CANADA
DEPARTMENT OF MINES

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

BUREAU OF ECONOMIC GEOLOGY
GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF ANTELOPE PARK No. 322 SASKATCHEWAN

BY

B. R. MacKay, H. N. Hainstock & G. Graham

Water Supply Paper No. 220

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF ANTELOPE PARK, NO. 322 SASKATCHEWAN

INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Bearpaw Formation. The Bearpaw consists mostly of incoherent dark grey to dark brownish grey, partly bentonitic shales, weathering light grey, or, in places where much iron is present, buff. Beds of sand occur in places in the lower part of the formation. It forms the uppermost bedrock formation over much of western and southwestern Saskatchewan and has a maximum thickness of 700 feet or somewhat more.

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Antelope Park, No. 322, comprises an area of approximately 242 square miles in western Saskatchewan. The Alberta-Saskatchewan boundary forms the western border of the municipality and its southern border lies 180 miles north of the International Boundary line. An area of 162 square miles consisting of four full townships, described as townships 31 and 32, ranges 27 and 28, and two fractional townships, described as townships 31 and 32, range 29, was covered by the field party and is discussed in this report. A branch line of the Canadian National railways traverses secs. 1, 2, 3, and 4, tp. 31, range 27, and then runs in a northwesterly direction from sec. 5, tp. 31, range 28, across the southwestern corner of the municipality. The hamlet of Hoosier is located in the southeastern corner of the municipality and the village of Loverna is located in the southwestern corner. Provincial highway No. 17 runs along the western border of the municipality.

The northwestern three-quarters of the area under discussion is mainly covered by moraine, a small area in the northwestern corner being mantled by boulder clay and Recent dune sands. The southeastern quarter of the area is largely overlain by boulder clay or glacial till. Small areas, however, are covered by dune sands, glacial lake clays, and moraine. The ground surface of the moraine-covered area is rough and hilly. Lakes and undrained depressions are numerous, and boulders are found on the surface of most of the hills. The till-covered area is undulating.

Water-bearing Horizons in the Unconsolidated Deposits

Due to the paucity of information it has been impossible to outline any general or continuous water-bearing horizons in this municipality. The small areas of dune sands in township 31, range 27, and in townships 32, ranges 27 and 29, have not been prospected for water and at present no wells are located in these Recent deposits. Small quantities of water can no doubt be obtained from these deposits, but it is advisable to prospect them with a small hand auger before digging a well. Any water obtained from these Recent deposits should be of very good quality.

The deposits of glacial lake clays that occur in township 31, range 27, and in township 31, range 28, are not thought to be of great thickness and they contain little or no water. Water, however, is obtained in the vicinity of the lake lying east of Loverna from deposits of sand that occur in the underlying till.

The water conditions in the moraine- and till-covered areas are quite similar. In the moraine-covered area small quantities of water should be readily obtained by digging wells beside the undrained depressions. The water from these wells is suitable for all farm needs, but the supply is readily affected by drought. Care should be taken to see that these wells do not become polluted by surface water containing animal refuse. The moraine and boulder clay consist of two zones; an upper weathered zone, usually not more than 30 feet in depth, and an unweathered zone that extends to the bedrock. Scattered pockets of sand or gravel occur within the weathered zone of the drift and form aquifers for shallow wells. They do not form a continuous water-bearing horizon, however, and in places many dry holes are dug before a water-bearing pocket is tapped. The yield from these wells depends upon the size of the water-bearing deposits tapped and upon the amount of annual precipitation. Wells that have tapped pockets of considerable areal extent usually yield a supply that is more than sufficient for farm needs, but those that tap small pockets yield a supply that is sufficient only for domestic needs and a few head of stock. All these shallow wells are readily affected by drought. The water is suitable for all farm needs. Before digging a shallow well it is advisable to locate one of these water-bearing deposits by means of a small hand auger.

The lower or unweathered zone of the glacial drift also contains scattered pockets of water-bearing sand or gravel. These water-bearing deposits are encountered at depths of 35 to 125 feet or more. They appear to be fairly numerous, but they do not form a continuous water-bearing horizon, although some continuity is apparent in adjacent quarter sections. A few dry holes have been dug in different parts of the municipality. Some of the wells tapping these deposits yield inadequate supplies of water for farm needs, but in general the yield from most of the wells is more abundant and dependable than that from shallower wells. The quality of the water, however, varies greatly, and in a few cases it is too highly mineralized to be used for domestic purposes.

In those areas where the sub-soil is impervious, dugouts can be excavated to retain a supply of surface water to supplement the supply from wells. When the soil is porous, however, two or more shallow wells may be used. Small dams can also be constructed in some areas in the municipality to retain water for stock use. The supply from springs can be considerably increased by digging out and cribbing the springs, and also by the use of collecting galleries. Reservoirs can be dug to retain the overflow water.

Water-bearing Horizons in the Bedrock

The Bearpaw formation is thought to immediately underlie the glacial deposits in the northeastern part of the municipality; and the Belly River formation immediately underlies the drift over the remainder of the area, and elsewhere underlies the Bearpaw formation. No wells were recorded that tapped aquifers in the bedrock, so that the thickness of the drift mantle is not definitely known. In the eastern part of the area, however, it is assumed to be approximately 150 feet thick and in some areas in the western part it is probably of even greater thickness.

It is possible that water-bearing horizons exist near the contact of the Belly River and the Bearpaw formations, as water-bearing sands were encountered in this zone in the municipality lying directly to the east, but since the water is usually very highly mineralized it does not appear advisable to drill wells to this depth. Water-bearing sands occur in the Belly River formation, but it might be necessary to sink a well 650 feet deep, or to an elevation of at least 1,750 feet above sea-level, before these sands would be encountered. Should a water-bearing horizon be present in the Belly River in this area, it will probably yield an abundant supply of water that would be usable for all farm purposes.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 31, Range 27

The chief source of water in this township is from wells sunk into the glacial deposits. Dugouts, springs, and sloughs are used to supplement the supply from the wells.

The northwestern part of the township, and small areas in sections 2, 3, 10, and 11, and in sections 22, 23, 24, 25, and 26, are covered by moraine. The remainder of the township is mantled by boulder clay or glacial till. Glacial lake clays overlie the till in parts of sections 9, 10, 11, 13, 14, and 15, and dune sands occur in the NW.$\frac{1}{4}$, section 36. The ground surface is rough, and numerous, small, undrained depressions occur in the northeastern part of the area. When these depressions are dry they form "alkali" flats. Springs are fairly common in the vicinity of the lakes.

The glacial lake clays have not been prospected for water, but it is doubtful if they contain water-bearing beds. They are quite thin, however, and it is possible that water-bearing deposits occur in the boulder clay that immediately underlies the clay.

The deposits of moraine and boulder clay are composed of the same types of material and the water conditions are similar. They consist of a few feet of top soil that contains boulders; a weathered zone of light-coloured boulder clay in which a few scattered pockets of sand and gravel occur; and an unweathered zone of dark-coloured, compact boulder clay that also contains scattered deposits of sand and gravel. A few wells sunk near sloughs or undrained depressions obtain small amounts of water. These wells, however, are directly affected by seasonal precipitation and in periods of prolonged drought they may become completely dry. If care is taken to see that these wells are not contaminated by surface pollution, the water from them should be quite satisfactory for domestic use. In years of normal rainfall an adequate supply for farm needs should be obtained by using such a well for domestic needs and a dugout to supply water for stock. The springs that occur along the small ravines and in the vicinity of lakes yield a fair supply of water that is suitable for stock use and which is also being used for domestic purposes. It contains a considerable amount of iron that forms an oil like scum. The scattered pockets of sand and gravel that occur in the weathered zone of the drift form aquifers for a few wells in this township. These water-bearing deposits do not form a continuous horizon and it is advisable to locate one of these pockets with a small test auger before digging a well. Wells that have tapped these pockets usually yield an abundant supply of water that has been found suitable for domestic purposes as well as for stock.

Most of the wells in this township obtain water from the sand and gravel deposits located in the lower part, or unweathered zone, of the glacial drift. These pockets appear to be fairly continuous over small areas, but no water-bearing horizons of large areal extent can be outlined. Dry holes have been dug in sections 3 and 10, and it is particularly difficult to obtain an adequate supply of water in section 15. Approximately one-third of the wells that tap deposits in the lower part of the drift yield inadequate supplies of water. A large number of the wells yield water that is unsatisfactory for domestic purposes.

In those areas where an adequate supply of water cannot be obtained from wells, farmers are advised to excavate dugouts to retain a supply of surface water sufficient for stock needs. The dugouts should be excavated at least 12 feet deep in order to retain a supply of water that will last throughout the year. Shallow wells dug beside the dugouts can be used for domestic purposes, if care is taken to see that they are not contaminated by surface waters containing animal refuse.

Township 31, Range 28

This township is largely mantled by moraine. Boulder clay mantles the southern and southwestern part of the area, and glacial lake clays occur in the vicinity of the lake in section 18. The northern part of the township is hilly and is characterized by undrained depressions and "alkali" flats. A large depression occurs in sections 22, 27, and 34, and another occurs in the southwestern part of the area.

The water supply in this township is obtained mainly from shallow wells sunk into the glacial drift. Wells sunk into the lower part of drift, and springs, are used by some of the residents.

Two wells have been sunk in the NW.$\frac{1}{4}$, section 18, and the NW.$\frac{1}{4}$, section 19, in the area mantled by glacial lake clay. These wells are 6 and 19 feet deep and yield large supplies of water that is suitable for all farm needs. It is assumed that the gravel that forms the aquifers in these wells occurs either at the contact of the lake clay and underlying boulder clay, or within the upper part of the boulder clay. Similar wells can no doubt be obtained in this area.

Most of the wells in this township obtain water from pockets of sand and gravel that occur at or near the base of the weathered zone of the deposits of moraine and till. Within narrow limits these pockets appear to be of fairly continuous occurrence, but they do not form continuous water-bearing horizons over large areas. The wells usually yield a supply that is sufficient for local needs, and with few exceptions the water has been found satisfactory for domestic use. A number of springs found along the ravines and near the small lakes in many cases yield sufficient water for stock needs. The available supply from such springs can be considerably increased by digging a reservoir to conserve the overflow water. Many of the shallow wells sunk near sloughs or small lakes yield a sufficient supply of water for domestic needs and a few head of stock. The supply retained by these wells can be increased by excavating a deep reservoir at the base of the well. The supply, however, is readily affected by prolonged periods of drought.

A few wells obtain water from the lower part of the drift in this township. They tap scattered pockets of sand and gravel at depths of 50 to 86 feet. The pockets show little or no relationship in their occurrence and they do not appear to be continuous even over small areas. When more information is available on the water-bearing conditions of the lower part of the drift it may be possible to outline fairly continuous water-bearing horizons. A dry hole was sunk to a depth of 90 feet in section 7, and a dry hole was also dug in the NW.$\frac{1}{4}$, section 31. Two wells tapping these deposits yield a supply that is inadequate for local needs and two others yield an abundant supply. The water from all the wells is used for domestic purposes as well as for stock. It is possible that the 50-foot well on section 30 may be drawing part of its supply from the upper part of the bedrock, but this cannot be definitely ascertained. The base of this well is at an elevation of 2,150 feet above sea-level. The underlying bedrock formations should contain water-bearing horizons.

Township 31, Range 29

This fractional township is an area of 9 square miles, and its western limit is formed by the Fourth meridian or the Alberta-Saskatchewan boundary. It is mantled by moraine and the ground surface is slightly rolling. Boulders are commonly found on the knolls and the top soil is quite sandy.

A well in section 24 derives water from a depth of 12 feet. It probably derives its water by seepage from a nearby slough. The water is satisfactory for domestic use and the supply is sufficient for local needs. The other wells in the township vary from 33 to 100 feet deep and tap scattered deposits of sand or gravel in the glacial drift. No dry holes have been dug and little difficulty should be experienced in this area in obtaining sufficient supplies of water for local needs. No continuous water-bearing horizons exist in the drift, but the water-bearing deposits appear to be of common occurrence. The water obtained is suitable for domestic needs and for stock.

Township 32, Range 27

The southeastern part of this township is a gently undulating till plain with deposits of dune sand occurring in sections 1, 2, 9, and 10. The remainder of the township is covered by moraine, the ground surface of which area is characterized by cone-shaped hillocks and undrained depressions. Stones are common on the surface of the knolls.

In years of normal rainfall shallow wells sunk near the undrained depressions should obtain sufficient water for household needs and a few head of stock. In years of prolonged drought, however, the supply from this type of well is noticeably decreased and many of the wells become dry.

The dune sands in this township have not been investigated for water, but it is possible that small supplies of moderately soft, usable water can be obtained from them at shallow depth.

Most of the wells in this township derive their supply from water-bearing sands and gravels in the deposits of moraine and boulder clay. Little difference can be noted in the water conditions in these two different types of glacial deposits.

The deposits are composed of a few feet of sandy loam that contains a few boulders; a zone of weathered or oxidized clay that may or may not contain pockets of sand or gravel; and an unweathered zone of compact, dark-coloured clay that contains scattered pockets of sand and gravel at various depths.

The pockets of sand and gravel are sparsely distributed in the weathered zone of the drift and they are not a good source of water supply. The pockets should be located with a small auger prior to digging a well. Wells that have encountered water-bearing deposits in the weathered zone of the drift usually yield sufficient water for domestic purposes and a few head of stock. The water is suitable for all farm needs, but care should be taken to see that the wells do not become contaminated by surface waters.

Most of the wells in this township obtain their supply of water from the scattered pockets of sand and gravel that occur in the lower part or unweathered zone of the glacial drift. The pockets are located at depths of 40 to 115 feet. No correlation is apparent in their occurrence even within narrow limits, and it appears that each well taps a separate deposit of sand or gravel. No dry holes were recorded, however, and it should not be difficult to obtain water from these deposits in the lower part of the drift. The supply from three wells is insufficient for local needs, and the water from three other wells is unsuitable for domestic purposes. The bedrock in this township should contain water-bearing horizons.

Township 32, Range 28

With the exception of parts of sections 19 and 30 that are mantled by boulder clay or glacial till, this township is covered by moraine. The western part of the area is quite rolling, but the eastern part is rough and hilly and is characterized by ravines and small lakes. Springs are fairly common along some of the larger ravines.

Water supplies in this township are obtained from sloughs, small lakes, springs, and from wells sunk into the glacial drift. The sloughs and small lakes are used extensively for stock during part of the year. Shallow wells dug near the lakes and sloughs yield sufficient water for household purposes and a few head of stock. A number of springs (shown as flowing wells on Figure 2 of the accompanying map), located on sections 13, 14, 23, and 25, flow throughout the year and they provide an abundant supply of water for stock purposes. It is not known if the water from these springs is suitable for domestic purposes, but that from other springs in the township is being used for drinking with no apparent ill effects.

The morainic deposits generally consist of a few feet of light, sandy loam top soil; a weathered or oxidized zone of a light-coloured boulder clay that extends to a depth of approximately 30 feet; and an unweathered zone of compact, dark-coloured boulder clay that usually contains some scattered deposits of sand or gravel. The distribution of water-bearing deposits in the weathered zone of the drift is particularly sparse in this township and most of the wells that tap deposits of sand and gravel have been sunk to depths of 40 to 80 feet. Deposits of water-bearing sand or gravel may occur at shallower depths, but they should be located by a test auger before wells are dug. The pockets of sand and gravel in the unweathered zone of the glacial drift show some relationship within narrow limits, but in general each well taps an individual deposit. At the present time no continuous water-bearing horizons can be outlined. The yield from wells located in the NE.$\frac{1}{4}$, section 28, the SW.$\frac{1}{4}$, section 32, and the SW.$\frac{1}{4}$, section 33, is insufficient for local needs, but the yield from other wells in the township is adequate for local needs. The well on section 18 is used only for stock, but the water from the other wells is being used for domestic purposes with no apparent ill effects.

Township 32, Range 29

This fractional township has an area of 9 square miles and its western boundary is formed by the Fourth meridian. The southern part of the area is mantled by moraine. The northern part is covered by boulder clay or glacial till and in parts of sections 13, 14, 23, and 24, Recent dune sands overlie the boulder clay. The ground surface is quite rough and sloughs and undrained depressions are common.

No wells have been dug into the dune sands, but it is possible that they contain small supplies of usable water at shallow depth.

A few shallow wells have been dug beside undrained depressions, but most of the producing wells in this township have been dug to depths of 55 to 85 feet and tap pockets of water-bearing sand and gravel in the unweathered zone of the morainic deposits. These deposits do not form a continuous water-bearing horizon, but it should not be difficult to locate water-bearing beds. Dry holes will no doubt be dug, however, as a well in the SE.$\frac{1}{4}$, section 2, was bored to a depth of 80 feet without encountering water. The supply from the producing wells is not abundant, but the yield is usually sufficient for local needs. The water from the well in the NE.$\frac{1}{4}$, section 1, is used only for stock, but that from the other wells is used both for drinking and stock. No wells have been dug in the glacial till-covered areas, but similar water conditions should exist in this area.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF ANTELOPE PARK, NO.322, SASKATCHEWAN

West of 3rd meridian	Township	31	31	31	32	32	32	Total No. in municipality
	Range	27	28	29	27	28	29	
Total No. of Wells in Township		36	32	8	22	23	10	131
No. of wells in bedrock		0	0	0	0	0	0	0
No. of Wells in glacial drift		36	32	8	22	23	10	131
No. of wells in alluvium		0	0	0	0	0	0	0
Permanency of Water Supply								
No. with permanent supply		33	31	8	22	23	9	126
No. with intermittent supply		0	0	0	0	0	0	0
No. dry holes		3	1	0	0	0	1	5
Types of Wells								
No. of flowing artesian wells		0	0	0	0	4	0	4
No. of non-flowing artesian wells		15	6	2	13	10	5	51
No. of non-artesian wells		18	25	6	9	9	4	71
Quality of Water								
No. with hard water		30	27	8	21	23	9	118
No. with soft water		3	4	0	1	0	0	8
No. with salty water		0	0	0	0	0	0	0
No. with "alkaline" water		14	2	3	8	2	0	29
Depths of Wells								
No. from 0 to 50 feet deep		14	23	3	8	17	3	68
No. from 51 to 100 feet deep		20	9	5	13	6	7	60
No. from 101 to 150 feet deep		2	0	0	1	0	0	3
No. from 151 to 200 feet deep		0	0	0	0	0	0	0
No. from 201 to 500 feet deep		0	0	0	0	0	0	0
No. from 501 to 1,000 feet deep		0	0	0	0	0	0	0
No. over 1,000 feet deep		0	0	0	0	0	0	0
How the Water is Used								
No. usable for domestic purposes		20	27	8	19	15	8	97
No. not usable for domestic purposes		13	4	0	3	8	1	29
No. usable for stock		33	31	8	21	23	9	125
No. not usable for stock		0	0	0	1	0	0	1
Sufficiency of Water Supply								
No. sufficient for domestic needs		33	31	8	22	23	9	126
No. insufficient for domestic needs		0	0	0	0	0	0	0
No. sufficient for stock needs		27	24	8	17	15	6	97
No. insufficient for stock needs		6	7	0	5	8	3	29

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

The term "total dissolved mineral solids" as here used refers to the residue remaining when a sample of water is evaporated to dryness. It is generally considered that waters that have less than 1,000 parts per million of dissolved solids are suitable for ordinary uses, but in the Prairie Provinces this figure is often exceeded. Nearly all waters that contain more than 1,000 parts per million of total solids have a taste due to the dissolved mineral matter. Residents accustomed to the waters may use those that have much more than 1,000 parts per million of dissolved solids without any marked inconvenience, although most persons not used to highly mineralized water would find such waters highly objectionable.

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

Calcium and magnesium salts impart hardness to water. Hardness of water is commonly recognized by its soap-destroying powers as shown by the difficulty of obtaining lather with soap. The total hardness of a water is the hardness of the water in its original state. Total hardness is divided into "permanent hardness" and "temporary hardness". Permanent hardness is the hardness of the water remaining after the sample has been boiled and ~~it represents the~~ amount of mineral salts that cannot be removed by boiling. Temporary hardness is the difference between the total hardness and the permanent hardness and represents the amount of mineral salts that can be removed by boiling. Temporary hardness is due mainly to the bicarbonates of calcium and magnesium and iron, and permanent harness to the sulphates and chlorides of calcium and magnesium. The permanent hardness can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. Water that has a total hardness of 300 parts per million or more is usually classed as excessively hard. Many of the Saskatchewan water samples have a total hardness greatly in excess of 300 parts per million; when the total hardness exceeded 3,000 parts per million no exact hardness determination was made. Also no determination for temporary hardness was made on waters having a total hardness less than 50 parts per million. As the determinations of the soap hardness in some cases were made after the samples had been stored for some time, the temporary hardness of some of the waters as they come from the wells probably is higher than that given in the table of analyses.

Analyses of Water Samples from the Municipality of Antelope Park, No. 322, 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	SE.	2	31	29	3	100	1,160											(3)	(1)		(2)		(4)		(5)	x1
2	NE.	13	31	29	3	60	1,660											(4)	(1)		(2)		(3)		(5)	x1
3	NE.	13	31	29	3	60	790											(3)	(1)		(2)		(4)	(5)		x1

Water samples indicated thus, x1, 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. 1, 2, and 3, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

No samples of water from the glacial drift in the municipality of Antelope Park were taken by the field party, but the results of three samples analysed by the Provincial Analyst are given in the accompanying table.

The water from wells that are dug near undrained depressions or sloughs is as a rule moderately soft. It is satisfactory for stock, and if it is not contaminated by water containing animal refuse it should be suitable for domestic uses. It is advisable to have the water from these wells tested frequently for bacterial content.

The waters from wells that tap small pockets of sand and gravel at shallow depths in the glacial drift usually vary from comparatively soft to very hard. They also vary considerably in the amount of mineral salts contained in solution. The waters are generally used for domestic purposes with no apparent ill effects. A number of springs in this municipality are used for stock. No doubt the water from some of these springs is quite suitable for domestic purposes also, although an oil-like scum, due to iron salts in solution, often occurs on the surface of the water.

The water obtained from wells sunk into the lower part of the drift generally contains more mineral salts in solution than that from shallow wells, but the three samples analysed at Regina show a relatively low mineral salt content. These waters are suitable for all farm needs. In some areas, however, the waters are known to contain more mineral salts in solution, and some of them are unfit for domestic purposes. No waters were recorded in this area that were unfit for stock use. The water from the deeper wells is generally quite hard.

Water from the Bedrock

At the present time no water is being derived from water-bearing beds in the bedrock in this municipality. Should water be obtained from the upper part of the bedrock it will probably be hard and highly mineralized, and may be suitable only for stock. If water-bearing horizons are encountered in the lower part of the Belly River formation, the water will probably be soft. It will probably contain a relatively large amount of mineral salts in solution, but will be found to be usable for domestic needs as well as for stock. It will probably not be suitable for irrigation as it usually contains fairly large amounts of sodium carbonate (black alkali) in solution.

WELL RECORDS—Rural Municipality of ANTELOPE PARK NO. 322, 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	SE.	1	31	27	3	Bored	75	2,300	- 67	2,233	67	2,233	Glacial sand	Hard, clear, "alkaline"	46	S	Yields 20 barrels a day; was an 80-foot well, now filled in.
2	NW.	2	"	"	"	Bored	90	2,345	- 70	2,275	90	2,255	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 30 head stock.
3	SW.	3	"	"	"	Bored	50	2,400	- 30	2,370	30	2,370	Glacial sand	Hard, clear		D, S	Insufficient for local needs; were four other wells; now all filled in but one.
4	SE.	3	"	"	"	Bored	70	2,320	- 52	2,268	70	2,250	Glacial drift	Hard, clear, "alkaline" iron	43	D	Sufficient for local needs; a 100-foot test-hole got a little water, also a 125-foot dry hole.
5	NW.	3	"	"	"	Dug	32	2,350	- 27	2,323	27	2,323	Glacial sand	Hard, clear, "alkaline"	46	N	Would yield 24 barrel a day.
6	NE.	3	"	"	"	Dug	100	2,350	- 84	2,266	100	2,250	Glacial gravel	Hard, clear, "alkaline"; iron	42	D, S	Yields 36 barrels a day.
7	NE.	4	"	"	"	Bored	95	2,360	- 94	2,266	94	2,266	Glacial gravel	Hard, clear, "alkaline"		N	Yields only 1 barrel a day.
8	NE.	4	"	"	"	Bored	83	2,360	- 74	2,286	74	2,286	Glacial sand	Hard, clear, "alkaline"; iron	42	D, S	Yields 10 barrels a day.
9	NW.	6	"	"	"	Dug	9	2,300	- 5	2,295	5	2,295	Glacial gravel	Hard, clear		S	Oversufficient for local needs.
10	NE.	9	"	"	"	Bored	75	2,290	- 8	2,282	75	2,215	Glacial sand	Hard, clear, "alkaline"		N	Good supply.
11	NE.	10	"	"	"	Bored	138	2,345	- 58	2,287	138	2,207	Glacial sand	Hard, clear, "alkaline"; iron	36	S	Sufficient for only 10 head stock; also had two dry holes 80 and 100 feet deep.
12	NW.	12	"	"	"	Dug	14	2,310	- 4	2,306			Glacial sand	Soft, clear	46	S	Oversufficient for local needs; has two shallow wells, small supply.
13	NW.	13	"	"	"	Bored	55	2,310	- 35	2,275	55	2,255	Glacial sand	Hard, clear, "alkaline"; iron	45	D, S	Yields 4 barrels a day; also a seepage well.
14	NE.	13	"	"	"	Dug	4	2,310	- 2	2,308	2	2,308	Glacial drift	Black sediment		S	Oversufficient for local needs.
15	SE.	14	"	"	"	Bored	27	2,310	- 26	2,284	26	2,284	Glacial sand	Soft, clear, iron	42	D, S	Oversufficient for local needs; had a 27-foot well now filled in.
16	NE.	14	"	"	"	Bored	31	2,310	- 23	2,287	23	2,287	Glacial sand	Soft, clear, iron	46	D	Sufficient for local needs.
17	NE.	15	"	"	"	Bored	70	2,300	- 30	2,270	70	2,230	Glacial gravel	Hard, clear, "alkaline"	44	S	Yield 1½ barrels a day, dug 9 wells here, and all gave poor supply of water.
18	SE.	16	"	"	"	Bored	62	2,300	- 42	2,258	62	2,238	Glacial gravel	Hard, clear, iron		D, S	Sufficient for 25 head stock.
19	SW.	16	"	"	"	Bored	50	2,300	- 38	2,262	50	2,250	Glacial sand	Hard, cloudy, iron	42	D, S	Yields 50 barrels a day.
20	NE.	20	"	"	"	Bored	60	2,310	- 25	2,285	60	2,250	Glacial gravel	Hard, clear		S	Yields 30 barrels a day.
21	SE.	20	"	"	"	Bored	40	2,300	- 37	2,263	37	2,263	Glacial clay	Hard, clear "alkaline"; iron	46	D, S	Sufficient for 6 head stock; also a 50-foot well with good supply.
22	SW.	20	"	"	"	Bored	38	2,360	- 28	2,332	38	2,322	Glacial drift	Hard, clear, "alkaline"	46	D, S	Oversufficient for 40 head stock.
23	SW.	23	"	"	"	Bored	70	2,300	- 58	2,242	70	2,230	Glacial sand	Hard, clear, "alkaline"; iron	46	D, S	Yields 8 barrels a day; also a 40 and 60-foot well, 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 ANTELOPE PARK NO. 322, 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
24	SE.	23	31	27	3	Bored	70	2,310	- 35	2,275	70	2,240	Glacial gravel	Hard, clear	44	D, S	Yields 35 barrels a day; also two wells 65 and 78 feet deep, good supply.
25	NW.	24	"	"	"	Bored	52	2,250	- 30	2,220	52	2,198	Glacial sand	Hard, clear, iron	43	D, S	Sufficient for 15 head stock.
26	SE.	30	"	"	"	Bored	50	2,260	- 25	2,235	50	2,210	Glacial gravel	Hard, clear		N	Would yield 30 barrels a day.
1	SW.	2	31	28	3	Bored	32	2,310	- 22	2,288	32	2,278	Glacial gravel	Soft, clear		D, S	Oversufficient for local needs.
2	SW.	2	"	"	"	Dug	8	2,300	- 4	2,296	8	2,292	Glacial sand	Hard, clear, iron		D, S	Sufficient for 16 head stock; also several springs.
3	SW.	4	"	"	"	Bored	40	2,240	- 10	2,230	40	2,200	Glacial sand	Hard, clear	46	D	Sufficient only for domestic needs; a 35-foot well is used for stock.
4	SE.	5	"	"	"	Spring		2,190					Glacial drift	Soft, clear		S	Oversufficient for local needs.
5	SW.	6	"	"	"	Bored	31	2,250	- 20	2,230	31	2,219	Glacial gravel	Hard, clear, iron	46	D, S	Yields 4 barrels a day.
6	SW.	7	"	"	"	Bored	35	2,260	- 32	2,228	32	2,228	Glacial drift	Hard, clear	48	D, S	Insufficient for local needs; has a 60-foot well with small supply and a 90-foot dry hole.
7	SE.	7	"	"	"	Dug	18	2,240	- 16	2,224	18	2,222	Glacial sand	Soft, clear	46	D, S	Oversufficient for local needs.
8	NW.	9	"	"	"	Dug	16	2,200	- 12	2,188	12	2,188	Glacial sand	Hard, clear	46	D	Sufficient only for domestic needs.
9	NW.	9	"	"	"	Dug	16	2,200	- 8	2,192	8	2,192	Glacial sand	Hard, clear	46	S	Oversufficient for local needs; also a flowing spring.
10	NW.	14	"	"	"	Bored	86	2,300	- 12	2,288	86	2,214	Glacial gravel	Soft, clear	42	D, S	Oversufficient for local needs; also a 54-foot well with small supply.
11	SE.	15	"	"	"	Bored	65	2,300	- 25	2,275	65	2,235	Glacial sand	Hard, clear, "alkaline", iron	44	D, S	Yields 20 barrels a day.
12	NW.	18	"	"	"	Dug	6	2,200	- 3	2,197	6	2,194	Glacial sand	Hard, clear	46	D, S	Oversufficient for local needs.
13	NW.	19	"	"	"	Dug	19	2,200	- 15	2,185	15	2,185	Glacial gravel	Hard, clear, iron	46	D, S	Oversufficient for local needs.
14	SW.	22	"	"	"	Dug	26	2,300	- 24	2,276	24	2,276	Glacial sand	Hard, clear	46	D, S	Sufficient for 11 head stock.
15	SE.	24	"	"	"	Bored	30	2,340	- 18	2,322	30	2,310	Glacial sand	Hard, clear	44	D, S	Oversufficient for local needs; has a 27-foot well with small supply.
16	NE.	24	"	"	"	Bored	65	2,340	- 55	2,285	55	2,285	Glacial drift	Hard, clear, iron	46	D, S	Oversufficient for 14 head stock.
17	NE.	26	"	"	"	Dug	10	2,200	- 4	2,196	4	2,196	Glacial sand	Hard, clear, "alkaline"	48	S	Yields 4 barrels a day.
18	NE.	30	"	"	"	Bored	50	2,200	- 30	2,170	50	2,150	Glacial? sand	Hard, clear, iron	42	D, S	Oversufficient for local needs.
19	SE.	31	"	"	"	Bored	68	2,280	- 66	2,214	66	2,214	Glacial clay	Hard, clear, iron		D, S	Insufficient for local needs; were two other wells now filled in.
20	NW.	31	"	"	"	Bored	64	2,300	- 34	2,266	64	2,236	Glacial drift	Hard, clear, iron	44	D, S	Oversufficient for local needs; were three other wells, now filled in, one dry hole.
21	NW.	32	"	"	"	Bored	70	2,300	- 69	2,231	69	2,231	Glacial sand	Hard, clear		D, S	Insufficient for local needs; also a 32-foot well with small supply.
22	SW.	34	"	"	"	Dug	16	2,240	- 8	2,232	8	2,232	Glacial gravel	Hard, clear	48	D, S	Oversufficient for local needs.
23	SE.	35	"	"	"	Bored	28	2,240	- 18	2,222	28	2,212	Glacial sand	Hard, clear, iron	38	D, S	Sufficient for 25 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 ANTELOPE PARK NO. 322, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SE.	2	31	29	3	Bored	100	2,300	- 83	2,217	100	2,200	Glacial ? sand	Hard, iron, cloudy	48	D, S	Oversufficient for local needs. #
2	NW.	12	"	"	"	Dug	33	2,350	- 29	2,321	29	2,321	Glacial drift	Hard, clear, iron	48	D, S	Sufficient for 15 head stock.
3	SW.	13	"	"	"	Dug	35	2,350	- 28	2,322	28	2,322	Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient for 15 head stock.
4	NE.	13	"	"	"	Bored	60	2,262	- 50	2,212	50	2,212	Glacial drift	Hard, cloudy	46	D	Sufficient for local needs; in village of Loverna. #
5	NE.	13	"	"	"	Bored	60	2,262	- 52	2,210	52	2,210	Glacial drift	Hard, cloudy		D	Sufficient for local needs; in village of Loverna. #
6	NE.	24	"	"	"	Dug	12	2,210	- 9	2,201	9	2,201	Glacial clay	Hard, cloudy, "alkaline", iron	46	D, S	Sufficient for 20 head stock.
7	SW.	24	"	"	"	Dug	70	2,295	- 50	2,245	70	2,225	Glacial sand	Hard, cloudy, iron	42	D, S	Sufficient for 35 head stock.
8	SW.	36	"	"	"	Bored	60	2,300	- 35	2,265	60	2,240	Glacial drift	Hard, clear, "alkaline", iron	46	D, S	Oversufficient for local needs.
1	NW.	5	32	27	3	Bored	73	2,360	- 65	2,295	65	2,295	Glacial drift	Hard, clear, iron	46	D, S	Oversufficient for local needs.
2	NE.	7	"	"	"	Bored	40	2,340	- 20	2,320	40	2,300	Glacial drift	Hard, clear, "alkaline"	46	D, S	Sufficient for 30 head stodk.
3	NW.	12	"	"	"	Dug	14	2,350	- 5	2,345	5	2,345	Glacial sand	Soft, clear	45	D, S	Oversufficient for local needs; also a similar 10-foot well.
4	SW.	13	"	"	"	Bored	60	2,380	- 57	2,323	57	2,323	Glacial clay	Hard, clear, "alkaline"	45	S	Sufficient for 8 head stock.
5	NW.	13	"	"	"	Bored	50	2,300	- 30	2,270	30	2,270	Glacial drift	Hard, clear, "alkaline", iron	46	D, S	Sufficient for 30 head stock.
6	NW.	14	"	"	"	Bored	80	2,345	- 50	2,295	80	2,265	Glacial drift	Hard, clear, "alkaline", iron	42	D, S	Sufficient for 100 head stock.
7	SW.	19	"	"	"	Bored	62	2,270	- 60	2,210	60	2,210	Glacial drift	Hard, clear		D, S	Yields 30 pails a day.
8	NE.	20	"	"	"	Bored	60	2,340	- 20	2,320	60	2,280	Glacial drift	Hard, clear, iron	46	S	Oversufficient for local needs; were two other wells, now both filled in.
9	SW.	20	"	"	"	Bored	115	2,340	- 80	2,260	115	2,225	Glacial sand	Hard, clear, iron	38	D, S	Sufficient for 45 head stock.
10	NE.	22	"	"	"	Bored	90	2,350	- 73	2,277	90	2,260	Glacial sand	Hard, clear, iron	44	D, S	Sufficient for 7 head stock.
11	NE.	23	"	"	"	Bored	30	2,320	- 10	2,310	10	2,310	Glacial sand	Hard, cloudy, "alkaline"	45	S	Sufficient for 20 head stock; also a 32-foot well used for house.
12	SE.	25	"	"	"	Bored	64	2,350	- 56	2,294	56	2,294	Glacial drift	Hard, clear, "alkaline", iron	45	D, S	
13	SW.	27	"	"	"	Bored	52	2,340	- 42	2,298	52	2,288	Glacial gravel	Hard, clear, "alkaline", iron	46	D, S	Sufficient for only 8 head stock; also two wells 52 and 86 feet deep.
14	NW.	31	"	"	"	Bored	50	2,310	- 35	2,275	50	2,260	Glacial sand	Hard, clear, iron	46	D, S	Oversufficient for local needs.
15	NW.	33	"	"	"	Bored	60	2,375	- 48	2,327	60	2,315	Glacial sand	Hard, clear, iron	46	D, S	Sufficient for 20 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 ANTELOPE PARK NO. 322, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	HEIGHT TO WHICH WATER WILL RISE Elev.	PRINCIPAL WATER-BEARING BED Depth	PRINCIPAL WATER-BEARING BED Elev.	PRINCIPAL WATER-BEARING BED Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
16	NW.	35	32	27	3	Bored	35	2,350	- 20	2,330	20	2,330	Glacial gravel	Hard, clear, "alkaline"	46	N	Would supply 20 head stock.
17	SE.	35	"	"	"	Bored	80	2,350	- 40	2,310	80	2,270	Glacial drift	Hard, clear, iron	46	D, S	Yields 12 barrels a day.
18	SW.	36	"	"	"	Bored	90	2,350	- 40	2,310	90	2,260	Glacial gravel	Hard, clear	46	D, S	Yields 50 to 60 barrels a day.
1	SE.	2	32	28	3	Dug	10	2,270	- 7	2,263	7	2,263	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for 30 head stock; also a spring used for house.
2	NW.	6	"	"	"	Bored	77	2,300	- 52	2,248	77	2,223	Glacial sand	Hard, clear	38	D, S	Oversufficient for local needs.
3	NW.	13	"	"	"	Spring		2,200					Glacial drift	Hard, clear, iron		S	Flowing spring.
4	NE.	14	"	"	"	Spring		2,280					Glacial drift	Hard, clear, iron		S	Flowing spring.
5	SW.	18	"	"	"	Bored	80	2,400	- 30	2,370	80	2,320	Glacial drift	Hard, clear, "alkaline"		S	Yields 20 barrels a day.
6	NW.	19	"	"	"	Dug	20	2,390	- 17	2,373	17	2,373	Glacial clay	Hard, clear	48	D, S	Yields 3 barrels a day; also 2 wells 15 and 20 feet deep, small supply.
7	NW.	21	"	"	"	Dug	50	2,340	- 20	2,320	50	2,290	Glacial drift	Hard, clear, iron	46	D, S	Oversufficient for local needs; also a 40-foot well with fair supply.
8	NE.	21	"	"	"	Dug	45	2,350	- 25	2,325	45	2,305	Glacial gravel	Hard, clear	43	D, S	Yields 1,800 gallons a day.
9	NE.	22	"	"	"	Dug	80	2,300	- 60	2,240	80	2,220	Glacial sand	Hard, clear, iron	48	D, S	Sufficient for 50 head stock.
10	SE.	23	"	"	"	Spring		2,250	+ 5	2,255			Glacial drift	Hard, clear, iron		S	Continuous flow.
11	NW.	25	"	"	"	Spring		2,200	+ 3	2,203			Glacial drift	Hard, clear, iron	42	S	Oversufficient for local needs.
12	NW.	27	"	"	"	Dug	45	2,350	- 25	2,325	45	2,305	Glacial drift	Hard, clear, iron	46	D, S	Sufficient for 20 head stock.
13	NE.	28	"	"	"	Bored	51	2,350	- 47	2,303	47	2,303	Glacial drift	Hard, clear, iron	46	D, S	Sufficient for only 8 head stock.
14	NW.	29	"	"	"	Bored	50	2,370	- 20	2,350	50	2,320	Glacial drift	Hard, clear	46	S	Yields10 barrels a day.
15	NW.	31	"	"	"	Dug	33	2,360	- 22	2,338	22	2,338	Glacial sand	Hard, clear, iron	46	D, S	Oversufficient for local needs.
16	NW.	32	"	"	"	Bored	47	2,370	- 39	2,331	39	2,331	Glacial sand	Hard, clear, iron	46	D, S	Yields 10 barrels a day.
17	SW.	32	"	"	"	Bored	60	2,370	- 57	2,313	59	2,313	Glacial sand	Hard, clear	46	D, S	Yields only 2 barrels a day; also a 60-foot well now caving in.
18	SW.	33	"	"	"	Dug	40	2,340	- 37	2,303	37	2,303	Glacial clay	Hard, clear, iron	48	D, S	Sufficient for only 2 head stock; also a 23-foot well with poor supply.
19	NW.	34	"	"	"	Bored	66	2,350	- 46	2,304	66	2,284	Glacial drift	Hard, clear, iron	46	D, S	Oversufficient for local needs.
20	SE.	36	"	"	"	Bored	40	2,300	- 20	2,280	40	2,260	Glacial drift	Hard, clear		D, S	Yields 15 barrels a day.
1	NE.	1	32	29	3	Bored	67	2,300	- 57	2,243	67	2,233	Glacial sand	Hard, clear	46	S	Yields 20 barrels a day.
2	SW.	1	"	"	"	Bored	55	2,345	- 44	2,301	55	2,290	Glacial sand	Hard, clear, iron	42	D, S	Yields 7 barrels a day.
3	SE.	2	"	"	"	Bored	85	2,360	- 55	2,305	85	2,275	Glacial drift	Hard, clear	40	D, S	Yields 4 barrels a day; also 56-foot well was filled in a 90-foot test-hole got a small supply; also an 80-foot dry hole.
4	NE.	12	"	"	"	Bored	75	2,400	- 63	2,337	63	2,337	Glacial drift	Hard, clear	43	D, S	Sufficient for 20 head stock; also a 20-foot seepage well.

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 ANTELOPE PARK NO. 322, 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				
5	SW.	13	32	29	3	Bored	58	2,400	- 24	2,376	58	2,324	Glacial sand	Hard, clear	46	D, S	Insufficient for local needs; also a 36-foot well with poor supply.
6	SE.	14	"	"	"	Bored	55	2,400	- 51	2,349	51	2,349	Glacial sand	Hard, clear	46	D	Yields 10 barrels a day; also a 14-foot well, good supply and several 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.