	1,877	5	1,877	" "	" "	D, S	Waters 25 horses in summer.	
10	NE.	13	"	"	"	Bored	40	1,890					Clay			Dry hole, haul water.	
11	SE.	14	"	"	"	Dug	9	1,884	- 3	1,881	3	1,881	Glacial gravel	Hard, clear	D, S	Normally a good supply.	
12	SE.	16	"	"	"	"	7	1,918	- 4	1,914	4	1,914	" "	" "	D, S	3 bbls. a day.	
13	SW.	16	"	"	"	"	12	1,937	- 3	1,934	3	1,934	" sand	" "	D, S	Sufficient for local needs,	
14	NW.	16	"	"	"	"	8	1,900								Dry holes, all water is hauled.	
15	SW.	18	"	"	"	"	14	1,954								Dry hole, use dugout and haul water for stock.	

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF ANTLEER NO. 61, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
16	NE.	18	8	31	1	Drilled	431	1,958	- 40	1,918	300	1,658	Ravenscrag sandy shale	Soft, salty	S,	No water below 390 feet; abundant supply.	
17	SW.	19	"	"	"	Bored	90	1,960								Dry holes.	
18	NW.	20	"	"	"	Dug	15	1,950	- 4	1,946	4	1,946	Glacial sand	Hard, clear	D, S	Poor supply.	
19	SW.	21	"	"	"	"	14	1,925	- 3	1,922	3	1,922	" gravel	Soft, clear	D, S	40 bbls. a day.	
20	SW.	23	"	"	"	"	10	1,892	- 8	1,884	8	1,884	" sand	Hard, clear	D, S	Waters 25 head stock.	
21	NW.	24	"	"	"	"	16	1,886	- 2	1,884	4	1,882	" "	" "	D, S	Domestic supply in dry years.	
22	SE.	26	"	"	"	"	10	1,885	- 4	1,881	4	1,881	" gravel	" "	D, S	Waters 25 head stock.	
23	SW.	20	"	"	"	Bored	70	1,935	- 30	1,905	30	1,905	" "	" "	S,	Poor supply.	
24	SW.	28	"	"	"	Drilled	463	1,935					shale			3 holes drilled to 463 feet, no water.	
25	SW.	29	"	"	"	Dug	8	1,940	- 5	1,935	5	1,935	Glacial gravel	Soft, clear	D, S	35 head stock watered until freeze-up.	
26	NE.	30	"	"	"	Drilled	400	1,948	- 40	1,908	350	1,598	Sandy shale			Supply gave out when casing was lowered.	
27	SE.	32	"	"	"	Dug	12	1,993	- 4	1,989	4	1,989	Glacial sand	Soft, clear	D, S	Domestic supply only.	
28	NW.	32	"	"	"	"	7	1,945	- 3	1,942	3	1,942	" gravel	Hard, clear	D, S	Cannot be pumped dry.	
29	SE.	34	"	"	"	"	12	1,895	- 4	1,891	4	1,891	" sand	" "	D, S	Waters 30 head stock, in summers.	
30	NW.	34	"	"	"	"	7	1,901	- 2	1,899	4	1,897	" "	" "	D, S	Very good supply.	
31	NE.	36	"	"	"	"	10	1,875	- 5	1,870	5	1,870	" gravel	" "	D,	10 bbls. a day.	
1	NW.	1	8	32	1	Dug	4	1,958	- 2	1,956	4	1,954	" "	" "	D, S	Poor supply.	
2	SE.	3	"	"	"	Drilled	500	1,980	- 40	1,940	480	1,500	Ravenscrag sandy shale	Soft, salty	D, S	Waters 70 head stock.	
3	SE.	4	"	"	"	Dug	14	2,025	- 5	2,020	3	2,023	Glacial gravel	Hard, clear	D, S	Poor supply, haul water for stock.	
4	NE.	4	"	"	"	"	10	2,015	- 5	2,010	5	2,010	" "	" "	D, S	Abundant supply.	
5	SE.	10	"	"	"	"	11	1,987	- 8	1,979	8	1,979	" "	" "	D, S	" "	
6	NE.	12	"	"	"	"	10	1,945					Yellow clay			Dry holes.	
7	SW.	13	"	"	"	"	9	1,950	- 3	1,947	5	1,945	Glacial gravel	Hard, clear	D, S	Abundant supply.	
8	NE.	14	"	"	"	"	14	1,955	- 10	1,945	10	1,945	" sand	" "	D, S	100 bbls. a day.	
9	NW.	15	"	"	"	"	15	1,985	- 13	1,972	13	1,972	" gravel	" "	D, S	Abundant supply.	
10	SE.	16	"	"	"	"	12	2,020	- 2	2,018			" sand	" "	D, S	Waters 30 head stock.	
11	SE.	18	"	"	"	"	14	2,060	- 11	2,049	12	2,048	" gravel	" "	D, S	Not a good supply.	

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

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

WELL RECORDS—RURAL MUNICIPALITY OF ANTLER NO. 61, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
12	SW.	10	8	32	1	Dug	20	2,065	- 4	2,061			Glacial gravel	Hard, clear	D, S	Waters 30 head stock in years of normal rainfall.	
13	SW.	22	"	"	"	"	9	1,982	- 2	1,980	5	1,977	" "	" "	D, S	Sufficient for local needs.	
14	SE.	24	"	"	"	"	8	1,955	- 5	1,950	5	1,950	" "	" "	D, S	Sufficient for local needs.	
15	SE.	26	"	"	"	"	10	1,965	- 6	1,959	6	1,959	" "	" "	D, S	Abundant supply.	
16	SE.	26	"	"	"	Bored	83	1,975	- 79	1,896	80	1,895	" clay	" "	D, S	Poor supply.	
17	NE.	26	"	"	"	Dug	16	1,970	- 14	1,956	14	1,956	" gravel	" "	D,	2 pails a day.	
18	NW.	28	"	"	"	"	28	1,998	- 23	1,975	27	1,971	" "	" "	D, S	Waters 80 head stock.	
19	SW.	30	"	"	"	Drilled	450	2,070	- 40	2,030	450	1,620	Ravenscrag sandy shale	Soft, salty	D, S	Cylinder and pipes fell to bottom and well plugged.	
20	NE.	30	"	"	"	Dug	15	2,058	- 10	2,048	12	2,046	Glacial clay	Hard, clear	46	D, S	All water is hauled. Haul some water for stock.
21	NW.	32	"	"	"	"	10	2,025	- 9	2,016	9	2,016	" gravel	Soft, clear	D, S	Abundant supply. fed by spring.	
22	SE.	36	"	"	"	"	18	1,978								Dry hole.	
1	NW.	3	8	33	1	Dug	14	2,050	- 4	2,046	4	2,046	Glacial gravel	Hard, clear	S,	Sufficient for 50 head stock.	
2	SE.	4	"	"	"	"	24	2,060	- 10	2,050	10	2,050	" "	" "	D, S	No water in winters.	
3	NW.	4	"	"	"	"	18	2,070	- 15	2,055	17	2,053	" sand	" "	48	D, S, I	Sufficient in 1935.
4	SE.	5	"	"	"	"	14	2,065	- 10	2,055	12	2,053	" gravel	" "	49	S,	Waters 10 head stock.
5	NW.	10	"	"	"	"	8	2,055	- 5	2,050	5	2,050	" "	" "	52	D, S, I	Sufficient for farm needs.
6	SE.	11	"	"	"	"	6	2,050	- 1	2,049	3	2,047	" "	" "	46	D, I	" " local needs.
7	NW.	12	"	"	"	Drilled	600	2,060	- 6	2,054			Ravenscrag	Soft, salty	41	S,	Abundant supply.
8	SE.	12	"	"	"	Dug	14	2,060	- 9	2,051	9	2,051	Glacial sand	" cloudy		D, S, I	Waters 30 head stock.
9	NE.	14	"	"	"	"	12	2,060	0	2,060	?		" clay	Hard, alkaline	51	S,	Goes dry early in summers.
10	SE.	14	"	"	"	"	10-20	2,065									Dry holes; haul water.
11	SE.	16	"	"	"	"	16	2,075	- 2	2,073	2	2,073	Glacial gravel	Hard, alkaline	51	S,	Poor supply, haul water.
12	SW.	16	"	"	"	Drilled	440	2,080	# 10	2,090	440	1,640	Ravenscrag sandy shale	" salty	46	S,	Used to flow; abundant supply.
13	SE.	17	"	"	"	"	400	2,085	- 40	2,045	400	1,685	Ravenscrag sandy shale	"		S,	Abundant supply.
14	SE.	18	"	"	"	Dug	19	2,115	- 18	2,097	18	2,097	Glacial sand	Hard, clear		D, S	Poor supply, well should be deepened.
15	SW.	18	"	"	"	"	50	2,115					" clay				Dry hole, all water is hauled.
16	NE.	20	"	"	"	"	8	2,090	- 5	2,085	5	2,085	" gravel	Hard, clear	48	D, S	Waters 200 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF ANTLER NO. 61, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
17	NE.	21	8	33	1	Dug	10	2,070	- 6	2,064	6	2,064	Glacial sand	Hard, clear	50	D, S	Good supply if deepened.
18	NW.	22	"	"	"	"	20	2,075	- 15	2,060	12	2,063	" gravel	"*alkaline"	50	S	Poor supply, water hauled in winters and dry years.
19	SE.	22	"	"	"	"	18	2,050	- 13	2,037	13	2,037	" "	" clear	45	D, S	Waters 70 head stock.
20	SW.	23	"	"	"	"	11	2,050	- 10	2,040	10	2,040	" sand	" "	46	D, S	24 bbls. an hour.
21	SW.	25	"	"	"	"	20	2,080	- 10	2,070	10	2,070	" gravel	" "		S	Waters 30 head stock.
22	SW.	26	"	"	"	"	15-20	2,070									Dry holes, dugout and haul water.
23	SE.	28	"	"	"	"	18	2,060	- 6	2,074			Glacial gravel	Hard, clear	48	D, S	Poor supply, haul water in winter.
24	SW.	30	"	"	"	"	6	2,130	- 3	2,127	3	2,127	" sand	Soft, clear	46	D, S	Abundant supply.
25	NW.	30	"	"	"	"	12	2,135	- 9	2,126	9	2,126	" "	Hard, clear	47	D, S	Gave 1,300 tanks water in 1934.
26	NW.	31	"	"	"	"	20	2,120	- 1	2,119	?	?	" gravel	" "	48		C. N. R. use it for locomotives. Never dry.
27	SW.	31	"	"	"	"	12	2,130	- 4	2,126	4	2,126	" "	" "		D, S, I	Abundant supply.
28	NW.	34	"	"	"	Drilled	500	2,090	- 9	2,081	300	1,790	Ravenscrag sandy shale	Soft, salty	41	S, I	Abundant supply.
29	SE.	34	"	"	"	Dug	10-30	2,090									Dry holes, all water is hauled.
30	SW.	35	"	"	"	"	10-15	2,090									" " , " " " " "
1	SE.	2	8	34	1	Drilled	660	2,090	+ 4	2,094	600	1,490	Ravenscrag sandy shale	Soft, salty		D, S	Sufficient for local needs.
2	NW.	2	"	"	"	Dug	9	2,060	- 6	2,054	6	2,054	Glacial gravel	Hard, clear		D, S	Cannot be pumped dry.
3	SE.	14	"	"	"	"	30	2,190					" "	"*alkaline"		N	Too alkaline for use; water is hauled.
4	NW.	14	"	"	"	Drilled	547	2,120	- 50	2,070	547	1,573	Ravenscrag sandy shale	Soft, saline		D, S	Waters 50 head stock.
5	SW.	23	"	"	"	Dug	20	2,150									Dry holes; all water is hauled.
6	NE.	24	"	"	"	"	19	2,140	- 16	2,124	12	2,128	Glacial gravel	Hard, clear		D, S	Sufficient in summer, but low in winter.
7	NE.	26	"	"	"	Bored	60										Dry holes, all water is hauled.
8	NE.	36	"	"	"	Drilled	515	2,148	0	2,148	515	1,633	Ravenscrag sand	Soft, salty		S	Plugged by sand, 2 similar wells.

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(#) Sample taken for analysis.