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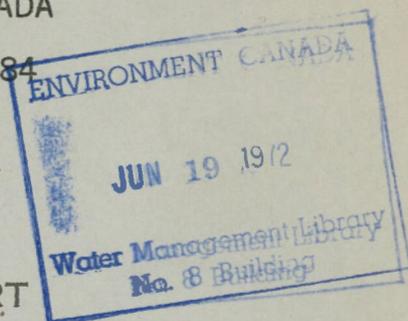
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WATER SUPPLY PAPER No. 184



PRELIMINARY REPORT
GROUND-WATER RESOURCES
OF THE
RURAL MUNICIPALITY OF COTEAU
NO. 255
SASKATCHEWAN

By
B. R. MacKay, and D. C. Maddox



OTTAWA
1936

CANADA
DEPARTMENT OF MINES
BUREAU OF ECONOMIC GEOLOGY
GEOLOGICAL SURVEY

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CONTENTS

	<u>Page</u>
Introduction.....	1
Glossary of terms used.....	5
Names and descriptions of geological formations referred to....	8
Water-bearing horizons of the municipality.....	10
Water-bearing horizons in the unconsolidated deposits.....	12
Water-bearing horizons in the bedrock.....	15
Ground water conditions by townships:	
Township 24, Range 5, west of 3rd meridian.....	18
Township 24, Range 6, " " " "	18
Township 24, Range 7, " " " "	18
Township 24, Range 8, " " " "	19
Township 24, Range 9, " " " "	21
Township 25, Range 5, " " " "	22
Township 25, Range 6, " " " "	22
Township 25, Range 7, " " " "	23
Township 25, Range 8, " " " "	24
Township 25, Range 9, " " " "	25
Township 26, Range 6, " " " "	26
Township 26, Range 7, " " " "	26
Township 26, Range 8, " " " "	27
Township 26, Range 9, " " " "	28
Statistical summary of well information.....	30
Analyses and quality of water.....	31
General statement.....	31
Table of water samples.....	35
Water from the unconsolidated deposits.....	36
Water from the bedrock.....	37
Well records.....	39

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 COTEAU, NO. 255.

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 given on the figure. Where contour lines are not shown on the figure, the elevations of adjacent wells as indicated in the Table of Well Records accompanying each report can be used. The approximate elevation of the water-bearing horizon at the well-site can be obtained from the Table of Well Records by noting the elevation of the water-bearing horizon in surrounding wells and by estimating from these known elevations its elevation at the well-site.¹ If the water-bearing horizon is in bedrock the depth to water can be estimated fairly accurately in this way. If the water-bearing horizon is in unconsolidated deposits such as gravel, sand, clay, or glacial debris, however, the estimated elevation is less reliable, because the water-bearing horizon may be inclined, or may be in lenses or in sand beds which may lie at various horizons and may be of small lateral extent. In calculating the depth to water, care should be taken that the water-bearing horizons selected from the Table of Well Records be all in the same geological horizon either in the glacial drift or in the bedrock. From the data in the Table

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 rests 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 Coteau, No. 255, comprises about 368 square miles in southern Saskatchewan, and includes tps. 24, 25, and 26, ranges 8 and 9; tp. 25, range 7; the parts of tp. 24, ranges 5, 6, and 7, north of South Saskatchewan river; and the parts of tp. 25, ranges 5 and 6, and tp. 26, ranges 6 and 7, west of South Saskatchewan river, all W. 3rd mer. The very irregular shape of the municipality is due to the fact that Southern Saskatchewan river forms the eastern boundary of the municipality, with "elbow" of the river occurring in township 25, range 5.

The Lucky Lake branch of the Canadian National railways on which are located Tullio, Birsay, Dunblane, and Tichfield, passes through the southeastern part of the municipality and joins Darmody branch of the Canadian National railways at Dunblane, the largest centre of population.

South Saskatchewan river occupies a valley that, within this municipality, is about 150 to 200 feet deep. The slopes to the river are steep in the southeast and the northeast. Elsewhere the slopes are mostly only moderately steep. Coteau creek, which is an intermittent tributary to South Saskatchewan river, occupies a narrow, steep-sided valley that passes through the northeastern part of the municipality. Luck lake is a lake bed, about 1,907 feet above sea-level, that is dry except in wet seasons. It occupies about $7\frac{1}{2}$ square miles in the eastern part of township 24, range 8, and the western part of township 24, range 9. Several intermittent streams flow into Luck lake, and intermittent streams also flow into South Saskatchewan river in the eastern part of township 24, range 7, and through the southern part of township 24, ranges 7 and 8. A few small lakes occur in township 25 and 26, range 9. Missouri coteau occupies most of the northwestern part of the municipality. In this part topographical relief is rather high and many hills and undrained hollows occur. In the northwest a considerable part of the Coteau

is over 2,400 feet above sea-level, and in the southwest part of township 26, range 9, one hill rises to over 2,550 feet above sea-level. South and east of the Coteau most of the surface is comparatively flat. Most of Elbow Forest reserve, in the eastern part of the municipality, is underlain by dune sand, and the topography of this part is of the hummocky type characteristic of areas of dunes, which in this municipality extend west of the reserve for an average distance of about one mile. West of the area of dune sands a zone of glacial lake sands from $\frac{1}{2}$ a mile to 3 miles wide trends northward to South Saskatchewan river and thence borders the river as far as the northern boundary of the municipality. These sands also underlie an area of about 2 square miles north of Coteau creek. Glacial lake clay underlies most of the lowland of township 24, ranges 7, 8, and 9, and extends into the southeastern part of township 25, range 7. Boulder clay underlies the valley of Coteau creek, and extends southwards from Coteau creek, bordering on the west the glacial lake sands and clay southerly as far as the northeastern part of township 24, range 8. Another belt of boulder clay with an average width of about half a mile is exposed along South Saskatchewan river from the vicinity of the Elbow to the southeastern corner of the municipality, and extends thence westward for about 4 miles up the valley of an intermittent stream. Boulder clay also occupies about 14 square miles in the southern part of township 24, ranges 8 and 9 about 6 square miles in the northwestern part of township 24, range 9. Moraine occupies an area of approximately 150 square miles of the Coteau country north of township 24, an area of about 3 square miles north of Coteau creek, and an area of about 2 square miles in the northeastern part of township 24, range 7.

Water-bearing Horizons in the Unconsolidated Deposits

The oldest of the unconsolidated deposits in the municipality consists of glacial drift that was deposited during the advance and withdrawal of immense sheets of ice that originated in the north and that spread southwards over the whole of southern Saskatchewan. In this municipality there appears to have been at least three advances and retreats of the ice which buried the bedrock beneath a thick covering of glacial drift consisting of clay, sand, gravel, boulders, and rock flour, part of which has been transported for considerable distances, and part of which is of local origin. The depth to bedrock can be ascertained now only by means of well logs. The deposits of the earlier ice-sheets are now buried beneath those of the last ice-sheet, and are identified by organic remains or by oxidized zones the top of which represents old land surface.

Only the deposits left by the last ice-sheet can be described and classified. The chief types of deposits and their water-bearing possibilities may be briefly outlined. The boulder clay or till is the most widespread type of glacial drift and is thought to underlie many of the other glacial deposits. The till consists of a very heterogeneous assemblage of rock debris, but clay or sandy clay, in which pebbles or boulders are embedded, generally forms the larger proportion of this deposit. This type of deposit is almost impervious to water. Occasionally, however, pockets, lenses, or detached beds of sand or gravel are found in the boulder clay and these deposits usually contain ground water. The quality of this water depends upon the composition of the enclosing sediments, and upon the conditions of circulation or ground water through sediments. The complex conditions under which the boulder clay was formed make it impossible to predict the presence of these sandy beds at any one point, although occasionally the well

records suggest the presence of an aquifer that is probably continuous under a group of wells. The moraine, which underlies such a large part of this municipality, thought to have been formed during a long halt in the retreat of the ice-front and the waters issuing from the ice are thought to have deposited isolated pockets, or elongated bodies of sand and gravel, and sub-glacial streams may also have formed sandy deposits. Missouri coteau is supposed to have formed during such a halt in the retreat of the ice-sheets, and it is thought that the glacial sediments were deposited on pre-glacial hills, although there are not many well records to prove this fact. The moraine is usually considered to be a more promising source of ground water than the boulder clay, but in this municipality the ground water conditions in the two types of deposits are mostly similar and have been treated as a unit.

The glacial lakes, sand and clays were deposited in lakes that were formed by the ponding of water by the ice-front during the retreat northwards of the last ice-sheet. The water-producing capacity of the glacial lake clay depends upon the presence in it of the beds of sand. In the clay that was deposited far from the shores of the old lakes there are very few sandy beds, and under these conditions the glacial lake clay is the poorest producer of ground water of any of the glacial deposits. The glacial lake sands are a marginal phase of the glacial lake clay, and they are usually a much better source of ground water, but they may be interbedded with glacial lake clay or be too thin to yield much water. The dune sands have been formed by the re-working of the glacial lake sands by wind action. The dune sands are a very good source of water, and large supplies of water of good quality and mostly soft, can be obtained by the use of sand-points driven into these deposits.

The thickness of the glacial drift in this municipality is not known, but on sec. 10, tp. 24, range 9, the drift is less than 130 feet thick, and on section 12 of the same township it is less than 66 feet thick. In the northern half of township 26, ranges 8 and 9, the drift appears to be very thick, however, as two wells 200 and 250 feet, in these townships did not pass into the bedrock.

In addition to the study of adjacent wells the character of the vegetation may be used in some places to indicate the presence of ground water that is near the surface, and the probable position of the aquifers that supply springs should be studied, as also the direction of sub-surface drainage, if it is known. If no information is obtainable as to any of these conditions, however, the use of bore-hole auger is recommended before the well site is definitely located. The possible pollution of the water in the well by sewage from stables or other sources should also be considered in locating the site for a well, as refuse of this nature may lie on the surface of impervious clay for a considerable time and may be washed down towards the well only during storms or in the spring or polluted surface water may pass underground to the aquifer that supplies the well. Occasionally water is obtained from wells that are adjacent to sloughs or creeks, and the passage of the water through the sands may remove some of the contamination that exists in the water of the sloughs and creeks, but the upper part of wells of this nature should be protected from the entrance of polluted surface water. It is also advisable to have a bacteriological test of the water in the well made soon after the well is completed. These tests are made by the Provincial Analyst, Regina, Saskatchewan.

South Saskatchewan river is the only dependable source of surface water in this municipality. There are a few very small lakes in townships 25 and 26, range 9, but they are not a

reliable source of water. In several parts of the township, however, especially in township 25, range 8, there are long, narrow valleys that would probably make good sites for dams for the storage of surface water, and it seems probable that dams could be built in the upper parts of the valleys of some of the intermittent streams. Dugouts may also be used, and in selecting a site for a dugout the porosity of the soil and sub-soil, the way in which run-off occurs and the probable nature of the water to be stored must all be considered. Cisterns for the storage of rain water are in use at some farms. The rain water is excellent for washing and can be used for drinking if care is taken to prevent contamination of the water.

Water-bearing Horizons in the Bedrock

The Bearpaw formation underlies the glacial drift over the entire municipality, but is exposed only at places in the valleys of South Saskatchewan river and of Coteau creek. The Bearpaw consists chiefly of grey or dark grey marine shales that contain little or no water. Sandy layers that contain soft or salty water are present in some parts of the Bearpaw formation, but in this municipality these sandy beds are known to exist, only in the southwestern part where two aquifers have been struck in wells. The lower aquifer is about 1,890 to 1,873 feet above sea-level and supplies two wells, 130 and 105 feet deep, on secs. 9 and 12, tp. 24, range 9, with water that contains 3,114 and 3,100 parts per million of dissolved solids, respectively, of which sodium sulphate forms the principal part. The upper aquifer, struck in the well, 50 feet deep, on sec. 12, tp. 24, range 9, is about 1,934 feet above sea-level. The water from it is soft.

The Belly River formation, which underlies the Bearpaw formation, contains a large proportion of sand that is porous and contains soft or salty water, but shales are present in some parts

of the formation. Most of the sediments were laid down in fresh or in brackish water, but some of them were laid down in the sea. The elevation of the contact of the Bearpaw and Belly River formations is not known as no detailed logs of the deep wells are available, but it is thought that all the bedrock wells except those on sec. 9 and 12, tp. 24, range 9, obtain water from aquifers in the upper part of the Belly River formation. There appear to three aquifers or groups of aquifers. One of these, on sec. 9, tp. 24, range 9, is about 1,308 feet above sea-level and is tapped by a well 575 feet deep. Aquifers that are about 1,418 to 1,479 feet above sea-level supply six wells, 410 to 530 feet deep, in the southern two-thirds of the municipality. The composition of the water in these aquifers extend continuously between the six wells. Another aquifer is about 1,509 to 1,529 feet above sea-level and supplies three wells 407 to 437 feet deep in sec. 7, tp. 24, range 7, and secs. 2 and 13, tp. 24, range 8, with soft water. The water in the first-mentioned well contains 1,914 parts per million of dissolved solids composed almost entirely of common salt. This aquifer does not appear to extend far north of the east-west centre line of township 24, ranges 7 and 8, and its westward extension seems limited by the deep wells in the southwest quarter of township 24, range 9, which did not obtain water at or near the elevations given.

The limits of the soft water aquifers in the bedrock are estimated only by the records of wells drilled, as there are no outcrops of these aquifers. It is assumed that an aquifer is not present at a well side if the well obtains water only from aquifers that lie below the elevation at which the first aquifer would be expected to be present. In estimating the probability of obtaining suitable water from bedrock aquifers the probable elevation of the aquifer and probable composition of the water should be considered. The height to which the water will rise in the well may also be estimated very approximately, although

this figure is in many cases not reliable. In this municipality the height to which the water rises in the bedrock wells falls into three general groups, of which the first is from 1,702 to 1,765 feet above sea-level, in all the bedrock wells east of range 9, except the well on sec. 1, tp. 25, range 8. The second is from 1,893 to 1,921 feet above sea-level, in the wells on secs. 9 and 4, tp. 24, range 9, respectively; and the third is 1,950 to 1,964 feet above sea-level in the wells on secs. 10 and 12, tp. 24, range 9, and the well on sec. 1, tp. 25, range 8.

GROUND-WATER CONDITIONS BY TOWNSHIPS

Township 24, Range 5

A little more than 2 square miles in the northwest corner of this township are included in the rural municipality of Coteau and form part of Elbow Forest reserve. South Saskatchewan river forms the southwest boundary of this part of the township, the top of the river bank being about 1,850 feet above sea-level and about 180 feet above river-level. There are no farms in this part of the township most of which is mantled by dune sands that would probably provide water to sand-points driven into them. The dune sand is underlain by boulder clay which is exposed on the valley slopes of the river.

Township 24, Range 6

All of township 24, range 6, north of South Saskatchewan river, except sections 18 and 19, and the western halves of sections 30 and 31, are included in the Elbow Forest reserve. The valley of South Saskatchewan river is about 200 feet deep in this part of its course, but the banks are not very steep. Elevations range from about 1,670 feet above sea-level in the river valley to 2,000 feet above sea-level on a small hill in section 35. From the elevated tract in the north the country slopes southeastwards to the valley of South Saskatchewan river.

Dune sands underlie the entire area except in the valley of South Saskatchewan river where boulder clay is exposed.

No well records were obtained from this township, which is not settled. Water that is comparatively soft can probably be obtained in the dune sands at depths up to 25 feet by the use of sand-points, and there is a spring on the NE. $\frac{1}{4}$, section 23.

Township 24, Range 7

This township is a plain that slopes very gently eastward from the western border of the township at an elevation of a little over 1,950 feet above sea-level. The South Saskatchewan

river which forms the southeastern boundary of that part of the township lying within the municipality occupies a valley that is about 200 feet deep. This valley is very steep-sided in the west, but becomes much less steep in the east where the valley of an intermittent stream extends back for about 3 miles from the river. The valley of another intermittent stream trends along the southern boundary of the township.

Dune sands underlie the eastern part of the township, the western boundary of the dune-covered area extending from the centre of the eastern boundary of section 13 to the southwest corner of section 36 and thence to the centre of the northern boundary of section 36. Boulder clay underlies an area of about $2\frac{1}{2}$ square miles in the northwest corner of the township and the valleys of South Saskatchewan river and the creeks mentioned elsewhere in the township glacial lake clay underlies the surface.

The wells in the boulder clay in this township are 10 to 40 feet deep and yield only small supplies of water, generally insufficient for local requirements. At only one farm is the well water supply supplemented by springs, adequate for local needs, but by the use of several shallow wells and dugouts, sufficient water is usually obtained. Water is hauled at two farms.

Two wells on sections 7 and 28, 416 and 410 feet deep respectively, obtain soft, salty water from an aquifer that is about 1,529 and 1,479 feet above sea-level. The water in the well on section 7 contains, 1,914 parts per million of dissolved solids, practically all of which is common salt, and the water from the well on section 28 contains 2,151 parts per million, most of which is common salt.

Township 24, Range 8

Topographical relief in this township is very low, and most of the northwest quarter part is occupied by the dry bed of Luck lake, which is about 1,907 feet above sea-level. Into this depression intermittent streams flow from the south and northeast. The valley of another intermittent stream extends westward into

the township for about 3 miles from the southeast corner of township.

Boulder clay underlies an area of about 3 square miles in the northeast corner of the township and extends in a very narrow belt along the northern border of the township nearly to section 32. Boulder clay also underlies the lower part of the valley of the intermittent stream in the southeast, and in the southwest a belt of boulder clay occupies most of sections 6 and 7, and extends eastwards along the southern boundary of the township in a belt about $\frac{1}{2}$ mile wide nearly to section 2. Glacial lake clay underlies the remaining parts of the township.

The upper part of the boulder clay in this township yields, to seven wells, 16 to 22 feet deep, small amounts of water that is generally used for domestic purposes. Four wells, 12 to 20 feet deep, in the glacial lake clay area, obtain supplies of water from the underlying boulder clay. The supplies on two of the farms are supplemented by the water from springs. The lower part of the boulder clay in this township is not a source of water of good quality; the water in four wells, 62 to 175 feet deep is very "alkaline," and in one of these wells, 164 feet deep, on section 3, the water is too "alkaline" to be used ~~even~~ for stock; and dry holes, 80 to 150 feet deep, were put down on sections 12, 14, and 16.

Four wells, 407 to 500 feet deep, obtain water from two aquifers in the bedrock. The first aquifer is about 1,465 to 1,437 feet above sea-level, and supplies two wells, 500 feet and 493 feet deep, in sections 25 and 26 respectively, with soft water. The water from the deeper well is used only for stock, but that from the shallower well is used also for drinking. The second aquifer, which is about 1,520 to 1,509 feet above sea-level, supplies two wells, 407 and 437 feet deep, on sections 2 and 13, respectively, with soft water that is suitable for drinking. This second aquifer probably underlies the southeast quarter of the township, but it

does not appear to extend far north of this quarter and its extension westward is unknown.

Township 24, Range 9

In the northwest part of the township the land rises gently westwards to a little over 2,150 feet above sea-level. Elsewhere the surface is comparatively flat. The western end of Luck lake extends for about one mile into the northeast part, and four intermittent streams discharge into the lake. In the south a belt of boulder clay with an average width of about 2 miles borders the southern boundary and extends westwards for about 5 miles. Boulder clay occupies most of the northwest quarter part and glacial lake clay underlies the remainder of the township.

Two wells, on sections 3 and 32, 14 and 25 feet deep, obtain small supplies of water in the upper part of the boulder clay. Five wells, 20 to 32 feet deep, in that part of the township underlain by glacial lake clay, also obtain small supplies of water, but it is probable that the glacial lake clay is thin, and some of these wells have probably passed through the glacial lake clay into the underlying boulder clay. Most of the wells in the glacial drift are over 40 feet deep, and there appears to be a few fairly well-defined aquifers. The first of these is about 1,940 to 1,945 feet above sea-level. and supplies two wells, 60 and 80 feet deep, on sections 1 and 2, respectively, with very hard water. The second aquifer, which is about 1,995 to 1,982 feet above sea-level, supplies two wells, 60 and 73 feet deep, on sections 18 and 20, respectively, with hard water. The third aquifer, which is about 1,900 to 1,912 feet above sea-level, supplies three wells, 53 to 80 feet deep, on sections 34 and 35, with a large supply of very "alkaline" water, the water in the 53-foot well being reported as soft.

Aquifers in the bedrock supply soft water to five wells, 66 to 675 feet deep. An aquifer that is about 1,368 feet above sea-level supplies a well, 675 feet deep, on section 9, with a very large

supply of soft water. Another aquifer that is about 1,418 feet above sea-level supplies a well, 630 feet deep, on section 4, whereas another that is about 1,890 to 1,873 feet above sea-level supplies two wells, 110 and 105 feet deep, on sections 10 and 12, with water that contains 3,114 and 3,160 parts per million of dissolved solids. Yet another aquifer about 1,934 feet above sea-level yields a small supply of soft water to a well, 66 feet deep on section 12. The last two aquifers mentioned probably do not extend over a wide area.

Township 25, Range 5

The only part of township 25, range 5, that is included in the rural municipality of Coteau is an area of a little less than 4 square miles in the southwest corner of the township. The "Elbow" of South Saskatchewan river is located in this area, and low sandy flats occupy about $\frac{1}{2}$ square mile near the bend of the river. Prairie level at the edge of the slopes to the river is about 1,850 feet above sea-level, and the surface rises very gently westwards to about 1,900 feet above sea-level, at the western boundary of the area, which forms part of the Elbow Forest reserve. Dune sands underlie that part of the area back from the river valley, the valley itself being underlain by boulder clay. The area is not settled and no well records were obtained. It is probable that good water would be obtained in the dune sands within 25 feet of the surface and wells put down in the sandy flats of the "Elbow" would probably be fed by seepage from the river.

Township 25, Range 6

That part of township 25, range 6, that is included in this municipality lies west of South Saskatchewan river and comprises the southwestern half of the township and about 4 square miles of the northeastern half.

Within this township the valley of South Saskatchewan river is about 150 to 200 feet deep, but the river banks are steep only in the northeast. Back from the valley of South Saskatchewan

river the country is gently undulating and rises towards the south of about 2,000 feet above sea-level. Dune sands underlie the part of Elbow Forest reserve that is included in this township, and extend for a short distance west of the reserve. A belt of glacial lake sands, about $\frac{1}{2}$ to 2 miles wide, occupies nearly 5 square miles in the western and northwestern parts of the township. A small area in the western parts of sections 18, 19, and 30 is underlain by boulder clay.

No well records were collected in this township, the greater part of which is not settled. Ground water of good quality could probably be obtained from the dune sands, within 25 feet of the surface, by the use of sand-points, and smaller supplies could probably be obtained from dug wells in the glacial lake sands at depth up to 25 feet. The glacial lake sands, however, are probably not very thick and the deeper wells might pass into the underlying boulder clay.

Township 25, Range 7

Topographical relief in this township is low, the land rising gently northwestwards from the southeast corner, which is a little over 1,900 feet above sea-level, to the northwest corner, which is a little over 2,050 feet above sea-level.

Dune sands underlie about $\frac{1}{2}$ a square mile in the southeast corner of the township. Glacial lake sands underlie the eastern half of section 12 and small parts of the eastern halves of sections 1 and 13. Glacial lake clay underlies about $2\frac{1}{2}$ square miles in the southeast part of the township, and about 4 square miles in the northwest is mantled with moraine. The eastern boundary of the moraine-covered area is a curved line that extends from the centre of the western boundary of section 18 to the northeast corner of section 32. A small area of moraine also occurs in the north-central part of the township. The remaining parts are underlain by boulder clay.

The glacial lake sands supply a large amount of water to a well 13 feet deep on section 12, but no wells in this town-

ship appear to obtain water from the glacial lake clay. A well 30 feet deep on the SE. $\frac{1}{4}$, section 3, passed through the glacial lake clay into the underlying boulder clay. Ground-water conditions in the moraine and boulder clay in this township are very unfavourable. Over twenty-two dry holes, 30 to 100 feet deep, were put down in locations scattered over the township, and the supply of water from many shallow wells is not sufficient for farm use. Most of the deeper wells yield small supplies of water, and the water from several of these wells is used only for stock. Dams or dugouts are in use at six farms, and a small spring supplies a little water to a farm on the SE. $\frac{1}{4}$, section 36.

Only one well, 565 feet deep, on section 30, obtains water from a bedrock aquifer. The water in this well contains 2,557 parts per million of dissolved solids, is salty, and has a "soda" taste, but it is used for stock. The aquifer that supplies it is about 1,447 feet above sea-level and probably underlies at least the western part of the township, as wells in the southeast part of township 25, range 8, and the northern parts of township 24, ranges 7 and 8, obtained water from an aquifer at about this elevation.

Township 25, Range 8

The land surface in this township rises from about 1,960 feet above sea-level in the southeast corner, to nearly 2,400 feet above sea-level in the west and northwest parts. In the eastern half of the township the rise towards the west is gentle, but in the southwest a moderately steep, southward-facing slope rises about 200 feet in a mile. In the western half of the township there are two northward-trending valleys that extend to the northern boundary of the township.

Boulder clay underlies an area of about $2\frac{1}{2}$ square miles in the southeast and about $\frac{1}{4}$ of a square mile in the south halves of sections 5 and 6, moraine underlies the remainder of the township.

Ground water conditions in the township are as a rule much more favourable than in township 25, range 7. Most of the wells in the glacial drift are less than 35 feet deep and yield enough water for a small number of stock. At several farms a second well is used to obtain water for the house. Four wells, 78 to 135 feet deep, yield supplies of water that are usually sufficient for local requirements. On the eastern slope of the upland two strong springs, on the NE. $\frac{1}{4}$, section 27, and the NE. $\frac{1}{4}$, section 35, provide a large supply of water. No widespread aquifers in the glacial drift can be outline, but the wells, 78 and 90 feet deep, on sections 9 and 17, obtain water from aquifers that are 2,057 feet and 2,070 feet above sea-level, respectively. The aquifers probably are continuous between the two wells.

A well, 560 feet deep, on section 1, obtained soft, brown water from an aquifer that is about 1,405 feet above sea-level. The water is unusual for a well of this depth as it contains only 1,440 parts per million of dissolved solids, of which 987 parts are sodium carbonate. The brown colour is probably due to the solvent action of the sodium carbonate on coal or carbonaceous shale.

Township 25, Range 9

The steep southward-facing slope in township 25, range 8, continues westward into township 25, range 9, for about 4 miles, but west of section 9 the slope begins to flatten out and the rise to the Coteau becomes comparatively gentle. Elevations in this township range from about 1,950 feet above sea-level in the south-east to a little over 2,500 feet above sea-level in the northwest. There are many small lakes, each of which covers less than $\frac{1}{8}$ of a square mile, in the western two-thirds of the township, and in section 18 the eastern arm of a lake extends for about $\frac{3}{4}$ of a mile into the township. An area of about $\frac{1}{2}$ of a square mile in the southern half of section 1 is mantled with glacial lake clay, and moraine underlies the rest of the township.

All the wells in this township are in the glacial drift, and all except one are less than 35 feet deep. None of the shallow wells yields "alkaline" water, although several of them either do not yield enough water for local requirements, or yield only enough for a small number of stock. A well, 86 feet deep, on section 14, provides enough "alkaline" water for 50 head stock, but the lower part of the glacial drift elsewhere in the township has not been prospected for water. In the southern third of the township there are five springs that supply large quantities of water, at elevations of about 1,975 feet to 2,200 feet above sea-level. They may be due to the outcrop of beds of sand and gravel, overlying impervious beds of clay. The springs may be derived from different aquifers or from one aquifer that slopes eastwards. A spring on the NE. $\frac{1}{4}$, section 28, a little over 2,000 feet above sea-level, is also used for watering stock.

Township 26, Range 6

Only about $1\frac{1}{2}$ square miles in the southwestern part of this township are included in the rural municipality of Coteau. Almost all the area is in the valley of South Saskatchewan river; the slopes to the river in this part are comparatively gentle. Glacial lake sands underlie the area, but they do not appear to be a good source of ground water as a well 110 feet deep on the SW. $\frac{1}{4}$, section 7, did not obtain water from them and passed into the underlying boulder clay from which it obtained very "alkaline" water.

Township 26, Range 7

The whole of township 26, range 7, except a little less than 2 square miles in the northeastern part of the township, is included in the rural municipality of Coteau. Coteau creek is an intermittent stream that occupies a rather deep valley in the northern third of township 26, range 7. The valley of the creek is underlain by boulder clay which also extends in a southeasterly direction as a belt, about $1\frac{1}{2}$ miles wide, at the western boundary of the township, and about $3\frac{1}{2}$ miles wide at the southern boundary. An area of a little over 2 square miles in the northwest

corner of the township is underlain by moraine. It is bordered on the east by an area of about 2 square miles, which is underlain by glacial lake sands. The sands extend south of Coteau creek and along South Saskatchewan river as a belt that widens to nearly 4 miles in the north but narrows to about $1\frac{1}{2}$ miles in the south. About 6 square miles in the southeastern part of the township are underlain by moraine and the remaining parts are covered by boulder clay.

All the wells except three are less than 35 feet deep, and most of these wells yield considerable supplies of hard water. The water in the wells 6, 30, and 27 feet deep on the SE. $\frac{1}{4}$, section 5, the SE. $\frac{1}{4}$, section 6, and the SE. $\frac{1}{4}$, section 16, is used only for stock. The well on the SE. $\frac{1}{4}$, section 10, does not produce enough water for local requirements, and the well 18 feet deep on the SE. $\frac{1}{4}$, section 23, is a dry hole. Three wells on sections 7, 12 and 14, 64, 41, and 61 feet deep, respectively, obtain water that can be used for drinking from aquifers in the moraine or the boulder clay, but there are not enough deep wells to outline any widespread aquifers. There are several springs in this township, one of which on section 12 is in the valley of South Saskatchewan river, whereas two others in sections 30 and 35 are in the valley of Coteau creek. Two others on sections 5 and 17 are on the eastern flank of Missouri coteau.

Township 26, Range 8

The valley of Coteau creek passes through the northeast part of the township. South of the creek valley the country is hilly and rises to a maximum elevation of nearly 2,400 feet above sea-level, the maximum difference in elevation in this township being about 550 feet. Boulder clay underlies and borders the valley of Coteau creek. Elsewhere in the township moraine underlies the surface.

The depth of the wells in the glacial drift of this township ranges from 9 to 200 feet, but most of the wells are less than 30 feet deep and yield small supplies of water. The supplies

are supplemented by other shallow wells or by dams, dugouts, or sloughs. The deeper part of the glacial drift is also not a very good source of water, as in seven wells, 46 to 100 feet deep, the supply is either insufficient for local needs or is sufficient only for a small number of stock. The 200-foot well on section 21 now yields no water, but this is probably due to the well being choked with sand. Dry holes 150, 70, and 150 feet deep were put down on sections 21, 32, and 33, respectively. A spring on the NW. $\frac{1}{4}$, section 31, about 2,150 feet above sea-level, provides an ample supply of water for farm use. Water is hauled throughout the year at a farm on the SW. $\frac{1}{4}$, section 3, and is hauled in dry periods at the farms on the SW. $\frac{1}{4}$, section 19, and on the NW. $\frac{1}{4}$, section 30.

Township 26, Range 9

The land surface in parts of this township rises gently northwards from elevations of about 2,300 feet above sea-level near the northern boundary to a little over 2,550 feet above sea-level in the southwest. Other parts of the township, however, are deeply dissected by several valleys that extend southwards into the township from the valley in which Stockwell lake lies, and in sections 5 and 22 there are depressions occupied by very small lakes. Moraine underlies the entire township.

In the southern half of the township all the wells except one are less than 25 feet deep, and springs on the SW. $\frac{1}{4}$, section 3, the NW. $\frac{1}{4}$, section 5, and the SE. $\frac{1}{4}$, section 18, supplement the supply of well water at these farms, but at the farm on the SE. $\frac{1}{4}$, section 1, the drinking water is hauled at all times. In the northern half of the township the wells are 10 to 250 feet deep, and ground water conditions are less favourable than in the southern half of the township. A dry hole 250 feet deep was put down on section 21, and several dry holes 72 to 200 feet deep were put down on section 27. Another dry hole 83 feet deep was put down on the NE. $\frac{1}{4}$, section 28. At six farms the supply of

water from the principal well is very small and additional supplies are obtained from auxiliary wells or from dams, dugouts, and sloughs. A strong spring on the SE. $\frac{1}{4}$, section 32, supplies water to several farms.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL
MUNICIPALITY OF Coteau, NO. 255, SASKATCHEWAN

	Township																Total No. in Muni- cipality
	24 5	24 6	24 7	24 8	24 9	25 5	25 6	25 7	25 8	25 9	26 6	26 7	26 8	26 9	Range		
West of 3rd meridian																	
<u>Total No. of Wells in Township</u>	0	0	26	27	39	0	0	52	32	35	1	42	65	36		355	
No. of wells in bedrock			2	3	5			1	1	0	0	0	0	0		12	
No. of wells in glacial drift			24	24	34			51	31	35	1	42	65	36		343	
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			21	21	36			27	31	34	1	40	52	29		292	
No. with intermittent supply			5	1	1			2	1	1	0	0	2	1		14	
No. dry holes			0	4	2			23	0	0	0	1	11	6		47	
<u>Types of Wells</u>																	
No. of flowing artesian wells			0	2	0			0	2	3	0	0	1	1		8	
No. of non-flowing artesian wells			2	8	17			6	4	1	1	2	5	3		49	
No. of non-artesian wells			24	18	22			22	26	31	0	38	48	26		255	
<u>Quality of Water</u>																	
No. with hard water			24	22	30			26	22	33	1	33	48	35		274	
No. with soft water			2	4	4			2	10	2	0	7	6	1		38	
No. with salty water			1	1	1			0	0	0	0	0	0	0		3	
No. with "alkaline" water			2	5	10			4	5	0	1	4	10	0		41	
<u>Depths of Wells</u>																	
No. from 0 to 50 feet deep			24	15	21			35	27	34	0	40	50	28		274	
No. from 51 to 100 feet deep			0	3	13			13	2	1	0	2	12	3		49	
No. from 101 to 150 feet deep			0	3	3			1	2	0	1	0	2	2		14	
No. from 151 to 200 feet deep			0	2	0			0	0	0	0	0	1	1		4	
No. from 201 to 500 feet deep			2	4	0			0	0	0	0	0	0	2		8	
No. from 501 to 1,000 feet deep			0	0	2			2	1	0	0	0	0	0		5	
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			19	16	23			26	26	31	0	33	43	25		242	
No. not usable for domestic purposes			7	6	11			2	6	4	1	7	11	5		60	
No. usable for stock			26	21	30			28	31	35	1	40	54	30		296	
No. not usable for stock			0	1	4			0	1	0	0	0	0	0		6	
<u>Sufficiency of Water Supply</u>																	
No. sufficient for domestic needs			19	19	28			22	31	33	1	38	43	22		256	
No. insufficient for domestic needs			7	3	6			6	1	2	0	2	11	8		46	
No. sufficient for stock needs			8	16	20			16	26	27	1	34	33	16		297	
No. insufficient for stock needs			18	6	14			12	6	8	0	6	21	14		105	

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

Chlorides

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

Iron

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

Hardness

Calcium and magnesium salts impart hardness to water. Hardness of water is commonly recognized by its soap-destroying powers as shown by the difficulty of obtaining lather with soap. The total hardness of a water is the hardness of the water in its original state. Total hardness is divided into "permanent hardness" and "temporary hardness". Permanent hardness is the hardness of the water remaining after the sample has been boiled and it represents the amount of mineral salts that cannot be removed by boiling. Temporary hardness is the difference between the total hardness and the permanent hardness and represents the amount of mineral salts that can be removed by boiling. Temporary hardness is due mainly to the bicarbonates of calcium and magnesium and iron, and permanent hardness to the sulphates and chlorides of calcium and magnesium. The permanent hardness

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.

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.

WATER FROM THE UNCONSOLIDATED DEPOSITS

The lack of uniformity in the composition of water from the glacial drift is shown in the attached table of analyses in which samples Nos. 3, 4, 5, 9, 10, 13, 14, 15, and 16 represent water from the glacial drift. In these samples the amount of dissolved solids ranges from 321 to 6,266 parts per million. Most waters from the deeper wells in the boulder clay and the moraine contain over 1,000 parts per million of dissolved solids and many of these waters contain several thousand parts per million. The typical water from wells of this type contains a large proportion of calcium sulphate (CaSO_4), and a lesser proportion of magnesium sulphate (MgSO_4), and is, therefore, very hard. Calcium carbonate (CaCO_3), and magnesium carbonate (MgCO_3), are also usually present and cause an increase in the hardness of the water. Sodium sulphate (Na_2SO_4), is usually present and together with magnesium sulphate tends to make water laxative. Sodium chloride (NaCl), and sodium carbonate (Na_2CO_3), are generally present only in small proportions.

Sample No. 3, contains 6,266 parts per million of dissolved solids, and although a detailed analysis of the water was not made there seems little doubt that it is laxative. The water is probably rather bitter, is exceedingly hard, and is not suitable for use by stock. The well from which the water was taken is in the glacial lake clay at a point in the basin in which Luck Lake lies, and the mineral salts may have washed down into this basin and accumulated in sandy beds in the glacial lake clay. Sample No. 9 is from a very shallow well on the banks of an intermittent stream that flows into Luck lake. The water contains 1,829 parts per million of dissolved solids and is of the same general type as sample No. 3, but as the water is much less mineralized than water No. 3, it may be used for all ordinary purposes. Samples Nos. 4 and 5 contain 354 and 429 parts per million of dissolved solids, respectively, and the exceptional chemical purity of the water may be due to the fact that the wells from which the

samples were taken are on the edges of the valley of an inter-stream where under-ground circulation may be comparatively rapid. The wells that supplied samples Nos. 14 and 16 may possibly be supplied by the aquifer that supplies the spring on the NE. $\frac{1}{2}$ section 12. See analysis No. 15, of the same township as that in which wells occur. These waters are comparatively soft and can be used for all purposes, as can the water of the Birsay town well represented by sample No. 10. Sample No. 13 represents a water that is much harder than the water from samples Nos. 4, 5, 10, 14, 15, and 16, but the water contains no sodium salts and is not laxative. Sample No. 17 shows the comparative purity of surface water conserved in a reservoir and has not acquired a large proportion of the dissolved salts. This water is the purest chemically of any of the waters listed.

WATER FROM THE BEDROCK

The analysis of water from wells in the bedrock may be placed in four groups that are here arranged in order of increasing saltiness of the water due to the increase in the proportion of sodium chloride. The water of the first group, represented by analyses Nos. 7 and 8, contains 3,114 to 3,160 parts per million of dissolved solids, of which sodium sulphate, sodium carbonate, and sodium chloride are the chief salts and predominate in the order given above. The detailed analysis of water No. 8 shows the presence of 2,785 parts of sodium sulphate and this water is laxative and used only for stock. The water of the second group represented by sample No. 12 contains 1,440 parts per million of dissolved solids, of which sodium carbonate is the chief constituent, sodium chloride and sodium sulphate being next in order of abundance. This water will have a marked "soda" taste and will extract the colour from tea or coffee, but it is not laxative. The water of the third group represented by samples Nos. 2, 6, and 11, contains 2,020 to

2,557 parts per million of dissolved solids, of which sodium chloride is the chief constituent, with sodium carbonate next in order of abundance. These waters are salty and will probably have a "soda" taste, but they are not laxative. The water of group 4, represented by sample No. 1, contains, 1,914 parts per million of dissolved solids, practically all of which is sodium chloride. This water is quite salty and is not suitable for drinking.

The water of the first three groups mentioned is suitable for use by stock, although the water of group 1 if used in large amounts may cause scouring in stock not accustomed to it. The water of the fourth group is rather salty for stock, but if it quenches thirst and is not used continuously it may not have any detrimental effect on the stock. The waters of all four groups contain too much "black alkali," and "white alkali," to make them fit for irrigation. The water of group 2 is the most harmful to vegetation as it contains so much "black alkali"

WELL RECORDS—Rural Municipality of COTEAU, NO. 255, 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	SW.	6	24	7	3	Dug	16	1,895	- 13	1,882	16	1,879	Glacial sand	Hard	42	D, S	Sufficient only for domestic needs.
2	NE.	6	"	"	"	Dug	16	1,955	- 0	1,955	16	1,939	Glacial sand	Medium hard	42	D	Sufficient only for domestic needs.
3	NE.	7	"	"	"	Drilled	416	1,945	-180	1,765	416	1,529	Belly River	Soft, salty	43	D, S	Sufficient; also dugout for stock; #.
4	NW.	8	"	"	"	Dug	19	1,945					Glacial drift	Hard	44	S	Intermittent supply; household well beside
5	NW.	9	"	"	"	Bored	24	1,930	- 16	1,914	24	1,906	Glacial drift	Hard, iron	43	D	Sufficient only for domestic needs; water for stock hauled.
6	NE.	15	"	"	"	Dug	16	1,900	- 13	1,887	16	1,884	Glacial drift	Hard, iron	44	D	Sufficient only for domestic needs.
7	NW.	15	"	"	"	Dug	20	1,900	- 17	1,883	20	1,880	Glacial sand			S	Supplies stock of NE. ¼, section 15.
8	SW.	16	"	"	"	Bored	30	1,925	- 0	1,925	30	1,895	Glacial drift	Hard	43	D	Sufficient only for domestic needs; stock water hauled.
9	SW.	17	"	"	"	Bored	40	1,930	- 12	1,918	40	1,890	Glacial drift		43	D, S	Insufficient supply; not used at present.
10	NW.	20	"	"	"	Dug	12	1,940	- 7	1,933	12	1,928	Glacial sand	Hard	42	D, S	Intermittent supply.
11	NE.	26	"	"	"	Sand-point	25	1,890	- 19	1,871	25	1,855	Glacial sand	Hard	43	D	Sufficient supply ; several springs supply stock.
12	SE.	28	"	"	"	Drilled	410	1,889	-160	1,729	410	1,479	Belly River	Soft	42	D, S	Sufficient supply; #.
13	NW.	28	"	"	"	Dug	20	1,908	- 5	1,903	20	1,888	Glacial drift	Hard	43	D, S	Sufficient for 12 head stock.
14	NE.	30	"	"	"	Dug	10	1,950	- 5	1,945	10	1,940	Glacial sand	Hard	43	D	Insufficient supply; also a similar well.
15	SW.	30	"	"	"	Dug	16	1,945	- 11	1,934	16	1,929	Glacial sand	Hard, slightly "alkaline"	42	D, S	Intermittent supply; similar well.
16	NE.	32	"	"	"	Dug	40	1,910	- 36	1,874	40	1,870	Glacial sand	Hard	42	D, S	Insufficient supply; 30-foot well used for stock.
17	NW.	34	"	"	"	Dug	12	1,895	- 8	1,887	12	1,883	Glacial drift	Hard	43	D	Insufficient supply; 12-foot well used for stock.
18	SW.	34	"	"	"	Dug	16	1,890	- 8	1,882	16	1,874	Glacial sand	Hard, slightly "alkaline"		D, S	Insufficient supply; also 12-foot well for stock.
1	SW.	2	24	8	3	Drilled	407	1,927	-225	1,702	407	1,520	Belly River	Soft	43	D, S	Sufficient supply.
2	SE.	3	"	"	"	Bored	164	1,945	-109	1,836	164	1,781	Glacial drift	Hard, salty		N	Unfit for use; now filled in.
3	SW.	4	"	"	"	Dug	22	1,990	- 12	1,978	22	1,968	Glacial sand	Hard	42	D	Sufficient for house use; dam which never goes dry for stock.
4	SE.	6	"	"	"	Drilled	175	2,020			175	1,845	Glacial drift	Very hard, very "alkaline"		S	Ample supply; rarely used; dam for stock.
5	NW.	6	"	"	"	Bored	62	2,010	- 30	1,980	62	1,948	Glacial drift	Hard, "alkaline"	42	S	Sufficient supply; also a dugout.
6	NE.	12	"	"	"	Drilled	125	1,930									Dry hole; base in glacial drift; dam used for stock; also 80-foot dry hole.
7	NE.	13	"	"	"	Drilled	437	1,946	-237	1,709	437	1,509	Belly River	Soft, cloudy		S	Sufficient supply; suitable for drinking.
8	SW.	14	"	"	"		150	1,940									Dry hole; base in glacial drift.
9	SE.	15	"	"	"	Dug	18	1,935					Glacial drift	Very "alkaline"		N	#.

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 COTEAU, NO. 255, 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				
10	SE.	16	24	8	3	Bored	80	1,945								Dry hole; base in glacial drift.	
11	NE.	18	"	"	"	Dug	20	1,930	- 10	1,920	20	1,910	Glacial sand	Hard	40	D, S	Ample supply.
12	NE.	25	"	"	"	Drilled	500	1,965	-200	1,765	500	1,465	Belly River	Soft		S	Sufficient supply; 16-foot well supplies house.
13	SE.	26	"	"	"	Drilled	493	1,930	-200	1,730	493	1,437	Belly River	Soft	42	D, S	Sufficient supply.
14	NW.	27	"	"	"	Flowing Spring		1,925						Hard		D, S	Used by community for 5 miles around.
15	NW.	31	"	"	"	Dug	12	1,950	- 9	1,941	12	1,938	Glacial coarse sand	Fairly hard	46	D, S	Ample supply.
16	SW.	33	"	"	"	Dug	12	1,940	- 9	1,931	12	1,928	Glacial gravel	Fairly hard		D, S	Sufficient for 25 head stock; also spring for stock.
17	SE.	34	"	"	"	Dug	18	1,945	- 14	1,931	18	1,927	Glacial drift	Hard, slightly "alkaline"	43	D, S	Sufficient supply.
18	NW.	34	"	"	"	Dug	20	1,963	- 16	1,947	20	1,943	Glacial sand	Hard, slightly "alkaline"	42	D, S	Sufficient with use of similar well; also 12-foot well for stock.
19	NE.	35	"	"	"	Dug	16	1,960	- 12	1,948	16	1,944	Glacial drift	Fairly hard	44	D, S	Intermittent supply; also 20-foot well, pond and dugout; water hauled at times.
20	NW.	36	"	"	"	Bored	130	1,980	- 30	1,950	130	1,850	Glacial black sand	Hard, slightly "alkaline"	42	D, S	Good supply; 18-foot intermittent well used for house.
1	NW.	1	24	9	3	Bored	60	2,005	- 6	1,999	60	1,945	Glacial sand	Very hard	42	N	Caved in; another well 11 feet deep; #.
2	NE.	2	"	"	"	Bored	80	2,020	- 30	1,990	80	1,940	Glacial sand	Hard, "alkaline"	42	S	Sufficient for 30 head stock; another well 12 feet deep; #.
3	SE.	3	"	"	"	Bored	62	2,040	- 37	2,003	62	1,978	Glacial blue sand	Hard, "alkaline"	43	N	Well, 14 feet deep used for drinking.
4	SE.	4	"	"	"	Drilled	630	2,048	-130	1,918	630	1,418	Belly River	Soft	44	D, S	Abundant supply; #.
5	NE.	6	"	"	"	Bored	90	2,010	- 50	1,960	90	1,920	Glacial sand	Hard, "alkaline"		S	Insufficient supply; 45- and 20-foot wells poor supplies.
6	SW.	9	"	"	"	Drilled	675	2,043	-150	1,893	675	1,368	Belly River	Soft, gaseous	45	D, S	Abundant supply; used by six farmers.
7	SW.	10	"	"	"	Bored	130	2,020	- 70	1,950	130	1,890	Bearpaw	Slightly hard, "alkaline"	42	D, S	Sufficient for 24 head stock.
8	SE.	10	"	"	"	Bored	110	2,018	- 90	1,928	110	1,908	Glacial black sand	Hard, iron, soda	42	D, S	Sufficient for 12 head stock.
9	NE.	12	"	"	"	Bored	105	1,978	- 15	1,963	105	1,873	Bearpaw	Soft, salty, gaseous		S	Ample supply; #.
10	NE.	12	"	"	"	Bored	66	2,000	- 36	1,964	66	1,934	Bearpaw	Soft	42	D, S	Sufficient; yields 10 barrels daily.
11	NE.	15	"	"	"	Bored	32	1,940	- 11	1,929	32	1,908	Glacial drift	Hard, slightly "alkaline"	42	D, S	Intermittent supply.
12	SW.	16	"	"	"	Bored	30	1,987	- 23	1,964	30	1,957	Glacial sand and gravel	Hard, slightly "alkaline"	40	D, S	Sufficient; watered 30 head stock; another well 8 feet deep for house; #.
13	SE.	18	"	"	"	Bored	100	2,005	- 60	1,945	100	1,905	Glacial drift	Hard	42	N	Not usable for stock.
14	SW.	18	"	"	"		26	2,015	- 0	2,015	26	1,989	Glacial sand	Hard	46	D	Used only for house use; water from creek supplies stock.
15	NW.	18	"	"	"	Bored	60	2,055	- 40	2,015	60	1,995	Glacial sand	Hard, iron, slightly "alkaline"	42	S	Sufficient for 35 head stock; 25-foot well for household.
16	NE.	18	"	"	"	Bored	27	2,015	-10	2,005	27	1,988	Glacial gravel	Hard	42	D	Sufficient for 6 head stock; 5 shallow wells complete 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 COTEAU, NO. 255, 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	SW.	20	24	9	3	Bored	73	2,055	- 50	2,005	73	1,982	Glacial sand	Hard, "alk- aline"	43	S	Sufficient for 20 head stock.
18	SE.	21	"	"	"	Bored	24	1,950	- 10	1,940	24	1,926	Glacial sand	Hard	42	D	Used only for domestic needs; also two ^{two} dry holes 90 and 70 feet in depth.
19	SE.	27	"	"	"	Bored	29	1,965	- 17	1,948	29	1,936	Glacial drift	Hard, "alk- aline"	42	D	Used only for domestic purposes.
20	SW.	32	"	"	"	Bored	25	2,080	- 14	2,066	25	2,055	Glacial sand	Hard	40	D, S	Sufficient for 15 to 20 head stock.
21	NW.	34	"	"	"	Bored	80	1,990	- 00	1,930	80	1,910	Glacial sand	Hard, very "alkaline", iron	40	S	Abundant supply; not used at present.
22	SE.	34	"	"	"	Bored	00	1,900	- 6	1,954	00	1,900	Glacial sand	Hard, iron, "alkaline"	43	S	Abundant supply.
23	SW.	35	"	"	"	Bored	53	1,965	- 5	1,960	53	1,912	Glacial sand	Soft, very "alkaline"	42	D, S	Abundant supply.
1	NE.	3	25	7	3	Bored	20	1,870	- 12	1,858	20	1,850	Glacial sand	Hard	42	D, S	Sufficient for 40 head stock.
2	SE.	3	"	"	"	Bored	30	1,870			30	1,840	Glacial drift	Hard			Yields 1 barrel daily.
3	SE.	4	"	"	"	Bored	70	1,900									Dry hole; base in glacial drift.
4	SW.	4	"	"	"	Dug	14	1,915	- 8	1,907	14	1,901	Glacial sand	Hard	43	D, S	Intermittent supply; also similar well.
5	SW.	6	"	"	"	Dug	20	1,900	- 14	1,946	20	1,940	Glacial sand	Fairly soft		D, S	Birsay village well, #.
6	SW.	7	"	"	"	Dug	18	1,960	- 8	1,952	18	1,942	Glacial drift	Hard	42	D, S	Sufficient for 4 head stock.
7	SE.	10	"	"	"	Dug	12	1,870			12	1,858	Glacial sand	Hard	42	D, S	Ample supply.
8	NW.	11	"	"	"	Dug	18	1,895	- 15	1,880	18	1,877	Glacial drift	Hard	42	D	Sufficient only for house; dugout for stock; 9-foot dry hole.
9	NE.	12	"	"	"	Dug	13	1,870	- 6	1,864	13	1,87	Glacial sand	Hard	42	D	Sufficient only for 150 head stock.
10	SW.	14	"	"	"	Dug	22	1,900	- 20	1,880	22	1,878	Glacial drift	Hard	42	D	Sufficient only for house; 100-foot dry hole.
11	SE.	16	"	"	"	Bored	35	1,920									Dry hole; base in glacial drift.
12	SW.	36	"	"	"	Bored	27	1,920	- 23	1,897	27	1,893	Glacial drift	Hard	42	D, S	Insufficient for 4 head stock.
13	SW.	18	"	"	"	Dug	14	1,955	- 8	1,947	14	1,941	Glacial gravel	Hard	42	D, S	Sufficient supply; also dam for stock.
14	NE.	18	"	"	"	Bored	95	1,978									Dry hole; base in glacial drift; also other dry holes to 30 feet deep.
15	NW.	20	"	"	"	Bored	110	1,985	- 20	1,965	110	1,875	Glacial drift	Hard, slight- ly "alkaline"		S	Intermittent supply; also 14-foot seepage well.
16	SW.	21	"	"	"	Bored	93	1,945	- 85	1,860	93	1,852	Glacial drift	Hard, "alk- aline"		S	Intermittent supply; 13 dry holes to 65 feet in depth.
17	NW.	24	"	"	"	Dug	14	1,890					Glacial gravel	Hard	42	D, S	Sufficient for 11 head stock.
18	SW.	24	"	"	"	Dug	8	1,890					Glacial drift				Ample supply.
19	SW.	25	"	"	"	Dug	23	1,885	- 9	1,876	23	1,862	Glacial drift	Fairly soft	42	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.

4

WELL RECORDS—Rural Municipality of COTEAU, NO. 255, 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				
20	SW.	26	25	7	3	Dug	40	1,935	- 20	1,915	40	1,895	Glacial sand	Hard, slightly iron	43	D, S	Sufficient for 150 head stock; also 2 dams.
21	SE.	28	"	"	"	Bored	60	1,905	- 0	1,905	60	1,905	Glacial drift	Hard, "alkaline"	42	S	Insufficient for 8 head stock; dugout used for stock.
22	NW.	30	"	"	"	Drilled	505	2,012	- 250	1,762	505	1,447	Belly River	Soft, soda	44	D, S	Sufficient supply; 30-foot well used for house; #.
23	NE.	31	"	"	"	Dug	15	2,005	- 11	2,054	15	2,050	Glacial drift	Hard	42	D, S	Sufficient for 40 head stock.
24	SW.	32	"	"	"	Dug	13	2,005	- 7	2,998	13	1,992	Glacial drift	Hard, slightly "alkaline"	43	S	Intermittent supply; also 50-foot dry hole; 2 dams, small supply.
25	NW.	33	"	"	"	Dug	30	1,940									Dry hole; base in glacial drift.
26	SE.	33	"	"	"	Bored	80	1,950	- 40	1,920	80	1,880	Glacial coarse sand	Hard, iron	42	D, S	Sufficient for 40 head stock; needs cleaning.
27	NW.	34	"	"	"	Bored	40	1,930	- 6	1,924	40	1,890	Glacial gravel	Hard	43	D, S	Insufficient; yields 1 barrel daily; dugout for stock.
28	NE.	34	"	"	"	Bored	20	1,930	- 8	1,922	20	1,910	Glacial sand	Fairly hard	42	D, S	Sufficient for 30 barrels daily.
29	NW.	35	"	"	"	Dug	20	1,920	- 8	1,912	20	1,900	Glacial sand	Fairly hard	42	D, S	Sufficient supply; yields 30 barrels daily; 90-foot dry hole.
30	NE.	36	"	"	"	Dug	44	1,900	- 39	1,861	44	1,850	Glacial sand	Hard	42	D, S	Sufficient for 30 head stock; also small spring.
31	SE.	36	"	"	"	Dug	45	1,890	- 41	1,849	45	1,845	Glacial drift	Hard	42	D, S	Sufficient for 15 head stock.
1	SE.	1	25	8	3	Drilled	560	1,955	- 20	1,945	560	1,405	Belly River	Soft, brown	44	D, S	Sufficient for 25 head stock; #. Also 12-foot well of hard water.
2	SE.	3	"	"	"	Dug	16	1,975			16	1,959	Glacial gravel	Soft	45	D, S	Sufficient only for house; also 14-foot well in pasture.
3	NE.	4	"	"	"	Dug	10	2,000	- 9	1,991	10	1,984	Glacial sand	Hard	42	D, S	Sufficient for 15 head stock.
4	NW.	4	"	"	"	Bored	18	2,050	- 16	2,034	18	2,032	Glacial sand	Fairly soft	42	D, S	Sufficient for 15 head stock.
5	NW.	6	"	"	"	Dug	15	2,140	- 12	2,128	15	2,025	Glacial sand	Fairly soft	43	D, S	Just sufficient.
6	SW.	9	"	"	"	Bored	78	2,135	- 38	2,097	78	2,057	Glacial gravel	Hard, slightly "alkaline"	42	D, S	Just sufficient for 35 head stock.
7	NW.	10	"	"	"	Dug	22	2,035	- 18	2,017	22	2,013	Glacial sand	Hard	44	D, S	Sufficient for 35 head stock; second well in pasture for stock.
8	SW.	15	"	"	"	Dug	16	2,070	- 13	2,057	16	2,054	Glacial sand	Fairly soft	44	D	Sufficient for only domestic purposes; second well for stock.
9	SE.	16	"	"	"	Dug	15	2,040	- 11	2,029	15	2,025	Glacial drift	Hard	42	D, S	Sufficient for 40 head stock.
10	SW.	16	"	"	"	Bored	15	2,100	- 10	2,090	15	2,085	Glacial sand	Soft	42	D, S	Sufficient supply.
11	SE.	17	"	"	"	Bored	90	2,150	- 80	2,080	90	2,070	Glacial gravel	Hard, "alkaline"	43	D, S	Sufficient for 15 to 20 head stock,
12	NE.	18	"	"	"	Dug	20	2,250	- 12	2,238	20	2,230	Glacial sand	Hard, slightly "alkaline"	43	D, S	Sufficient supply.
13	SW.	19	"	"	"	Dug	15	2,360	- 10	2,350	15	2,345	Glacial sand	Soft	43	D, S	Intermittent supply.
14	SE.	19	"	"	"	Dug	16	2,300	- 10	2,290	16	2,284	Glacial drift	Soft	44	D, S	Sufficient for 30 to 40 head stock; 13-foot well used for house.
15	SE.	23	"	"	"	Drilled	135	2,025	- 10	2,015	135	1,890	Glacial sand	Hard, iron	43	D, S	Sufficient for 100 head stock; but caved in and is now unused.

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 COTEAU, NO. 255, 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.	25	25	8	3	Bored	30	2,030					Glacial drift	Hard, "alk- aline"	43	N	Dam used for stock.
17	NE.	26	"	"	"	Dug	16	2,050	- 2	2,048	16	2,034	Glacial sand	Fairly soft	44	D, S	Sufficient for 16 head stock.
18	SE.	26	"	"	"	Dug	14	2,040	- 13	2,027	14	2,026	Glacial sand	Fairly soft	43	D	Sufficient for 10 head stock; 3 dams used for stock.
19	NE.	27	"	"	"	Flowing Spring		2,140					Glacial drift	Hard		D, S	Abundant supply.
20	NE.	32	"	"	"	Dug	14	2,215	- 11	2,204	14	2,201	Glacial gravel	Hard	43	D, S	Ample for 20 head stock.
21	NE.	33	"	"	"	Bored	120	2,280	-109	2,171	120	2,160	Glacial gravel	Hard	42	D, S	Ample; yields 20 barrels daily.
22	SE.	33	"	"	"			2,150					Glacial drift			S	Waters 30 head stock during winter.
23	SW.	34	"	"	"	Dug	20	2,245	- 15	2,230	20	2,215	Glacial sand	Hard	42	D, S	Barely sufficient for 20 head stock; #. 20-foot well for house use.
24	NE.	35	"	"	"	Flowing spring		2,085					Glacial gravel	Hard		D, S	Abundant supply for many farms.
25	NE.	36	"	"	"	Dug	15	2,065	- 8	2,057	15	2,050	Glacial sand	Hard, "alk- aline"	42	S	Sufficient; yields 75 barrels daily; 15-foot well for house.
1	SE.	1	25	9	3	Dug	16	1,970	- 12	1,958	16	1,954	Glacial sand	Hard	42	D, S	Sufficient supply.
2	NW.	2	"	"	"	Flowing spring		2,000					Glacial drift	Hard, iron		D, S	Ample supply; similar spring on SW.¼, section 2.
3	SW.	4	"	"	"	Dug	17	2,050	- 8	2,042	17	2,033	Glacial fine sand	Hard	43	D, S	Sufficient for 100 head stock in wet years; also 25-foot well.
4	NE.	5	"	"	"	Flowing spring		2,110					Glacial drift	Hard, iron		D, S	Abundant supply.
5	NW.	5	"	"	"	Dug	9	2,145	- 6	2,139	9	2,130	Glacial fine sand	Hard	50	D, S	Sufficient supply.
6	NE.	6	"	"	"	Spring		2,200					Glacial drift	Hard		S	Sufficient for 300 head stock.
7	SW.	7	"	"	"	Dug	10	2,200	- 6	2,194	10	2,190	Glacial fine sand	Hard	43	D, S	Abundant supply; also a nearby spring.
8	SW.	9	"	"	"	Dug	9	2,110	- 7	2,103	9	2,101	Glacial drift	Hard	43	D	Sufficient only for domestic needs.
9	NW.	12	"	"	"	Dug	30	2,340	- 26	2,314	30	2,310	Glacial sand	Hard	42	D, S	Sufficient for 8 head stock.
10	NW.	13	"	"	"	Dug	24	2,370	- 20	2,350	24	2,346	Glacial quick-sand	Soft	42	D, S	Insufficient supply.
11	SE.	14	"	"	"	Bored	86	2,340	- 00	2,274	86	2,254	Glacial sand	Hard, "alk- aline"	42	D, S	Sufficient for 50 head stock.
12	SE.	15	"	"	"	Dug	15	2,340	- 11	2,329	15	2,325	Glacial sand	Hard	43	D, S	Sufficient supply.
13	NE.	15	"	"	"	Dug	15	2,375	- 12	2,363	15	2,360	Glacial sand	Hard	43	D, S	Insufficient in dry years.
14	NE.	16	"	"	"	Dug	20	2,340	- 17	2,323	20	2,320	Glacial sand	Hard	43	D, S	Sufficient supply.
15	SW.	16	"	"	"	Dug	14	2,275	- 10	2,265	14	2,261	Glacial sand and gravel	Hard, slight- ly "alkaline"	43	D, S	Sufficient for 10 head stock.
16	SE.	18	"	"	"	Dug	14	2,230	- 9	2,221	14	2,216	Glacial gravel	Hard	43	D, S	Sufficient for 30 head stock.
17	NE.	20	"	"	"	Dug	17	2,420	- 13	2,407	17	2,403	Glacial sand	Hard	42	D, S	Insufficient in winter.

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

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

WELL RECORDS—Rural Municipality of COTEAU, NO. 255, 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	SE.	21	25	9	3	Dug	16	2,410	- 6	2,404	16	2,394	Glacial sand	Hard, iron	43	D, S	Sufficient for 30 head stock; sloughs in pasture.
19	SW.	22	"	"	"	Dug	20	2,375			20	2,355	Glacial gravel	Hard	43	D, S	Insufficient for 4 horses; also 10-foot well.
20	NW.	23	"	"	"	Dug	20	2,390			20	2,370	Glacial gravel	Hard	43	D, S	Insufficient for house and 10 head stock; 24-foot well.
21	SE.	27	"	"	"	Dug	17	2,360	- 5	2,355	17	2,343	Glacial sand	Hard	43	D, S	Sufficient for 30 head stock.
22	NE.	27	"	"	"	Dug	16	2,405	- 10	2,395	16	2,389	Glacial fine sand	Hard	43	D, S	Sufficient for 15 head stock.
23	NW.	27	"	"	"	Dug	30	2,460	- 20	2,380	30	2,370	Glacial sand	Hard, cloudy	42	D, S	Sufficient for 4 head stock.
24	NE.	28	"	"	"	Dug	25	2,390	- 18	2,372	25	2,365	Glacial sand	Hard	42	D, S	Sufficient for 15 head stock.
25	NW.	28	"	"	"	Dug	12	2,440	- 11	2,429	12	2,428	Glacial drift	Hard, iron	42	D	Just sufficient for house; spring on NE. ¼, section 28, waters stock.
26	NE.	32	"	"	"	Dug	34	2,470	- 30	2,440	34	2,436	Glacial sand	Fairly hard	42	D, S	Not always sufficient; intermittent; also 8-foot well and several sloughs, Just sufficient for 8 head stock.
27	NW.	33	"	"	"	Dug	27	2,430	- 17	2,413	27	2,403	Glacial sand	Hard	40	D, S	
28	SW.	33	"	"	"	Dug	18	2,440	- 14	2,426	18	2,422	Glacial quick-sand	Soft	42	D, S	Ample for 40 head stock.
29	SW.	34	"	"	"	Dug	20	2,390	- 15	2,375	20	2,370	Glacial sand	Hard	42	D, S	Usually supplies 20 head stock.
1	SW.	7	26	6	3	Drilled	110	1,910	- 80	1,830	110	1,800	Glacial drift	Hard, "alkaline"	42	S	Sufficient for 25 head stock.
1	NE.	2	26	7	3	Dug	14	1,895	- 12	1,883	14	1,881	Glacial quick-sand	Fairly soft	46	D, S	Sufficient for 27 head stock; 4-foot well yields good supply.
2	SE.	2	"	"	"	Dug	12	1,930	- 9	1,901	12	1,898	Glacial sand	Fairly soft	42	D, S	Sufficient; yields 200 barrels a day.
3	NE.	3	"	"	"	Dug	8	1,930	- 6	1,924	8	1,922	Glacial sand	Hard	45	D, S	Sufficient for 6 head stock.
4	NW.	3	"	"	"	Dug	9	1,940	- 5	1,935	9	1,931	Glacial sand	Fairly soft	48	D, S	Sufficient for 15 head stock.
5	NE.	4	"	"	"	Dug	10	1,960			10	1,950	Glacial drift	Fairly soft	46	D	Sufficient only for domestic use; dam and dugout for stock.
6	NE.	5	"	"	"	Dug	24	2,000	- 16	1,984	24	1,976	Glacial drift	Hard	43	D, S	Sufficient for 25 head to 30 head stock.
7	NW.	5	"	"	"	Dug	10	2,000	- 7	1,993	10	1,990	Glacial gravel	Hard, salty, slightly	43	D, S	Sufficient for 25 head stock; spring supplies water for stock.
8	SE.	5	"	"	"	Dug	6	2,000	- 2	1,998	6	1,994	Glacial drift	Very "alkaline"		S	Ample supply.
9	SE.	6	"	"	"	Dug	27	2,045	- 7	2,030	27	2,018	Glacial drift	Very hard, some "alkali"	42	D, S	Ample for 100 head stock; 26-foot well used mainly for house.
10	NW.	6	"	"	"	Dug	14	2,085	- 0	2,085	14	2,071	Glacial sand	Soft	48	D, S	Insufficient supply; also similar well.
11	NW.	7	"	"	"	Bored	64	2,050	- 44	2,006	64	1,986	Glacial gravel	Hard, iron	42	D, S	Sufficient supply; also dam used for stock.
12	SE.	9	"	"	"	Dug	10	1,950	- 8	1,942	10	1,940	Glacial drift	Hard	48	S	Sufficient for 20 head stock.
13	SE.	10	"	"	"	Bored	11	1,925	- 7	1,918	11	1,914	Glacial drift	Hard, "alkaline"	42	D, S	Sufficient for 16 head stock.
14	SW.	11	"	"	"	Dug	32	1,900	- 28	1,872	32	1,878	Glacial drift	Soft		D, S	#.

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 COTEAU, NO. 255, 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				
15	SE.	12	20	7	3	Dug	41	1,865			41	1,824	Glacial sand	Fairly soft	43	D, S	Sufficient for 8 head horses; springs on N. ½, section 12, used for stock.
16	NW.	14	"	"	"	Dug	7	1,880	- 3	1,877	7	1,873	Glacial quick-sand	Fairly soft, iron		D, S	Sufficient supply; #.
17	SW.	14	"	"	"	Bored	61	1,900	- 59	1,841	61	1,839	Glacial gravel	Hard	42	D, S	Ample supply; #.
18	SE.	16	"	"	"	Bored	30	1,920			30	1,890	Glacial sand	Hard	42	S	Sufficient for 20 head stock; 30-foot well used for domestic purposes.
19	SW.	17	"	"	"	Sand point	22	1,995			22	1,973	Glacial sand	Fairly hard	43	D	Used only for house; spring for stock needs.
20	SE.	18	"	"	"	Dug	21	2,000			21	1,979	Glacial sand	Hard	43	D, S	Sufficient supply.
21	SW.	19	"	"	"	Dug	12	2,020	- 8	2,012	12	2,008	Glacial drift	Hard, "alkaline"	46	D, S	Ample supply; springs on NE. ¼, section 19.
22	SE.	20	"	"	"	Dug	8	1,910	- 0	1,910	8	1,902	Glacial drift	Hard	44	D, S	Ample supply.
23	NW.	21	"	"	"	Dug	12	1,850			12	1,838	Glacial drift				Abundant supply.
24	SE.	23	"	"	"	Dug	18	1,900									Dry hole in glacial drift.
25	NW.	28	"	"	"	Dug	6	1,820	- 4	1,816	6	1,814	Glacial sand	Hard	45	D, S	Ample supply; 5 springs.
26	SE.	30	"	"	"	Dug	8	1,960	- 5	1,955	8	1,952	Glacial sand	Hard	54	D, S	Sufficient supply.
27	SE.	35	"	"	"	Dug	20	1,820	- 16	1,804	20	1,800	Glacial quick-sand	Fairly soft, iron	43	D, S	Sufficient for 20 head stock.
1	NW.	1	26	8	3	Dug	20	2,050	- 15	2,035	20	2,030	Glacial drift	Hard, very "alkaline"		S	Sufficient supply.
2	NE.	2	"	"	"	Dug	20	2,100	- 16	2,084	20	2,080	Glacial sand	Hard	44	D, S	Sufficient for 15 head stock.
3	NE.	3	"	"	"	Bored	36	2,240	- 15	2,225	36	2,204	Glacial drift	Hard, iron	43	D	Sufficient for domestic needs; two 22-foot wells; limited supply; slough for stock.
4	SW.	3	"	"	"	Bored	60	2,295	- 49	2,246	60	2,235	Glacial drift	Hard	42	D, S	Insufficient supply; dugout that dries; water hauled.
5	NW.	4	"	"	"	Dug	13	2,225	- 9	2,216	13	2,212	Glacial sand	Hard, iron	44	D, S	Sufficient for 60 head stock.
6	SE.	5	"	"	"	Dug	9	2,215	- 2	2,213	9	2,206	Glacial sand	Hard, iron	42	D, S	Ample supply for 12 head stock.
7	SW.	5	"	"	"	Dug	15	2,240	- 0	2,240	15	2,225	Glacial sand	Hard	42	D, S	Ample supply for 30 head stock.
8	SE.	6	"	"	"	Dug	20	2,300	- 10	2,284	20	2,280	Glacial sand	Hard, "alkaline"	42	D, S	Just sufficient for 20 head stock.
9	NW.	7	"	"	"	Dug	14	2,300	- 9	2,291	14	2,280	Glacial gravel	Fairly soft	42	D, S	Ample for 25 head stock; second well used for stock.
10	NE.	7	"	"	"	Dug	13	2,275	- 11	2,264	13	2,262	Glacial gravel	Hard, iron		S	Sufficient; not used a great deal.
11	NE.	8	"	"	"	Dug	12	2,230	- 4	2,226	12	2,216	Glacial sand	Fairly soft	49	D, S	Not always sufficient.
12	NW.	9	"	"	"	Dug	26	2,270	- 22	2,248	26	2,244	Glacial drift	Hard, iron	42	S	Insufficient; 14-foot well yields 30 barrels daily.
13	NW.	10	"	"	"	Bored	100	2,250	- 84	2,166	100	2,150	Glacial drift	Hard, very "alkaline"	42	S	Sufficient for 15 head stock; also 12-foot well beside slough; drinking water hauled.
14	NE.	10	"	"	"	Dug	14	2,205	- 10	2,195	14	2,191	Glacial fine sand	Hard	44	D, S	Just sufficient for 24 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 COTEAU, NO. 255, SASKATCHEWAN

Table with columns: WELL No., LOCATION (1/4, 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.

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.

9

WELL RECORDS—Rural Municipality of COTEAU, NO. 255, 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				
4	SW.	3	26	9	3	Dug	18	2,410	- 15	2,395	18	2,392	Glacial fine sand	Hard	42	D, S	Sufficient for house; spring for stock.
5	SE.	4	"	"	"	Dug	19	2,430	- 13	2,417	19	2,411	Glacial sand	Hard	41	D, S	Sufficient just for 15 head stock.
6	SW.	5	"	"	"	Dug	4	2,490	- 0	2,490	4	2,486	Glacial drift	Hard		D, S	Sufficient supply.
7	NW.	5	"	"	"	Dug	15	2,490	- 10	2,480	15	2,475	Glacial sand	Hard	42	D, S	Insufficient; spring supplies stock.
8	SE.	13	"	"	"	Dug	14	2,330	- 10	2,320	14	2,316	Glacial sand	Hard	43	D, S	Ample supply; 14-foot well yields good supply.
9	NW.	16	"	"	"	Dug	23	2,430	- 8	2,422	23	2,407	Glacial sand	Hard	44	D, S	Sufficient supply.
10	SE.	18	"	"	"	Flowing Spring	2	2,460					Glacial drift	Hard		D, S	Sufficient supply; used by four farmers in vicinity.
11	NW.	19	"	"	"	Dug	20	2,346	- 15	2,325	20	2,320	Glacial sand	Hard	43	D	Intermittent supply.
12	NE.	21	"	"	"	Drilled	250	2,440									Dry hole; base in glacial drift; sloughs for stock; drinking water hauled.
13	SW.	22	"	"	"	Dug	23	2,300	- 13	2,287	23	2,277	Glacial sand	Hard	43	D, S	Sufficient for 50 head stock.
14	SE.	22	"	"	"	Dug	25	2,290	- 15	2,275	25	2,265	Glacial sand	Hard	44	D, S	Sufficient supply.
15	NW.	23	"	"	"	Dug	24	2,375	- 23	2,352	24	2,351	Glacial drift	Hard	42	D, S	Intermittent supply; also 2 similar wells and 250-foot well; small supply.
16	SE.	25	"	"	"	Bored	40	2,345	- 25	2,320	40	2,305	Glacial sand	Hard, iron		D	Sufficient only for house uses; 56-foot well unfit for use; 35-foot well and dam for stock.
17	SW.	25	"	"	"	Dug	22	2,300	- 12	2,288	22	2,278	Glacial drift	Hard	44	D, S	Insufficient for more than 4 head stock; 10-foot well also used for stock.
18	NW.	27	"	"	"	Dug	22	2,360	- 8	2,352	22	2,338	Glacial drift	Hard	44	D, S	Intermittent supply; 72-foot dry hole.
19	NE.	27	"	"	"	Bored	150	2,410									Many dry holes to 200 feet in depth.
20	SE.	28	"	"	"	Dug	12	2,375	- 6	2,369	12	2,363	Glacial sand	Hard	45	D	Intermittent supply; water for stock hauled.
21	NE.	28	"	"	"	Bored	83	2,375									Dry hole; base in glacial drift; small slough used in summer.
22	SE.	30	"	"	"	Dug	10	2,300	- 4	2,296	10	2,290	Glacial sand	Hard	44	D, S	Sufficient supply.
23	SE.	32	"	"	"	Dug	20	2,300	- 16	2,284	20	2,280	Glacial sand	Hard	42	D, S	Serves several farmers; also spring for stock.
24	NW.	35	"	"	"	Dug	8	2,250	- 4	2,246	8	2,242	Glacial sand	Hard	42	D, S	Insufficient supply.

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

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