CANADA
DEPARTMENT OF MINES

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

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY GRASSY CREEK No. 78 SASKATCHEWAN

BY

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

Water Supply Paper No. 39

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INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Grassy Creek covers an area of 324 square miles in the southwestern part of Saskatchewan. It is described as tps. 6, 7, and 8, ranges 16, 17, and 18, W. 3rd mer. The town of Shaunavon, located on the Canadian Pacific Lethbridge-Weyburn Railway line, lies in the northwest corner of the municipality in sec. 17, tp. 8, range 18.

The topography of the three southern townships of the municipality is very rough and hilly. Deeply eroded valleys and ravines with many bedrock exposures extend southward into Frenchman River valley along the eastern part of the southern boundary in ranges 16 and 17.

From an approximate elevation of 2,800 feet above sea-level in the bottom of Frenchman valley the land surface rises rapidly to the top of the valley and extends as a gently rolling plain throughout the rest of the area. It rises gently to the northwest until it reaches its maximum elevation of approximately 3,450 in the northwest corner of township 6, range 18 and thence it falls off gently to the northeast to an elevation of 2,850 feet in the northeast corner of the municipality. The continental drainage divide extends across the central part of the area. Streams to the north are part of the Hudson Bay drainage system, whereas the southern streams form a part of the Missouri-Mississippi system.

Small supplies of ground water are derived from the deposits of Recent sands and gravels occurring along the ravine and valley bottoms. Many residents have shallow wells drawing their supply from the mantle of glacial deposits that cover practically the entire municipality. The underlying Ravenscrag bedrock formation, however, is the main source of ground water for the majority of farms in the area.

Water-bearing Horizons in the Unconsolidated Deposits

The Recent deposits occurring along the ravine and coulée bottoms in the three southern townships of the municipality are composed of sands and silts interspersed with occasional thin beds of gravels. Many small springs occur along the sides and bottoms of the ravines. Some of these derive their supply from the gravel beds in the alluvium, but others undoubtedly have their source in the coal seams and sand beds of the Ravenscrag bedrock formation, which are either exposed at the surface or lie immediately below the beds of Recent material. No wells have been sunk into the alluvium in this part of the municipality. It is probable, however, that small supplies of water of varying degrees of mineralization will be found in the sands and silts and larger supplies of hard, only slightly alkaline, water in the gravel beds. It may be necessary to sink several test holes before a gravel aquifer is encountered, as there is usually little evidence of their existence upon the ground surface.

Glacial deposits varying in thickness from 10 to 100 feet cover the entire municipality with the exception of the small areas in valleys at the south. These deposits were laid down by the great continental ice-sheet that many thousands of years ago covered the province of Saskatchewan, and by the streams and lakes formed by the melting ice. The drift is composed largely of yellow boulder clay which grades downward into blue clay at depths. Owing to the impervious nature of the clay only small seepages of generally highly mineralized water are obtainable from it. There are, however, a few scattered sand and gravel pockets and possibly a few thin beds of sand or gravel in buried stream channels from which fairly large supplies of hard, drinkable water have been obtained. In sinking wells there is no certainty of encountering productive sand or gravel pockets in the drift and it is advisable to continue into the underlying bedrock where more productive

horizons can be expected.

A slightly more irregular surface "knob and kettle" topography or terminal moraine is to be seen throughout the central and north-central part of the municipality. Here, the upper 35 feet of the drift is in many cases more porous due to a greater number of sand and gravel pockets being present in the boulder clay. Shallow wells sunk into the drift in this part of the municipality supply the domestic requirements and often yield sufficient water for 10 to 15 head of stock. If larger supplies are required, sinking into the underlying bedrock becomes necessary.

Water-bearing Horizons in the Bedrock

Two bedrock formations, designated the Ravenscrag formation and the Bearpaw formation, underlie the glacial drift in this municipality. The upper or Ravenscrag formation occurs throughout the entire area west and north of the geological boundary indicated on the map (Figure 1) which accompanies this report. South and east of this line the Ravenscrag has been eroded away and the underlying Bearpaw shales are either exposed at the surface or immediately underlie the glacial deposits. The Ravenscrag formation has a maximum thickness of 450 feet in the high area in the south-western part of the municipality, and thins uniformly to the east and south. The formation is composed of yellow to brown shales and clays, beds of soft sandstone, and thin seams of lignite coal. A thick bed of coarse sandstone occurs at the base of the formation and at an approximate elevation of 2,850 feet above sea-level. This bed forms the most extensive water-bearing horizon in the municipality. The coal seams and upper sand beds form less extensive aquifers. An attempt has been made to indicate on the accompanying map, by means of lines, the areas in which the various productive horizons are known to exist. These boundary lines can be at best only approximate as no topographic map of this area, so necessary to more detailed work, is known to exist. Several wells that have

not been indicated on the map have struck small productive beds in the Ravenscrag.

Four extensive water-bearing horizons are known to exist in the Ravenscrag formation. The uppermost horizon occurs in the area bounded by the line "A" in the southwest corner of the area. Coal seams forming this aquifer are encountered at elevations between 3,270 and 3,250 feet above sea-level. The water is hard and contains varying amounts of mineral salts including Glauber's Salt and iron. These do not exist in sufficient quantities to render the water objectionable for household use. The supply varies in different parts of the area but is usually amply sufficient for local needs. The "B" lines mark the approximate boundary of areas in which water can be obtained from coal seams at elevations between 3,130 and 3,170 feet. In the large area in the southwest part of the municipality the supplies being obtained from this horizon are usually of good quality. The yield is similar to that obtained from the higher horizon bounded by the "A" line. Coal seams yielding much smaller supplies are encountered at the same elevation in a smaller area in township 8, range 17. A third water-bearing coal horizon occurs at elevations between 3,090 and 3,050 feet in the area to the south and west of the "C" line. The supply and quality of water obtained from this horizon are similar to the two horizons described above. The bed of sand at the base of the Ravenscrag formation is believed to be continuous under the greater part of the municipality, west and north of the line marking the contact of the Ravenscrag and the underlying Bearpaw formation. Large supplies of soft water have been obtained from this bed in the northwest part of the area. Flowing-artesian wells and springs occurring in low valleys shown at the north of the township are fed from this aquifer. These lower horizons are believed to be productive under areas in which the upper horizons occur. In some localities where water supplies from the higher horizons have

not been sufficient the residents have sunk wells to the lower beds and have obtained a satisfactory supply.

Two wells located along the eastern boundary of tp. 8, range 16, have been classified as having aquifers in the Ravenscrag formation. These wells are situated on a narrow ridge underlain by a thin section of Ravenscrag beds that has escaped erosion. Due to the limited areal extent of this ridge the presence of the small area of the Ravenscrag has not been indicated on the geological map.

The Bearpaw formation underlies the Ravenscrag formation at elevations ranging from 2,900 to 2,800 feet above sea-level throughout the greater part of the municipality. In two narrow zones along the eastern and southern borders the Ravenscrag is absent and the Bearpaw either immediately underlies the glacial drift or outcrops along the sides of stream valleys. Much of the Bearpaw formation is believed to be composed of a very dark grey marine shale which, due to its compact nature, is generally not water-bearing. Beds of sand occur interspersed through the upper part of the formation, however, from which fairly large supplies of soft water have been obtained. Throughout the greater part of the municipality there is little need of sinking wells below the water-bearing sands of the basal part of the Ravenscrag.

In the southeast corner of the municipality adjoining on the north several wells sunk to depths of 225 to 300 feet produce large supplies of soft, brownish coloured water from a sand bed in the Bearpaw at an approximate elevation of 2,560 feet above sea-level. This horizon will probably be found to be productive at slightly greater depths in at least part of the northeastern township of this municipality. In other parts of the municipality it seems inadvisable to drill wells to the great depths necessary to reach this horizon in the Bearpaw. There is no assurance that this

horizon will be productive in any part of the municipality remote from the northeast corner. Furthermore, careful prospecting in the overlying Ravenscrag and glacial deposits should produce an adequate water supply.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 6, Range 16

All ground water supplies used in this township are obtained from natural springs. These springs provide an abundant supply of hard, potable water for range stock.

The best possibilities of obtaining suitable supplies of water at shallow depths in this township occur in the Recent deposits along the bottoms of valleys. These deposits consist of a mixture of glacial gravels and clays with eroded shales, sandstones and coal from the Ravenscrag formation. There are numerous springs along Bates creek in sections 6, 7, 18, 19, and 30, in which the water comes from sand or gravel aquifers in this material. Wells sunk to depths of 10 to 20 feet near the bottoms of valleys will probably yield small supplies of hard, drinkable water from the pockets of sand or gravel interspersed through the silts.

The covering of glacial drift in this area is thin and confined to the plateau areas between valleys that have been deeply eroded, exposing the bedrock formations. The springs on section 36 derive their supply from the glacial drift, but it is unlikely that extensive water-bearing horizons exist in this material.

To obtain any appreciable supply of water on high areas adjacent to the main valleys it becomes necessary to sink wells into the Ravenscrag bedrock formation, where water-bearing coal seams and sand beds will undoubtedly be encountered at depths between 50 and 200 feet. Three water-bearing horizons, namely B, C, and the basal sand horizon, are believed to exist over the central and northern parts of the township as shown by the geological map.

Township 6, Range 17

As only one well has been sunk in the township, the discussion is based largely upon observations along the creeks and inferences drawn from conditions in adjacent townships. Natural springs deriving their supply from water-bearing beds in the Ravenscrag bedrock formation furnish abundant supplies of hard, potable water for range stock and the few residents.

Shallow wells sunk to depths not exceeding 20 feet in the Recent deposits along the creek bottoms can be expected to serve as a source of water for domestic needs and for a few head of stock. These deposits also form the aquifers supplying the many small springs that occur along Gunn creek and several of the smaller ravines. Small, carefully located dams would make this spring water available to a fairly large number of stock. A thin layer of glacial drift composed largely of boulder clay covers the uplands. Small quantities of water are undoubtedly obtainable from the drift. Residents in this part of the area are much better advised, however, to sink wells into the underlying Ravenscrag bedrock formation. This formation underlies the entire township to the north of the geological boundary as shown on Fig. 1 of the accompanying map. Coal seams and sand beds occurring at the B and C horizons are believed to be water-bearing throughout the northern half of the area. The basal sandstone outcrops form springs along the lower reaches of the creeks. It is probable that wells sunk to this horizon will yield fairly large supplies of soft, soda-bearing water, suitable for stock. Sinking wells into the Bearpaw shales south of the line of contact is not advisable due to the poor water conditions existing in this formation.

Township 6, Range 18

Both the glacial deposit and the underlying bedrock offer fairly good water possibilities in this township. An irregular mantle of glacial drift covers the entire township to

depths of 80 to 120 feet. The drift is composed largely of boulder clay. The scattered pockets and occasional, thin beds of sands and gravels do not form aquifers over wide areas. Due to their irregular distribution first attempts to find water are not always productive and several test holes may be dug before even a small supply is obtained. Several residents have wells sunk to depths of 30 to 50 feet which supply the household needs and water for a few head of stock. When larger supplies are required it is advisable to extend drilling into the underlying Ravenscrag bedrock formation. A study of the existing wells in the area indicates that there are four productive horizons, namely the A, B, C, and the basal sand horizons as indicated on the accompanying map, occurring, respectively, at elevations of 3,270 to 3,250, 3,170 to 3,130, 3,090 to 3,050, and 2,950 to 2,900 feet above sea-level. Coal seams form the aquifers in the upper three horizons and yield adequate supplies of hard, slightly alkaline water. The lowest horizon is a coarse sandstone that marks the base of the formation. This horizon is generally the most productive in the formation. It yields a soft, soda-bearing water that is suitable for drinking. In the uplands this horizon lies approximately 500 feet below the surface. However, it has not been found necessary to drill to this horizon as residents have obtained satisfactory supplies from the upper horizons at depths not usually exceeding 125 feet. One well located in the NW. $\frac{1}{4}$, section 31, was drilled to a depth of 305 feet, obtaining water in the "C" horizon, but as no log of the well was kept it is impossible to determine whether or not the "A" and "B" horizons contained water at this location.

Township 7, Range 16

As this township is very sparsely settled few wells have been sunk. The isolated sand and gravel pockets that occur interspersed through the glacial boulder clay form potential sources of

water for household use. The drift has a thickness varying from 30 to 80 feet over the area. The upper part of the glacial deposits is more porous in this township than in areas to the north or south. It is probable that little difficulty will be experienced in obtaining supplies of hard, only slightly alkaline, water from gravel beds and pockets at depths not exceeding 30 feet. No information in regard to the yield to be expected is available, but individual wells should give sufficient water for at least 15 head of stock.

The Ravenscrag bedrock formation underlies the entire area west of the line of contact with the Bearpaw formation down to an approximate elevation of 2,850 feet above sea-level. No information is available as to the water conditions at the horizons that are known to be productive in adjoining townships. It seems probable, however, that the coal seams contain good supplies of water and that ample yields may be expected from wells drilled to depths of 50 to 150 feet. The Bearpaw shales underlie the drift east of the line of contact as shown on the map. In this area there is no information to indicate the possibilities of obtaining suitable water supplies from the Bearpaw. However, it is believed advisable to confine the search for water to the glacial drift.

Township 7, Range 17

Small supplies of hard water are obtained from isolated sand and gravel pockets in the layer of boulder clay comprising the glacial drift that covers the township to depths of 20 to 100 feet. There is little possibility of obtaining sufficient water for farm requirements from wells less than 40 feet deep in the drift. A few residents have struck water-bearing sand or gravel pockets in the boulder clay at depths of 50 to 75 feet. Some of these wells are giving suitable supplies for local farm requirements, whereas others are much less productive, the yield depending largely upon

the areal extent of the aquifer. The prospect of obtaining any large supplies of ground water in the glacial drift is small and the majority of the residents have sunk wells through the drift into the more productive Ravenscrag bedrock formation.

Coal seams and sand beds are the common aquifer encountered in the Ravenscrag. These seams and beds are struck at depths varying from 45 to 230 feet below the surface. The water contains varying quantities of mineral salts, including Glauber's Salt and iron, which are seldom present in sufficient quantities to render the water unfit for human consumption. The supplies obtained from this formation are large, but in some cases it is necessary to sink wells to lower aquifers when the first water horizon encountered does not yield sufficient supplies.

The coal seams at the "B" water-bearing horizon, as shown on the geological map, occur at elevations of 3,170 to 3,130 feet and form the uppermost productive beds in the southwest and extreme southern part of the township. This area is also underlain by the "C" water-bearing horizon which occurs at elevations of 3,070 to 3,050 feet above sea-level. It is also productive throughout the rest of the township with the exception of a low area in the east-central part. Depths to which it is necessary to drill to obtain water at these horizons depend upon the elevations of the surface. Throughout the eastern half of the township the "C" horizon is reached at depths varying from 60 to 100 feet, but in the western half it is necessary to drill to depths of 130 to 170 feet. The basal sand bed of the Ravenscrag lies at an approximate elevation of 3,000 to 2,950 feet above sea-level throughout the township. Two wells located in the SW. $\frac{1}{4}$, sections 2 and 9, encountered this horizon at depths of 230 and 233 feet, respectively, but will be found at much shallower depths in the lower parts of the area. The water is soft and often soda-bearing. The yield has been found to be sufficient for local household and stock raising

requirements. Drilling below this horizon is not recommended in any part of the township, due to the non-water-bearing character of the underlying Bearpaw shale.

Township 7, Range 18

Small quantities of hard water, suitable for household use, are obtained from isolated sand and gravel pockets in the mantle of glacial drift that covers the northwestern half of the township to depths of 10 to 50 feet. Throughout the southeastern half the ground surface is more rolling and the sand and gravel pockets in the drift are more extensive. Here shallow wells yield hard, slightly mineralized water in sufficient quantities for domestic needs and for watering a few head of stock. When large supplies are required for stock-raising purposes residents are well repaid by sinking wells through the drift to the more productive sand beds and coal seams forming the aquifers in the underlying Ravenscrag formation.

Ground water is known to occur at four distinct horizons in the Ravenscrag formation. The uppermost horizon is encountered at depths of 85 to 100 feet within the area bounded by the "A" line. Throughout the most of the remaining part of the township the "B" horizon, occurring at approximate elevations of 3,170 to 3,130 feet above sea-level, forms the uppermost productive aquifer and is struck, in drilling, at depths of 35 to 75 feet, depending upon the surface elevation. This horizon does not occur along the northern boundary of the township. Residents are here obliged to sink to depths of 50 to 150 feet to the water-bearing coal seam forming the "C" horizon. In sections 25, 32, and 36 wells have been sunk to depths of 376, 150, and 300 feet, respectively, to the basal sand of the Ravenscrag at elevations between 3,000 and 2,950 feet above sea-level. This sand bed would probably be found to be productive over the entire township, but it would be necessary to drill to depths of 400 to 500 feet to reach it in the higher areas.

Water from the upper three horizons is hard and although containing small amounts of Glauber's Salt (sodium sulphate) and iron it is quite suitable for human consumption. The lower sand horizon yields a soft, usually soda-bearing water which is considered to be a good drinking water and is quite satisfactory for stock and for laundry requirements. Drilling for water below an elevation of 2,850 into the Bearpaw shale is not recommended in this township.

Township 8, Range 16

A few residents of this township obtain suitable supplies of water from wells not exceeding 70 feet in depth, penetrating sand or gravel pockets in the glacial drift that overlies the area to depths varying from 20 to 100 feet. The quality of water obtained from the drift varies in different localities. Supplies from shallow wells are often soft, whereas in others the water contains mineral salts, although not in sufficient quantities to render the water unfit for household use.

With the exception of a narrow area along the eastern boundary of the township, where the Bearpaw shale is the uppermost bedrock formation, the glacial drift is underlain by the Ravenscrag bedrock formation down to an approximate elevation of 2,850 feet. The basal part of the Ravenscrag, in the area, consists of a massive sand bed.

Throughout the area west of Notukeu creek large supplies of soft water are obtained from wells tapping this sand basal bed at elevations of 2,850 to 2,950 feet. The depths of wells necessary to reach this horizon vary from 50 to 200 feet depending on surface elevation. Artesian springs along Notukeu Creek valley are believed to be fed from this source.

Throughout the central area of the township, between Notukeu creek and the geological boundary indicated on the map, the sand of the basal Ravenscrag is encountered at depths of 70 to 100 feet. Much smaller supplies of water are obtained from the sand in

this area than from the same aquifer west of Notukeu creek. The two wells on the NE. ¼ of sec. 13 and the SE. ¼ of sec. 12, indicate that there is a narrow area along the eastern boundary of the township where a thin section of the Ravenscrag escaped erosion. This area is not indicated on the accompanying map, due to its small areal extent and lack of information regarding its definite outline.

In the adjoining township to the north, large supplies of soft water are being obtained from a sand horizon in the Bearpaw formation at an approximate elevation of 2,560 feet above sea-level. It is quite probable that similar supplies could be obtained in, at least, the northern part of this township. The depths of wells necessary to reach this horizon would vary between 300 and 500 feet, depending on the surface elevation.

In the small area along the eastern boundary of the township, where the Bearpaw underlies the glacial drift, wells sunk into the drift to depths not exceeding 70 feet, offer the best prospect of obtaining water supplies unless residents are prepared to drill to depths greater than 300 feet, where there is the possibility of tapping productive sand beds in the Bearpaw formation.

Township 8, Range 17

Small quantities of hard, slightly mineralized water are obtained from the few scattered sand and gravel pockets in the layer of glacial drift that covers this township to depths of 20 to 50 feet. Most of the residents in the area, however, derive their supplies from the more productive Ravenscrag bedrock formation. Very little water can be expected from the impervious boulder clay that comprises the greater part of the drift. A few residents, however, obtain their household supplies from wells not exceeding 30 feet in depth, which penetrate the sand and gravel pockets, but these pockets are usually not sufficiently extensive to yield

quantities ample for local stock requirements.

The sandstones, shales, and coal seams that comprise the Ravenscrag formation underlie the drift of the entire township down to an elevation of approximately 2,850 feet above sea-level. Coal seams, and more occasionally sand beds, form the aquifers in the Ravenscrag, and are encountered at depths ranging from 35 to 150 feet from the surface. Extensive areas in which water is likely to be encountered in coal seams of the "B" and "C" horizon are shown on the geological map. There are also wells having aquifers in sand beds and coal seams not included in these horizons. The waters from the above aquifers are generally hard and contain varying amounts of mineral salts, usually Glauber's Salt and iron, but these are not in sufficient quantities to preclude the use of the water for household needs. With the exception of a few wells having aquifers in the "B" horizon, the yield from wells in the Ravenscrag are, in most localities, sufficient for both household and stock requirements.

Should the yield not be sufficient much larger supplies of soft water are to be expected from the thick sand bed at the bottom of the Ravenscrag formation. This sand bed is believed to extend continuously throughout the township at elevations from 2,900 to 3,000 feet above sea-level. In the valleys this extensive productive aquifer may be struck at depths of 50 to 100 feet, but on the higher land it will be necessary to drill to depths of 150 to 300 feet from the surface. Artesian wells and springs in the creek valley in the northwestern part of the township are fed by this aquifer.

Township 8, Range 18

Small supplies of hard water are obtained from a few scattered sand pockets in the glacial drift that covers the township to depths of 10 to 70 feet. These supplies, derived from wells not exceeding 40 feet in depth, are occasionally sufficient for both

domestic and stock requirements. In most localities residents have found it necessary to sink wells to tap the more productive Ravenscrag bedrock formation.

The Ravenscrag formation, composed of beds of sandstone, sand, and shale, and seams of coal, underlies the drift of the entire township, down to an elevation of approximately 2,850 feet. Sand beds and coal seams yielding hard, slightly mineralized water are generally encountered near the top of this formation at depths of 50 to 100 feet. The water-bearing coal seams of the "C" horizon are considered to underlie small areas at the south as shown by the geological map. The horizon is encountered at elevations between 3,090 to 3,050 feet. The water from this aquifer and other less extensive beds usually contains mineral salts in varying quantities. However, the supplies and quality of water obtained are usually sufficient and suitable for stock and domestic requirements.

Large supplies of soft water are available in the sand bed at the base of the formation at elevations from 2,950 to 2,850 feet in all parts of the area, at depths from 50 to 300 feet, depending on surface elevation. Many residents of the town of Shaunavon and surrounding district have drilled wells through the upper water-bearing beds to this horizon which is encountered at depths of 90 to 100 feet from the surface. The water at this horizon is under hydrostatic pressure and rises in wells to within 20 feet of the surface.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF GRASSY CREEK, NO. 78, SASKATCHEWAN

Township	6	6	6	7	7	7	8	8	8	Total No. in Municipality
West of 3rd mer. Range	16	17	18	16	17	18	16	17	18	
Total No. of Wells in Township	7	11	22	9	48	41	39	52	55	284
No. of wells in bedrock	6	10	8	9	26	32	26	45	47	209
No. of wells in glacial drift	1	1	14	0	22	9	13	7	8	75
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	7	11	21	9	43	40	38	46	54	269
No. with intermittent supply	0	0	0	0	2	0	0	0	0	2
No. dry holes	0	0	1	0	3	1	1	6	1	13
Types of Wells										
No. of flowing artesian wells	0	0	0	0	0	0	5	8	2	15
No. of non-flowing artesian wells	0	0	7	0	24	20	23	24	34	132
No. of non-artesian wells	7	11	14	9	21	20	10	14	18	124
Quality of Water										
No. with hard water	7	11	17	9	39	31	22	31	21	188
No. with soft water	0	0	4	0	6	9	16	15	33	83
No. with salty water	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	0	0	1	8	3	1	6	1	2	22
Depths of Wells										
No. from 0 to 50 feet deep	7	11	10	9	19	16	19	26	18	135
No. from 51 to 100 feet deep	0	0	6	0	18	13	19	10	16	82
No. from 101 to 150 feet deep	0	0	1	0	5	4	1	7	13	31
No. from 151 to 200 feet deep	0	0	2	0	3	2	0	6	6	19
No. from 201 to 500 feet deep	0	0	3	0	3	6	0	3	2	17
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0
How the Water is Used										
No. in use for domestic purposes	7	10	21	9	40	36	35	40	50	248
No. not in use for domestic purposes	0	1	0	0	5	4	3	6	4	23
No. in use for stock	7	11	21	9	43	40	37	45	52	265
No. not in use for stock	0	0	0	0	2	0	1	1	2	6
Sufficiency of Water Supply										
No. sufficient for domestic needs	7	11	21	9	45	40	38	46	54	271
No. insufficient for domestic needs	0	0	0	0	0	0	0	0	0	0
No. sufficient for stock needs	7	10	17	9	32	34	32	40	47	228
No. insufficient for stock needs	0	1	4	0	13	6	6	6	7	43

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

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

can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. Water that has a total hardness of 300 parts per million or more is usually classed as excessively hard. Many of the Saskatchewan water samples have a total hardness greatly in excess of 300 parts per million; when the total hardness exceeded 3,000 parts per million no exact hardness determination was made. Also no determination for temporary hardness was made on waters having a total hardness less than 50 parts per million. As the determinations of the soap hardness in some cases were made after the samples had been stored for some time, the temporary hardness of some of the waters as they come from the wells probably is higher than that given in the table of analyses.

Analyses of Water Samples from the Municipality of Grassy Creek, No. 78, Saskatchewan

LOCATION						Depth of Well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS								Source of Water
No.	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alkalinity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1.	NE.	28	8	16	3	29	651											(3)	(1)		(2)				(4)	≠ 1
2.	NE.	6	6	16	3	Spring	460	280	130	150	9	170	40	68	123	43	335	72		82	86		80	15		≠ 2
3.	NE.	2	7	17	3	152	709												(4)		(5)	(2)	(1)	(3)		≠ 2
4.	NE.	32	8	16	3	112	860	55	Nil	55	12	505	20	11	250	446	918	36		23		469	370	20		≠ 2
5.	NE.	25	8	17	3	187	1,060	75	15	60	14	540	10	25	328	509	1,067	18		52		488	486	23		≠ 2

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

WATER FROM THE UNCONSOLIDATED DEPOSITS

The water from wells in the glacial drift varies so greatly in mineral character that it is practically impossible to determine, beforehand, the nature of water that may be obtained in any locality. Water encountered at similar depths at points only 50 feet apart may show marked difference in this respect. Analyses were obtained of only one sample of water from the glacial drift of this municipality, so that only a general discussion of conditions existing in this formation can be given.

Most of the water obtained from sand and gravel pockets in the glacial drift is hard to excessively hard. However, within the municipality, no water from the drift was reported to be unusable and only a few instances were reported of water having any taste or disagreeable effects. The mineral salts commonly present in waters obtained from the glacial drift of Saskatchewan listed in order of their decreasing quantities are as follows: sodium sulphate (Na_2SO_4), magnesium sulphate ($MgSO_4$), calcium carbonate ($CaCO_3$), calcium sulphate ($CaSO_4$), magnesium carbonate ($MgCO_3$), sodium chloride ($NaCl$), and sodium carbonate (Na_2CO_3).

The one analysis obtained for water from the glacial drift of this municipality has a low total solid content, and the predominant mineral salts are calcium sulphate ($CaSO_4$) and Epsom salts ($MgSO_4$), Glauber's salt (Na_2SO_4) being negligible. The two sulphate salts contained in this water cause permanent hardness. However, the water is of good quality for domestic use.

Water from the Bedrock

No samples of water that comes from the coal seams and sand beds of the upper part of the Ravenscrag formation were analysed, but this water is usually hard, and the sulphate salts and iron are commonly present in sufficient quantity to be noticeable on evaporation of the water.

Three samples derived from the bedrock of the lower part of the Ravenscrag formation in this municipality were analysed and their mineral contents are shown in the accompanying table. These samples were obtained from two wells and a spring. The wells draw their water from the same sand aquifer at the base of the Ravenscrag formation, and their analyses should be representative of the water in this horizon. Reference to the table will show that the total hardness of the water is less than 100 parts per million, and the total dissolved solid content is low, the highest being 1,060 parts per million. The solid content is made up, largely, of sodium carbonate (Na_2CO_3) and sodium sulphate (Na_2SO_4), but these are not present in sufficient quantities to render the water unfit for domestic use. The water may, in some cases, have a harmful effect on vegetation.

WELL RECORDS—RURAL MUNICIPALITY OF GRASSY CREEK, NO. 78, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	E½.	6	6	16	3	Spring	0	2,970	- 1	2,971	0	2,971	Ravenscrag sandstone	Hard, clear		D, S, I	There are numberous springs along
2	E½.	7	"	"	"	"	0	?	0	?	0	?	" sand	" , "		S	the same valley in Sections 6, 7, 18,
3	E½.	18	"	"	"	"	0	?	0	?	0	?	" "	" , "		S	19, and 30. The water apparently comes
4	E½.	19	"	"	"	"	0	3,130	0	3,130	0	3,130	" coal	" , "		S	from the Ravenscrag sandstones and coal
5		23	"	"	"	"	0	?	0	?	0	?	" sand	" , "		S	seams and the west side of the valley.
6		30	"	"	"	"	0	?	0	?	0	?	" "	", "		S	The supply from these springs is suffic-
7		36	"	"	"	"	0	3,000	0	3,000	0	3,000	Glacial gravel	" , "		S	for a large number of stock.
1	NW.	2	6	17	3	Spring	0	?	0	?	0	?	Ravenscrag ?	Hard, clear		S	Springs along valleys in Sections 4, 9,
2	SW.	4	"	"	"	"	0	3,000	0	3,000	0	3,000	" sandstone	Medium hard, clear		D, S	16, 21, 22, 27, and 34 provide a con-
3		6	"	"	"	"	0	?	0	?	0	?	" ?	Hard, clear		S	tinuous flow of water sufficient for
4		9	"	"	"	"	0	?	0	?	0	?	" ?	" , "		S	large numbers of stock. This water ap-
5		16	"	"	"	"	0	?	0	?	0	?	" ?	" , "		S	parently comes from water-bearing sand-
6	SE.	21	"	"	"	"	0	2,980	0	2,980	0	2,980	" coal	" , "		S	stones and coal seams on the west sides
7	NE.	21	"	"	"	"	0	3,075	0	3,075	0	3,075	" sand	" , iron		S	of the valleys.
8	NW.	22	"	"	"	"	0	3,020	0	3,020	0	?	" ?	" , clear		S	
9	W½.	27	"	"	"	"	0	?	0	?	0	?	" ?	" , "		S	
10	SW.	34	"	"	"	"	0	3,145	0	3,145	0	3,145	" sandstone	Medium hard, clear		D, S	
11	NW.	33	"	"	"	Dug	20	?	0	?	0	?	Glacial clay	Hard, "		S	Seepage from slough; insufficient supply.
1	SE.	1	6	18	3	Spring	0	2,015	+1	3,016	0	3,015	Ravenscrag ?	Soft, clear		D, S	Good supply.
2	NW.	2	"	"	"	Dug	13	3,240	- 9	3,231	9	3,231	Glacial sand	Medium hard, clear		D, S	" " .
2a	NW.	5	"	"	"	Bored	14	3,315	- 9	3,306	9	3,306	" clay	Hard, clear		D, S	Poor " ; well 65 feet deep in clay; dry hole
3	NE.	6	"	"	"	"	85	3,335	- 70	3,265	85	3,250	Ravenscrag coal	Medium hard, cloudy		D, S	Good " .
4	NE.	7	"	"	"	Drilled	175	3,380	-100	3,280	175	3,205	" sand	Medium hard, iron		D, S	" " .
5	SW.	19	"	"	"	Bored	95	3,420	- 88	3,332	88	3,332	" ?	Hard, clear		D, S	" " .
6	NE.	19	"	"	"	"	75	3,410	- 70	3,340	70	3,340	" sand	" , " , iron		D, S	Sufficient for 35 head stock.
7	NW.	20	"	"	"	Drilled	202	3,490	-106	3,384	202	3,288	Ravenscrag coal	Medium hard, clear		D, S	Large supply.
8	NE.	21	"	"	"	Bored	48	3,380	- 43	3,337	40	3,340	Glacial gravel	Medium hard,		D, S	Good supply.

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

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

WELL RECORDS—RURAL MUNICIPALITY OF GRASSY CREEK, NO. 78, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
9	SW.	25	6	18	3	Drilled	187	3,350	-147	3,203	180	3,170	Ravenscrag coal	Soft, clear		D, S	Good supply.
10	SW.	27	"	"	"	Dug	7	3,350	- 2	3,348			Glacial clay	Hard, "		D, S	Poor supply. Spring on same ¼ section with poor supply.
11	SE.	30	"	"	"	Bored	107	3,490	- 90	3,400	65	3,425	" gravel	Soft, "		D, S	Sufficient for 25 head stock.
12	SW.	31	"	"	"	Dug	48	3,455	- 46	3,409	46	3,409	" sand	Medium hard, clear		D, S	" supply.
13	NW.	31	"	"	"	Drilled	305	3,425	-240	3,185	305	3,120	Ravenscrag ?	Hard, iron, clear		D, S	Large supply.
14	NE.	32	"	"	"	Dug	225	3,400	- 10	3,390	10	3,390	Glacial clay, gravel mixed	Medium hard, alkaline, clear		D, S	Sufficient for 12 head stock.
15	NE.	36	"	"	"	Drilled	265	3,320	- 238	3,082	238	3,082	Ravenscrag coal	Soft, clear		D, S	Large supply.
1	NE.	3	7	16	3	Spring	0	3,000	0	3,000	0	3,000	" sandstone	Hard, alkaline"		S	
2	SW.	4	"	"	"	"	4	3,170	- 2	3,168	0	3,170	" coal	" , clear, iron		D, S	Sufficient for 500 head stock.
3	E½.	11	"	"	"	"	0		0		0		" sand	" , alkaline"		S	Springs 1 and 3 to 10, inclusive,
4	W½.	12	"	"	"	"	0		0		0		" "	" , "		S	are along the same valley. There
5	E½.	14	"	"	"	"	0		0		0		" "	" , "		S	are numerous springs along this course
6	E½.	23	"	"	"	"	0		0		0		" "	" , "		S	that maintain a continuous supply of
7	W½.	24	"	"	"	"	0		0		0		" "	" , "		S	water standing in depressions. This supply
8	W½.	25	"	"	"	"	0		0		0		" "	" , "		S	is sufficient for large numbers of stock.
9	E½.	26	"	"	"	"	0		0		0		" "	" , "		S	The water apparently originates in water-
																	bearing sandstone formations west of the valley.
1	SW.	1	7	17	3	Dug	71	3,030	- 36	2,994	71	2,959	Ravenscrag sand	Soft, clear		D, S	Good supply.
2	NE.	2	"	"	"	Drilled	152	3,095	-112	2,983	152	2,943	" "	Medium hard, clear		D, S	" " ; #.
3	SW.	3	"	"	"	"	230	3,195	-204	2,991	230	2,965	" coal	Medium hard, iron, clear		D, S	" " .
4	NW.	3	"	"	"	"	170	3,165	-140	3,025	170	2,995	" "	Medium hard, clear		D, S	Sufficient for 30 head stock.
5	NW.	4	"	"	"	Dug	12	3,180	- 6	3,174			Glacial clay	Hard, clear		D, S	Insufficient for 10 head stock.
6	SE.	7	"	"	"	"	90	3,210	- 50	3,160			" ?	" , " ,		D, S	" " local needs.
7	SW.	9	"	"	"	Drilled	233	3,215	-203	3,012	233	2,982	Ravenscrag coal	" , iron, red sediment		D, S	Good supply.
8	SE.	9	"	"	"	"	193	3,285	- 80	3,205	193	3,092	" "	Soft, clear,		D, S	" " .
9	SE.	12	"	"	"	Bored	105	3,180	-102	3,078	105	3,075	" sand	Hard, iron-bearing red sediment		D, S	" " .
10	SE.	13	"	"	"	"	45	3,020	- 25	2,995	43	2,977	" coal	Hard, clear		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 GRASSY CREEK, NO. 78, 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				
11	SE.	14	7	17	3	Dug	50	3,030	- 44	2,986	50	2,980	Glacial gravel	Hard, clear		D, S	Sufficient for 20 head stock.
12	NE.	14	"	"	"	"	50	3,135	- 13	3,122	30	3,105	" sand			D, S	Insufficient supply
13	NW.	16	"	"	"	"	84	3,075	- 61	3,014	84	2,991	Ravenscrag coal	" "		D, S	Good supply.
14	SE.	17	"	"	"	Bored	70	3,075	- 53	3,022	70	3,005	" "	Medium hard, clear		D, S	" " .
15	SW.	17	"	"	"	"	55	3,125	- 45	3,080	55	3,070	" "	Hard, " , "alkaline"		D, S	" " .
16	NE.	18	"	"	"	"	125	3,185	-113	3,072	125	3,060	" "	Hard, clear		D, S	" " .
17	SE.	21	"	"	"	"	67	3,060	- 30	3,030	60	3,000	" "	Medium hard, clear		D, S	" " .
18	NE.	21	"	"	"	Dug	70	3,085	- 63	3,022	70	3,015	" "	Hard, clear		D, S	" " .
19	SW.	22	"	"	"	"	45	3,050	- 30	3,020	30	3,120	Glacial sand and clay mixture	"; "alkaline"		S	Poor supply; 2 wells necessary.
20	NW.	22	"	"	"	Drilled	89	3,025	- 20	3,005	84	2,941	Ravenscrag sand	Soft, clear		D, S	Large supply.
21	NW.	23	"	"	"	Dug	60	3,025	- 25	3,000	60	2,965	" "	Medium hard, clear		D, S	Good supply.
22	NE.	23	"	"	"	"	32	3,125			32	3,093	Glacial sand	Hard, clear, iron-bearing		D, S	Sufficient for 10 head stock.
23	NW.	24	"	"	"	Drilled	116	3,140	- 46	3,094	116	3,024	Ravenscrag sand	Soft, clear		D, S	Large supply.
24	NW.	26	"	"	"	Dug	72	3,150	- 37	3,113	72	3,078	Glacial gravel	Medium hard, clear		D, S	" " .
25	NE.	27	"	"	"	Bored	51	3,170	- 41	3,129	41	3,129	" sand	Hard, clear, bitter		N	
26	SW.	28	"	"	"	Dug	88	3,170	- 80	3,090	80	3,090	Ravenscrag coal	Hard, clear, iron-bearing		D, S	Good supply.
27	NE.	30	"	"	"	"	130	3,160	- 90	3,070	90	3,070	" "	Soft, clear		D, S	Poor supply.
28	SW.	30	"	"	"	"	50	3,260					Glacial sand			S	" " .
29	SW.	31	"	"	"	"	25	3,185	- 20	3,165	20	3,165	" clay	Medium hard, clear		D, S	Sufficient supply.
30	SW.	32	"	"	"	Drilled	169	3,175	-129	3,046	160	3,015	Ravenscrag sand-stone	Soft, clear		D, S	Good supply.
31	SE.	32	"	"	"	Bored	80	3,135	- 50	3,085	50	3,085	Ravenscrag coal	Hard, iron, red sediment		S	1 barrel a day.
32	NW.	32	"	"	"	"	30	3,135	- 0	3,135	4	3,131	Glacial sand	Medium hard		D, S	Good supply.
33	SE.	35	"	"	"	"	73	3,135	- 55	3,080	54	3,071	" "	Hard, iron, clear		D, S	Sufficient supply.
34	NE.	36	"	"	"	Drilled	75	3,105	- 50	3,055	75	3,030	" gravel	Hard, clear, "alkaline"		D, S	" for 20 head stock.
1	NW.	1	7	18	3	Dug	15	3,280	- 0	3,280	?	?	" clay	Hard, clear		D, S	Poor supply; seepage from slough.
3	NE.	3	"	"	"	Bored	175	3,255	-161	3,094	175	3,080	Ravenscrag coal	Soft, "		D, S	Good supply.
3a	SE.	5	"	"	"	Dug	?	3,300	- 6	3,294	?	?	Glacial clay	Hard, "		D, S	Sufficient 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 GRASSY CREEK, NO. 78, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
4	SW.	6	7	18	3	Drilled	230	3,315	-185	3,130	230	3,085	Ravenscrag coal	Hard, clear, "alkaline"		D, S	Good supply.
55	NW.	7	"	"	"	Bored	80	3,310	- 75	3,235	80	3,230	" "	Hard, iron, red sediment		D, S	Sufficient for 25 head stock.
6	NE.	7	"	"	"	Dug	85	3,350	- 71	3,279	85	3,265	" sand	Hard, clear, iron		D, S	Good supply.
7	NE.	8	"	"	"	"	35	3,370	- 31	3,339	35	3,335	Ravenscrag sandstone	Hard, "		D, S	Large " .
8	NW.	9	"	"	"	"	15	3,260	- 4	3,256	13	3,247	Glacial gravel	" , "		S	Sufficient supply.
9	SE.	9	"	"	"	Bored	89	3,330	- 80	3,250	89	3,241	Ravenscrag sand	Soft, "		D, S	Good supply.
10	NE.	10	"	"	"	Drilled	275	3,340	-235	3,105	265	3,075	" "	" , "		D, S	Large supply.
11	SE.	12	"	"	"	Dug	60	3,165	- 54	3,111	56	3,109	" sandstone	Hard, "		D, S	Insufficient for 25 head stock.
12	SE.	13	"	"	"	Drilled	170	3,235	-140	3,095	170	3,065	" coal	",iron,"		D, S	Good supply.
13	SW.	13	"	"	"	Spring	0	3,175	0	3,175	0	3,175	" "	Soft,clear		D, S	Large supply.
14	SW.	15	"	"	"	Bored	90	3,335	- 73	3,262	80	3,255	" sand	Hard, "		D, S	Good " .
15	NW.	16	"	"	"	Spring	0	3,335	0	3,335	0	3,335	Glacial gravel	Soft, "		D, S	" " .
16	SE.	17	"	"	"	Bored	100	3,370	- 84	3,286	88	3,282	Ravenscrag sand	Hard, "		D, S	Sufficient for 40 head stock.
17	NE.	17	"	"	"	Drilled	275	3,305	-175	3,130	271	3,034	" sandstone	Medium hard, clear		D, S	Large supply.
18	SE.	18	"	"	"	Bored	80	3,350			80	3,270	" coal	Hard,clear		S	Sufficient for 20 head stock.
19	NE.	19	"	"	"	"	72	3,170	- 56	3,124	72	3,098	" ?	" , "		D, S	" " 50 " " .
20	NE.	20	"	"	"	"	47	3,260	- 28	3,232	24	3,236	Glacial gravel	Medium hard, clear		D, S	Poor supply.
21	SW.	21	"	"	"	"	64	3,245	- 44	3,201	60	3,185	Ravenscrag sand	Soft, clear		D, S	Sufficient supply.
22	SE.	22	"	"	"	"	79	3,260	- 64	3,196	79	3,181	Glacial sand	Hard, "		D, S	" " .
23	SW.	24	"	"	"	Dug	30	3,275	- 10	3,265	30	3,245	" ?	" , " , iron		D, S	" " .
24	NW.	25	"	"	"	Drilled	376	3,275	-276	2,999	376	2,899	Ravenscrag sand	Soft, "		D, S	Large supply.
25	NE.	26	"	"	"	"	210	3,255	-171	3,084	202	3,053	" coal	Medium hard, clear		D, S	Good supply.
26	NW.	27	"	"	"	Dug	25	3,150	- 4	3,146	12	3,138	Glacial gravel	Hard,clear		D, S	Sufficient supply.
27	NW.	28	"	"	"	Bored	140	3,250	-137	3,113	137	3,113	Ravenscrag coal	Hard,iron, red sediment		D, S	" " .
27a	SW.	29	"	"	"	Dug	39	3,200	- 31	3,169	31	3,169	Glacial clay	Hard,clear		D, S	Poor supply.
28	NE.	30	"	"	"	Spring	0	3,170	0	3,170	0	3,170	Ravenscrag coal	" , " , oily scum		D, S	Large supply.
29	SE.	32	"	"	"	Bored	150	3,160	-130	3,030	150	3,010	" sand	Soft,clear		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 GRASSY CREEK, NO. 78, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
30	SW.	33	7	18	3	Bored	50	3,135	- 44	3,091	44	3,091	Ravenscrag coal	Medium hard, clear		D, S	Sufficient for 18 head stock.
31	NW.	33	"	"	"	"	50	3,130			50	3,080	" ?	Hard, iron, red sediment		D, S	" " 20 " " .
32	NW.	34	"	"	"	Dug	60	3,125	- 58	2,067	54	3,071	" coal	Hard, clear		D, S	" " 20 " " .
33	SW.	36	"	"	"	Drilled	300	3,195	-200	2,995	300	2,895	" sand	Soft, "		D, S	Large supply.
1a	SE.	3	8	18	3	Dug	34	3,050	- 29	3,021	34	3,016	" "	Hard, "		D, S	Sufficient supply.
1	NE.	4	"	"	"	"	50	3,010	- 43	2,967	50	2,960	Glacial gravel	Soft, "		D, S	" " .
2	NW.	6	"	"	"	Bored	52	2,980	- 38	2,942	52	2,928	Ravenscrag sand	Hard, "		D, S	" for 25 head stock.
2a	NW.	7	"	"	"	Spring	0	2,980	+ 1	2,981	0	2,980	" "	Soft, "		S	Large flow.
3	SE.	9	"	"	"	Dug	70	3,025	- 60	2,955	70	2,955	" "	Soft, "		D, S	" supply.
4	NW.	9	"	"	"	"	84	3,031	- 80	2,951	84	2,947	" "	Medium hard, clear		D, S	" " .
5	NE.	9	"	"	"	Bored	75	3,050	- 67	2,983	75	2,975	" "	Soft, clear		D, S	Sufficient for 10 head stock.
6	SE.	12	"	"	"	"	60	2,930	- 40	2,890	60	2,870	" sandstone	" , "		D, S	Good supply.
7	SW.	13	"	"	"	Dug	65	2,975	- 59	2,916	59	2,916	Glacial gravel	Hard, " , "alkaline"		D, S	Sufficient supply.
8	NE.	13	"	"	"	"	93	3,020	- 89	2,931	93	2,927	Ravenscrag sand	" , hard, iron, red sediment		D, S	" for 20 head stock.
9	NW.	13	"	"	"	"	65	2,930	- 58	2,872	64	2,866	Glacial sand	Hard, clear, "alkaline"		D, S	" " 30 " " .
10	NE.	14	"	"	"	"	64	2,970	- 61	2,909	61	2,909	" gravel	" , hard, clear		D, S	" supply.
11	NE.	15	"	"	"	"	35	3,040	?	?	?	?	" ?	Medium hard, clear		D, S	" for 9 head stock.
12	SE.	16	"	"	"	"	70	3,045	- 56	2,989	70	2,975	Ravenscrag sand	Soft, clear		N	
12a	NW.	16	"	"	"	Bored	84	3,156	- 44	3,112	84	3,072	" "	Hard, "		D, S	Sufficient supply.
13	SE.	18	"	"	"	Spring	0	2,975	0	2,975	0	2,975	" "	Soft, "		D, S	Large supply.
14	SW.	18	"	"	"	Bored	62	2,965	- 3	2,962	62	2,903	" "	" , "		D, S	" " .
15	SW.	19	"	"	"	Dug	20	3,020	- 17	3,003	20	3,000	Glacial gravel	" , "		D, S	Sufficient for 7 head stock.
16	NE.	19	"	"	"	Spring	0	2,935	0	2,935	0	2,935	Ravenscrag sand	" , "		D, S	Large supply.
17	SW.	20	"	"	"	Dug	18	2,940	- 13	2,927	18	2,922	" "	" , "		S	Sufficient for 8 head stock.
18	NW.	21	"	"	"	"	85	3,060	- 70	2,990	85	2,975	" ?	" , "		D, S	" " 14 " " .
19	NE.	26	"	"	"	Spring	0	2,895	0	2,895	0	2,895	" ?	" , "		D, S	Large supply.
20	SW.	27	"	"	"	Dug	17	3,015	- 5	3,010	17	2,998	" sand	Hard, "		S	Sufficient supply.
21	NW.	27	"	"	"	Bored	85	3,025	- 75	2,950	75	2,950	" ?	Soft, "		D, S	Good supply.

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

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

WELL RECORDS—RURAL MUNICIPALITY OF GRASSY CREEK, NO. 76, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
22	SE.	28	8	16	3	Bored	55	3,050	- 44	3,006	52	2,998	Ravenscrag sand	Soft, clear		D, S	Sufficient for 28 head stock.
23	NE.	28	"	"	"	Dug	29	3,060	- 24	3,036	29	3,031	Glacial gravel	Hard, "		D, S	Sufficient supply.
24	NW.	28	"	"	"	"	15	3,085	- 11	3,074	15	3,070	" sand	" , " , iron		D, S	" for 20 head stock.
25	NW.	32	"	"	"	Drilled	112	2,980	+ 1	2,981	112	2,868	Ravenscrag sand	Soft, clear	43	D, S	Large supply; #.
26	NW.	33	"	"	"	Bored	65	3,035	- 39	2,996	65	2,970	" "	Hard, " , "alkaline"		D, S	Sufficient for 20 head stock.
27	SW.	35	"	"	"	Spring	0	2,875	0	2,875	0	2,875	" "	" , hard iron, clear		D, S	Large supply.
28	NE.	36	"	"	"	Bored	70	2,880	- 47	2,833	70	2,810	Glacial gravel	Soft, "		D, S	Sufficient for 40 head stock.
1	SW.	2	8	17	3	Dug	12	3,060	- 8	3,052	8	3,052	" clay	Hard, " , iron		D, S	Insufficient for 17 head stock.
2	NW.	2	"	"	"	Bored	42	3,140	- 29	3,111	42	3,098	Ravenscrag sand	Hard, iron, cloudy		D, S	Large supply.
3	NW.	3	"	"	"	Dug	45	3,190	- 42	3,148	42	3,148	" coal	Soft, clear		D, S	Sufficient for 8 head stock.
3a	NE.	4	"	"	"	Drilled	150	3,200			150	3,050	" "	Hard, cloudy, iron		D, S	" supply.
4	NE.	5	"	"	"	Bored	63	3,150	- 58	3,092	58	3,092	Glacial ?	Hard, clear		D, S	Small supply.
5	SW.	7	"	"	"	Dug	17	3,155	- 8	3,147	16	3,139	" sand	Soft, "		D, S	Sufficient for 25 head stock.
6	SW.	9	"	"	"	Bored	34	3,225	- 30	3,195	34	3,191	Ravenscrag coal	Medium hard, clear		D, S	" " 4 " " .
7	NE.	9	"	"	"	"	98	3,280	- 90	3,190	98	3,182	" "	Hard, "		D, S	Poor supply.
8	NE.	10	"	""	"	Drilled	110	3,220	- 60	3,160	110	3,110	" "	" , " , iron		D, S	Large supply.
9	NW.	10	"	"	"	Dug	40	3,180					Glacial			N	Dry hole.
10	NW.	11	"	"	"	"	22	3,145	- 17	3,128	17	3,128	" clay	Hard, clear,		D, S	Sufficient for 12 head stock.
11	SE.	12	"	"	"	Bored	40	2,985	- 20	2,965	40	2,945	Ravenscrag sand	Soft, clear, iron		D, S	Large supply.
12	NE.	12	"	"	"	Spring	0	3,060	0	3,060	0	3,060	" "	Soft, "		D, S	Good " .
13	SW.	13	"	"	"	Drilled	94	3,085	- 2	3,083	94	2,991	" "	" , "		D, S	Large " .
14	SW.	14	"	"	"	Dug	40	3,155	- 28	3,127	40	3,115	" coal	Hard, " , iron		D, S	Sufficient supply.
15	NE.	15	"	"	"	Bored	54	3,150	- 32	3,118	51	3,099	" shale	Hard, "		D, S	" for 25 head stock.
16	SW.	16	"	"	"	"	55	3,205	- 45	3,160	53	3,152	" sandstone	" , "		D, S	" supply.
17	SE.	17	"	"	"	Dug	35	3,185	- 30	3,155	30	3,155	" coal, sand	" , " , iron		N	Good supply.
18	NW.	17	"	"	"	Spring	0	3,090	0	3,090	0	3,090	" ?	Hard, "		D, S	Very large supply.
19	SW.	18	"	"	"	Drilled	95	3,145	- 85	3,060	95	3,050	" coal	" , " , iron		D, S	Large 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 GRASSY CREEK, NO. 78, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
20	NE.	18	8	17	3	Spring	0	3,105	0	3,105	0	3,105	Ravenscrag sand	Hard, clear, odorous		S	Large supply.
20a	SW.	19	"	"	"	"	0	3,050	+ 1	3,051	0	3,050	" "	Hard, clear		D, S	" " .
21	NW.	21	"	"	"	Drilled	244	3,230	-209	3,021	244	2,986	" "	Soft, "		D, S	" " .
22	SE.	23	"	"	"	"	150	3,165			150	3,015	" "	" , "		D, S	" " .
23	NE.	23	"	"	"	"	270	3,170	- 160	3,010	270	2,900	Eastend sand	" , "		D, S	" " .
24	SE.	24	"	"	"	Dug	26	2,970	- 22	2,948	26	2,944	Glacial sand	Hard, "		D, S	Sufficient for 10 head stock.
25	NE.	25	"	"	"	Drilled	187	3,055	-122	2,933	187	2,868	Ravenscrag sand	Soft, "		D, S	Large supply; #.
26	SE.	27	"	"	"	Bored	99	3,220	- 93	3,127	93	3,127	" "	Hard, "		D, S	Insufficient for 13 head stock.
27	NW.	27	"	"	"	Drilled	153	3,185	-133	3,052	153	3,032	" coal	" , "		D, S	Sufficient supply.
28	SE.	28	"	"	"	Bored	137	3,190	-119	3,071	90	3,100	" "	" , " , "alkaline"		S	Sufficient supply.
29	SE.	29	"	"	"	"	100	3,240	- 80	3,160	100	3,140	" "	Hard, clear		S	Large supply.
30	NW.	29	"	"	"	Drilled	130	3,240	- 45	3,195	123	3,117	" sand	" , " , iron		D, S	Large supply.
31	NW.	30	"	"	"	Spring	0	2,995	+ 10	3,005	0	2,995	" "	Soft, clear		D, S	" " .
32	SW.	31	"	"	"	Bored	50	2,995	+ 1	2,996	45	2,950	" "	" , "		S	" " .
33	NE.	31	"	"	"	Drilled	70	2,985	+ 15	3,000	70	2,915	" "	" , "		D, S	" " .
34	NW.	31	"	"	"	"	?	2,985	+ 20	3,005	?	?	" ?	" , "		N	" " .
35	NE.	32	"	"	"	"	80	3,090	?	?	80	3,010	" sand	Medium hard, clear		D, S	Good supply.
36	SE.	34	"	"	"	"	160	3,145	- 60	3,085	160	2,985	" ?	Soft, "		D	Large " .
37	NW.	34	"	"	"	"	153	3,160	-123	3,037	153	3,007	" sand	" , "		D, S	" " .
38	SW.	35	"	"	"	"	167	3,175	-138	3,037	168	3,007	" "	" , "		D, S	" " .
39	NW.	36	"	"	"	"	220	3,145	-110	3,035	160	2,985	" "	Hard, " , iron		D, S	" " .
1	SE.	1	"	"	"	Bored	40	3,242	- 35	3,207	35	3,207	" ?	Hard, " , bitter		D, S	Sufficient supply.
2	NE.	1	"	"	"	"	114	2,988	-110	2,878	110	2,878	" coal	Soft, " , soda		N	
3	NW.	1	"	"	"	Drilled	106	3,060	- 20	3,040	98	2,962	" sand	Hard, " , "alkaline"		N	
4	SE.	2	"	"	"	"	295	3,200	-115	3,185	295	2,905	" ?	Soft, clear		D, S	Large supply.
5	NE.	2	"	"	"	"	227	3,060	-160	2,900	212	2,848	" sand	" , "			" " .
6	NW.	2	"	"	"	"	188	3,100	?	?	188	2,912	" "	" , "			" " .

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 GRASSY CREEK, NO. 78, 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				
7	SW.	3	8	18	3	Drilled	186	3,090	-100	2,990	186	2,904	Ravenscrag sand	Soft, clear		D, S	Large supply.
8	NW.	4	"	"	"	"	165	3,100	- 75	3,025	165	2,935	" "	" , "		D, S	" " .
9	SW.	5	"	"	"	Bored	68	3,155	- 60	3,095	68	3,087	" coal	Hard, iron, red sediment		D, S	Sufficient for 25 head stock.
10	SE.	6	"	"	"	"	85	3,132	- 80	3,052	85	3,047	" "	Hard, iron, clear		D, S	Poor supply.
11	SW.	7	"	"	"	Spring	0	3,000	0	3,000	0	3,000	" sand	Soft, clear		S	Good supply.
13	NW.	7	"	"	"	Drilled	65	3,010	0	3,010	65	2,945	" sandstone	" , "		D, S	Large supply.
14	NE.	7	"	"	"	"	84	3,010	- 20	2,990	84	2,926	" "	" , "		D, S	" " .
14b	NE.	7	"	"	"	"	104	3,020	- 24	2,996	104	2,916	" sand	" , "		D, S	" " .
12	SE.	7	"	"	"	"	175	3,040	-100	2,940	175	2,865	" ?	" , " ,		D, S	" " .
15	SW.	8	"	"	"	Dug	12	3,070	- 0	3,070	12	3,058	" coal	Hard, " , iron		D, S	" " .
16	SW.	9	"	"	"	"	120	3,125	-114	3,011	114	3,011	" sand	Medium hard, clear		D, S	Poor supply.
17	NE.	9	"	"	"	Drilled	160	3,030	- 30	3,000	160	2,870	" "	Soft, clear		D, S	large " .
18	SW.	10	"	"	"	Bored	63	3,056	- 52	3,004	52	3,004	Glacial "	" , "		D, S	Sufficient for 25 head stock.
19	NW.	10	"	"	"	Dug	41	2,990	- 36	2,954	36	2,954	" "	" , "		D, S	" supply.
20	SE.	10	"	"	"	Bored	72	3,070	- 58	3,012	70	3,000	Ravenscrag sand	Hard, "		D, S	Large " .
21	NE.	11	"	"	"	Dug	60	3,020	- 32	2,988	60	2,960	" "	", alkaline, iron, clear		D, S	" " .
22	NW.	12	"	"	"	"	37	3,080	- 33	3,047	27	3,053	Glacial sand	Hard, "		D, S	Sufficient " .
23	SW.	14	"	"	"	Drilled	160	3,050	- 30	3,020	160	2,890	Ravenscrag sand	Soft, "		D, S	Large " .
24	SW.	15	"	"	"	Bored	34	3,000	- 6	2,994	34	2,966	" "	" , "		D, S	" " .
25	SE.	17	"	"	"	Dug	90	3,000	- 12	2,988	90	2,910	" sandstone	" , "		C. P. R. Supply	" " .
26	SW.	17	"	"	"	"	8	3,020	- 6	3,014	6	3,014	" sand	" , "		D, S	Sufficient for 300 head stock.
27	NE.	17	"	"	"	Drilled	107	3,020	- 20	3,000	100	2,920	" "	" , "		D	Large supply.
28	NE.	17	"	"	"	"	106	3,020	- 20	3,000	100	2,920	" "	" , "		D	" " .
29	SE.	18	"	"	"	"	90	3,000	?	?	90	2,910	" "	" , "		D, S	" " .
31	SE	19	"	"	"	"	85	3,020	- 20	3,000	85	2,935	" "	" , "		D, S	" " .
32	NW.	19	"	"	"	Bored	40	3,000	- 30	2,970	40	2,960	" "	" , "		D, S	" " .
33	NE.	19	"	"	"	"	104	3,030	- 64	2,966	80	2,950	" "	" , "		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 GRASSY CREEK, No. 78, 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				
34	SW.	20	8	18	3	Bored	40	3,035	- 28	3,007	40	2,995	Glacial sand	Hard, clear		D	Sufficient supply.
35	NE.	20	"	"	"	"	30	3,030	- 25	3,005	25	3,005	" clay	" , "		D	65 foot well used for stock.
36	NE.	21	"	"	"	Drilled	105	3,050	- 75	2,975	105	2,945	Ravenscrag sand	Soft, "		D, S	Large supply.
37	NW.	23	"	"	"	Bored	69	3,045	- 51	2,994	60	2,985	" "	" , "		D, S	" " .
38	SW.	24	"	"	"	"	56	2,990	+ 4	2,994	56	2,934	" "	" , "		D, S	" " .
39	SE.	24	"	"	"	Spring	0	3,042	0	3,042	0	3,042	" "	Hard, iron-bearing, clear		D, S	" " .
40	NW.	25	"	"	"	Drilled	180	3,030	?	?	180	2,850	" "	Soft, clear		D, S	" " .
41	SW.	26	"	"	"	Dug	72	3,060	- 66	2,994	72	2,988	" ?	Hard, "		D, S	Sufficient for 12 head stock.
42	SW.	28	"	"	"	Drilled	127	3,020	- 27	2,993	127	2,893	" "	Soft, "		D, S	Large supply.
43	SW.	30	"	"	"	Bored	37	3,020	- 23	2,997	37	2,983	Glacial sand	Hard, "		D, S	Sufficient for 25 head stock.
44	NE.	30	"	"	"	Drilled	132	3,060	- 72	2,988	120	2,940	Ravenscrag sand	Soft, "		D, S	Large supply.
45	NW.	30	"	"	"	"	135	3,045	- 55	2,990	135	2,910	" "	" , "		D, S	" " .
46	NW.	31	"	"	"	"	120	3,040	- 50	2,990	120	2,920	" "	" , "		D, S	" " .
47	SE.	32	"	"	"	"	128	3,050	?	?	128	2,922	" "	" , "		D, S	" " .
48	NE.	32	"	"	"	Bored	68	3,050	- 56	2,994	56	2,994	Glacial ?	Hard, "		D, S	Good " .

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.