CANADA
DEPARTMENT OF MINES
AND
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PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF WAVERLEY NO. 44 SASKATCHEWAN

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Cypress Hills Formation. The name given to a series of conglomerates and sand beds which occur in the southwest corner of Saskatchewan, and 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 Waverley covers an area of 324 square miles near the southern border of Saskatchewan. It is comprised of nine townships described as tps. 4, 5, and 6, ranges 4, 5, and 6, W. 3rd mer. The centre of the municipality lies 85 miles southwest of Regina and 80 miles southeast of Swift Current. The Wood Mountain branch of the Canadian Pacific railway extends in an east-west direction across the central part of the area and on it are located the stations of Glentworth and Fir Mountain.

The southern part of the municipality is a highlands area; in the southeastern corner the topography is rugged, and elevations exceed 3,200 feet above sea-level at several points along the southern boundary. Northward the surface becomes gently rolling. It slopes gradually to the north and northwest falling below an elevation of 2,400 feet in the valley of Lynthorpe creek in the northeast corner and to about the same elevation in the broad valley of Wood river along the western border of the municipality.

The township is drained by the northerly flowing Wood river and its tributaries. The central and eastern uplands of the municipality are deeply incised by ravines. Some of the inter-stream ridges extend for distances of 6 to 9 miles to the northwest of the main upland.

The ground water in the municipality is derived from three sources - Recent stream deposits, glacial drift, and several horizons in the three underlying bedrock formations. Creeks and springs in the ravines form important additional sources of water for stock where supplies derived from wells are inadequate for local requirements.

Water-bearing Horizons in the Unconsolidated Deposits

The Recent deposits of sands, silts, and gravels that lie along the bottoms of the stream valleys and are seldom more than 15 feet thick contain variable amounts of water. The supplies are dependent partly on the character of the materials at any particular place and partly on the amount of water available either by seepage from the streams or as run-off from the surrounding uplands. Silts due to their compact nature yield the smallest supply, but embedded in them are lenses and pockets of sand and gravel from which larger supplies can be expected. Wells dug into these deposits form convenient sources of small household supplies for residents along Wood river and the larger creeks. Water taken from shallow sources in such deposits is easily contaminated, and if such a well is being used for domestic purposes the utmost care should be exercised in keeping the catchment area free from sewage and other decaying organic matter. Such well water is considered preferable for domestic use to water obtained directly from the creeks.

The glacial drift that occurs throughout the municipality was deposited by a great continental ice-sheet that many thousands of years ago advanced and retreated over the province of Saskatchewan, and by waters resulting from the melting ice. Most of the municipality is covered by a mantle of variable thickness of glacial till or boulder clay. The drift is composed of an upper zone of yellowish brown boulder clay, and a lower zone of compact, bluish grey clay, both of which contain beds or pockets of sand and gravel. These sands and gravels form the porous water-bearing beds of the drift. Over the southeastern upland half of the municipality the till seldom exceeds 10 to 15 feet in thickness, and in many places the bedrock is exposed at the surface. Throughout this upland region the till, where present, is too thin to form a source of more than very small seepages of ground water. In a small area bounded by the "D" line as indicated on Figure 1 of the map accompanying this report, the drift is thicker and large supplies of ground water of good quality occur within 20 feet of the surface. The drift thickens in a northwesterly direction and over the northwestern lowlands is 50 to 65 feet thick. In these parts, sand and gravel pockets in the boulder clay form sources of adequate supplies of water for all local requirements. In the northeastern corner of the municipality a narrow area approximately 1 to 1½ miles wide west of Lynthorpe creek is covered by moraine, the surface of which is characterized by low knolls and depressions. This deposit marks the place where the ice front paused for a considerable period of time during its retreat, permitting a slightly greater accumulation of sands and gravels than is generally found in the till plain areas. Although nearly all wells in this small, moraine-covered area derive their supplies from horizons in the underlying bedrock, shallow wells penetrating gravel or sand beds can be expected generally to yield small supplies of water suitable for domestic use.

Waters from the melting ice-sheet during the retreat gradually accumulated in the areas of low elevation and formed lakes. The sites of these now extinct lakes in this area are marked by deposits of bluish grey lake clays that extend over the broad valley of Wood river in the northwestern part of the municipality and in a narrow area along a tributary valley that crosses the northern boundary of the municipality. The lake clay is generally too compact to yield more than very small quantities of ground water. However, fairly continuous beds of sands and gravels occur either in the lower part of the lake clays or at the contact of the lake clays and the underlying boulder clay, from which many residents have been able to obtain adequate supplies of ground water at depths nowhere exceeding 55 feet from the surface. Generally, however, the water is highly mineralized, and in some places is unfit for domestic use.

Water-bearing Horizons in the Bedrock

The bedrock formations underlying the glacial drift yield water supplies in all parts of the municipality, and especially in the southern and western townships. Three bedrock formations have been recognized in the area. The uppermost, known as the Ravenscrag formation, either immediately underlies the glacial drift or outcrops at the surface on the uplands that occupy much of the southeastern half of the municipality. In the southwest corner the Ravenscrag is underlain by the Eastend formation at an approximate elevation of 2,900 feet above sea-level. Traced northward the formations are found to drop slightly in elevation and in the vicinity of Fir Mountain the contact between the Ravenscrag and the Eastend lies at an approximate elevation of 2,800 feet. Over a belt of territory fringing the uplands of the southeastern half of the municipality in which the Ravenscrag formation has been removed by erosion, the Eastend formation immediately underlies the drift. The streams in eroding their channels have in many places cut their valleys through the Eastend formation into the underlying Bearpaw, so that the Eastend formation projects northwesterly in the inter-stream areas for distances of 1 to 8 miles. The Bearpaw formation underlies the Eastend where the latter is present, but over most of the northwestern half of the municipality it occurs immediately beneath the glacial drift. The areal distribution of these several formations is shown on Figure 1 of the accompanying map.

The Ravenscrag formation consists of a series of light buff, brownish weathering clays and sandy shales interbedded with beds of bluish grey sands and seams of lignite coal. Both the sand beds and the coal seams are porous and form aquifers. The water-bearing beds are in some places thin and of only local occurrence, whereas others form continuous aquifers over large areas. Three of these horizons are believed to occur also in the adjacent municipality on the east where they form extensive aquifers. These horizons, designated on the accompanying map (Figure 1) as "A", "B", and "C", have been traced over townships 4 and 5, range 4, and they may continue into townships 4, ranges 5 and 6, but in the absence of well data confirming their continuity they have not been shown there. These water horizons will be discussed in detail in the section of the report dealing with the particular townships in which they occur, and only the general features of water occurrence in this formation will be here considered.

The water obtainable from both the coal seams and the sand beds in the Ravenscrag formation is generally of good quality. It is soft to moderately hard, not highly mineralized, and thus satisfactory for domestic use. The majority of the wells yield sufficient water for local stock requirements. At several places along the eastern part of the southern border difficulty has been experienced in obtaining sufficient water for stock from wells. Springs and creeks are used to supplement the well water supply. At several places in the central part of the southwestern township the Ravenscrag formation is thin and unless wells are continued down into the Eastend formation only small quantities of water are to be expected. Beds of light buff to white clays having a maximum thickness of 40 feet outcrop on the sides of the valleys immediately south and east of Fir Mountain at an approximate elevation of 2,775 feet above sea-level. These beds, known as the Whitemud formation are too compact to form a source of ground water. The basal coal-bearing Ravenscrag greenish sands and the light buff Whitemud clays form readily recognizable horizon markers in wells.

The Eastend formation, where exposed, is a buff to brown weathering, fine-grained, light grey sandstone, interbedded with thin beds of sandy shale. No exact figure of the thickness of the formation was obtained, but it probably nowhere exceeds 50 feet. It immediately underlies the Whitemud formation in the vicinity of Fir mountain, and farther west at places where these white clay beds are absent it underlies the basal greyish green sands of the lower Ravenscrag. The upper part of the Eastend forms a source of ground water in several localities. Over much of the area along the northeast-southwest diagonal of the municipality where the Eastend is either exposed or immediately underlies the drift, the upper sands are thin and only the shaly phases characteristic of the lower part of the formation are present. Water from the upper sands of the Eastend is of good quality, although generally more highly mineralized than that from the Ravenscrag. Water from the lower, shaly part of the formation resembles that from the underlying Bearpaw into which the Eastend grades imperceptibly.

The Bearpaw formation underlies the Eastend at an approximate elevation of 2,700 feet in the central part of the municipality and, due to its easterly dip, at slightly higher elevations toward the western border. Throughout the northwestern half of the municipality, this formation immediately underlies the glacial drift. The formation consists of not less than 400 feet of compact, dark grey shale. It weathers light yellow to buff, and crumbles into small, roughly cubical, iron-stained fragments along the outcrops. The upper 50 feet of the Bearpaw formation contains thin beds of fine grey sand that are water bearing. These beds are generally of local extent, although in a few places they have been traced over several sections. The sands of the upper part of the formation yield small supplies of hard, "alkaline" water, satisfactory for stock use, but which is not generally drinkable. At greater depths in the formation the mineral salt content of the water increases and renders it unfit for any farm use. Drilling to more than 75 feet below the point at which the Bearpaw shale is encountered in a well is inadvisable in any part of this municipality, and it is improbable that a satisfactory water supply will be found at more than 50 feet below the contact of the shale and the overlying beds.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 4, Range 4

In this township, deposits of Recent sands, silts and gravels, located along the stream valleys, glacial drift, and the bedrock constitute the possible sources of ground water supply. At present, however, no water is being obtained from the Recent deposits, and only one resident is obtaining water from the glacial drift.

The Recent deposits in the stream valleys are generally less than 15 feet thick. They are a source of only small supplies, which to residents located along the valleys would possibly be sufficient for their domestic needs.

The glacial till covering the uplands probably nowhere exceeds 25 feet in thickness, and in several places it is entirely absent, and bedrock is exposed. Consequently in most parts of the township the drift yields very little water. However, on the NE.$\frac{1}{4}$, section 29, a 16-foot well obtains an ample supply of good quality water from a gravel bed, lying below 15 feet of boulder clay. This bed is probably local in extent, as elsewhere in the township it was found necessary to sink into bedrock to obtain a satisfactory water supply.

By far the greater amount of the ground water used in the area is derived from the Ravenscrag formation, which is uppermost throughout the township except for a small area in the northwest corner, where stream erosion has exposed the lower formation. Four and possibly more water-bearing horizons in the Ravenscrag are productive. These horizons become successively uppermost with the decrease of surface elevations towards the northwestern corner of the township. In the south no definite, continuous horizon has been traced and wells obtain their supplies from small, isolated sand pockets or beds. Supplies derived from these scattered pockets are not in every instance sufficient for local requirements, and a 75-foot well on the NE.$\frac{1}{4}$, section 5, failed to obtain any water from a coal bed which was pierced at an elevation of 3,149 feet above sea-level. Evidence of findings in wells to the north would suggest that it would be necessary to deepen this well by approximately 100 feet before a productive horizon would be encountered.

Residents near the coal mines in the central part of the township obtain water for their stock from the mine openings. At the centre of the township the coal seam occurs at an elevation of 3,040 feet above sea-level, but rises uniformly to 3,080 feet near its western boundary. It is presumable that wells sunk to depths not exceeding 40 feet in depth in sections 16, 17, and 18 will obtain adequate supplies of hard, drinkable water from the coal seam. The continuity of this seam into sections 5, 6, 7, 8, and 9, has not been determined, but it is probably present and worth prospecting.

The "A" horizon has been tapped in two wells. Moderately large amounts of water were found in sand at an elevation of 2,875 feet in a 16-foot well on section 28, and in coal at approximately the same elevation in a 60 foot well on section 30. The presence of several springs at this horizon along the coulees in the intervening areas further indicates that this horizon is productive over a considerable area. As the surface elevation of 2,970 feet at the 57 foot well in section 19 may be incorrect it is not known whether the coal seam encountered in this well represents the "A" horizon. In a well on sec. 20, tp. 4, range 3, in the municipality to the east, a coal seam occurring at an approximate elevation of 2,835 feet yielded a small supply of water at a depth of 40 feet and it is probable that this horizon will be found to be productive in the east-central part of this township. Due to the slight westerly rise of the formation the coal seam should be reached at approximately the same depth. The water from this horizon obtained in township 4, range 3, is of good quality and satisfactory for all domestic requirements.

Along the northern border of the township the presence of the "B" horizon as the uppermost productive horizon in the Ravenscrag is indicated by two wells on sections 32 and 33, 60 and 100 feet deep respectively. The water is reported to occur in coal seams at elevations near 2,820 feet above sea-level. Another well, 96 feet deep, located on the SE.$\frac{1}{4}$, section 3, in the township to the north, tapped this same horizon. Several wells at only slightly lower elevations in the township to the east are deriving water from coal. Such evidence seems to favour the assumption that this horizon will be found at depths less than 125 feet in the northeast corner of the township. The wells producing from this horizon each yield sufficient quantities of hard, drinkable water adequate for domestic requirements and about 15 head of stock.

Township 4, Range 5

In this township ground water is derived from three sources. These are: the Recent deposits of sands, silts, and gravels lying along the bottoms of the stream valleys; the glacial deposits that are spread thinly over the area; and the water-bearing horizons in the bedrock formations.

The Recent deposits in the stream valleys do not contain large quantities of water, but to residents along the valleys they are a possible source of small supplies for domestic purposes. A 4-foot well on the SE.$\frac{1}{4}$, section 13, obtains water of good quality from Recent deposits of clayey silt. The supply is adequate for the needs of the residents. No other wells have been sunk in these deposits.

Over the greater part of the township the glacial drift is too thin to be regarded as a source of ground water. In the northwest corner, however, the drift reaches a thickness of 25 feet or more. Here glacial sands and gravels irregularly interspersed through the boulder clay form a water-bearing horizon that provides supplies for shallow wells, and many springs. The supply of water from individual wells is sufficient for 25 head of stock. The water is of good quality and used in the household. The area within which the glacial deposits are regarded as sources of ample supplies of water at shallow depths is shown enclosed by the "D" line on Figure 1 of the map.

Throughout the remainder of the township the bedrock horizons are the chief source of ground water supply. With one exception, these supplies come from the Ravenscrag, which is the uppermost formation in all parts of the area except in the valleys along the northern boundary where stream erosion has exposed the lower formations. One well in the northwest corner of the township derives its supply from the shales of the Bearpaw formation.

Sand and gravel beds and coal seams of varying lateral extent form the water-bearing beds in the Ravenscrag formation. In the south the sand beds and coal seams are small and of spotty occurrence. In this area, consequently, conditions for obtaining a satisfactory water supply are uncertain. At present, although a 102-foot well is obtaining only a poor supply of water from a sand bed at an elevation of 3,160 feet above sea-level, a 17-foot well on section 2 obtains a large supply of good water from a gravel bed at approximately the same elevation. It is believed, however, that deepening the 102-foot well by approximately 60 feet, would reach a more productive horizon.

On section 3 a spring gives a supply sufficient to water throughout the year 20 head of stock and 200 of sheep. This water comes from a coal seam at an elevation of 3,090 feet. Two wells on sections 10 and 15, 8 and 12 feet in depth, respectively, obtain moderate supplies of water from a coal seam at an elevation of 2,996 feet. In both areas springs and a creek furnish additional supplies. From these observations it is evident that although continuous productive horizons do not seem to be present over large areas, little difficulty is experienced in most places in obtaining adequate supplies of water at shallow depths. No wells have been sunk in the east-central part of the township so that no evidence was obtained for the existence of the "A" or "B" water-bearing horizons in this township. In the northeast corner two wells, 40 and 65 feet in depth, obtain water from a sand horizon which is mapped as the "C" horizon. The wells encounter this horizon at elevations of 2,736 and 2,723 feet, respectively, and both obtain adequate supplies of water for the stock needs of the residents. The areal extent of this horizon as a water-producing bed has not been determined, but it may extend over the east-central sections. The depth of well necessary to penetrate the horizon will increase in the higher lands to the south. The water obtained in this township from the different horizons in the Ravenscrag is suitable for household use.

No wells are known to be deriving their supply from the Eastend formation in this township, but it exists as a potential source of small supplies of water in the lowlands along the northern border of the township. A 32-foot well was sunk into the upper, sandy shales of the Bearpaw formation, on the NE.$\frac{1}{4}$, section 31. It yields a fairly large supply of water that is being used for domestic purposes and for watering 30 head of stock. Springs that flow continuously throughout the year and the creek form additional sources of supplies of water for stock on this farm.

Township 4, Range 6

With the one exception of a well obtaining water from Recent deposits of sand lying on the bottom of a stream valley, the ground water supply in this township is derived from water-bearing horizons in the bedrock formations. The glacial drift overlying this area is too thin to carry water in sufficient quantities to yield well supplies.

Thin deposits of Recent sands, silts, and gravels lying along the stream valleys in most places are the source of only small supplies. A 12-foot well located beside the creek on the NW.$\frac{1}{4}$, section 30, however, yields a supply of drinkable water in sufficiently large amounts to water 12 head of stock.

The bedrock supplies come from the Ravenscrag formation in the areas of high relief on the southeastern half and from the Bearpaw shale in the northwestern part of the township. The Eastend formation, lying between these formations is not tapped by wells at places where it is near the surface in this township, and no records were obtained of any wells having been sunk into it in the southeastern half of the township where it is overlain by the Ravenscrag. The Ravenscrag formation contains several beds of coarse sand and should yield moderately large supplies of drinkable water at depths less than 50 feet below the surface. Several springs occurring in coulées in the southwest corner derive their supplies from sand beds or coal seams occurring in the Ravenscrag.

Four wells in sections 6, 9, 23, and 24, having depths of 42, 3, 40, and 26 feet, respectively, tap aquifers at approximately 2,880 feet above sea-level. The nature of the aquifer, however, is different in the different wells being gravel, coal, or sand, and it is probable that these deposits do not form any one continuous horizon. It is likely, however, that water supplies can be obtained at approximately this elevation throughout the southeastern part of the township. The supply from the 40-foot well penetrating coal is small, but the supply from each of the other wells is sufficient for local stock needs. The water in all instances is used for domestic purposes.

A 40-foot well on the NE.$\frac{1}{4}$, section 7, obtains a moderate supply of water from a lower gravel aquifer at an elevation of 2,812 feet. This water is not highly mineralized and is used for domestic purposes.

In section 36 two wells, 36 and 52 feet deep, tap a sand horizon lying at an elevation of 2,729 feet. The water is used for domestic purposes and the yield is sufficient for the stock needs of the farmer. No wells have been sunk in sections 25, 26 and 35, but it is possible that the horizon yielding water in section 36 will also be productive in these sections at greater or lesser depths depending upon surface elevation.

The Bearpaw formation underlies the Ravenscrag and Eastend formations throughout the southeastern half of the township at an approximate elevation of 2,700 feet. Should the Ravenscrag and Eastend formations fail to give water a possibility exists of obtaining small supplies of water from the upper sands of the Bearpaw. No wells have been sunk sufficiently deep in the uplands to determine the yield or quality of water to be expected.

The Bearpaw formation underlies the Recent and glacial deposits at depths of 25 feet or less, throughout the northwestern lowlands area. The upper sand beds of this formation are water-bearing. Wells have tapped these sands at depths not exceeding 50 feet in section 17, the thin beds of overlying formations being unproductive. The water from each well is drinkable and in sufficient quantities to water 10 to 15 head of stock. Soft water was found in similar sands in the 12-foot well on section 28 and the 22-foot well on section 34. On the higher land in section 27, however, it was necessary to bore to a depth of 100 feet before an adequate supply of soft water was obtained. Two wells on sections 20 and 30, 45 and 32 feet deep, respectively, failed to encounter the sands, and they yield a highly mineralized undrinkable water, characteristic of the shale.

Township 5, Range 4

The small supplies of water contained in the Recent sands, silts, and gravels have not been utilized, and ground water supplies in this township are derived on one farm from the glacial deposits, and in all other locations from water-bearing horizons in the bedrock formations. The Recent deposits are very thin, but in places undoubtedly form a possible source of domestic supply.

The glacial deposits are only a few feet thick in the south, but reach a thickness of 50 feet or more towards the north border of the township where they form a source of ground water. The water occurs in isolated pockets of sand and gravel that lie 20 to 50 feet below the surface. A 32-foot well on section 19 taps such an aquifer and yields an adequate supply of water that is used for both household and stock. A 50-foot well on the NW.¼, section 36, and a 35-foot well on the NE.¼, section 36, struck similar pockets in the drift at a depth of about 16 feet, but as the supply from these pockets was small the wells were later deepened into the Eastend formation where an additional supply was obtained.

In this township, with the gradual lowering of surface elevation from south to north, each of three bedrock formations becomes successively the uppermost. The Ravenscrag formation extends over the southeastern uplands areas. It is underlain by the fine, grey sands and silts of the Eastend formation at an approximate elevation of 2,700 feet. The Eastend is probably less than 100 feet thick where it underlies the Ravenscrag, but in the long, narrow, northwesterly trending interstream areas where it underlies the glacial drift it is much thinner due to the upper part having been removed by erosion. The Eastend grades downward into the Bearpaw shales at an approximate elevation of 2,600 feet. The shales occur immediately below the glacial drift where the Eastend has been eroded away in the valley areas of the northwest corner of the township. Each of the bedrock formations has been found to be productive in the areas in which it is uppermost.

The Ravenscrag formation has two continuous horizons of porous sand beds that form aquifers. The higher of these occurs at an average elevation of 2,792 feet and underlies the areas of higher relief along the southern border. The "B" line on Figure 1 of the map indicates the approximate northern limit of this aquifer. Springs, at points where this horizon outcrops in coulées and along the hill-sides, furnish a supply suitable only for stock. In section 10 the horizon was reached at a depth of 16 feet, but further south in section 3 where the land surface is higher a well was sunk to a depth of 96 feet to reach it. Adequate supplies of water for all farm purposes are obtained from this horizon by the residents in the area.

The lower horizon, which occurs at an average elevation of 2,712 feet, is uppermost in the central and southwestern portions of the township. Its northern limit is shown by the "C" line on the geological map. Wells tapping this horizon vary in depth from 4 to 80 feet depending on the surface elevation. A spring on section 25 derives its water from this horizon. Water supplies taken from this source are generally ample for stock needs. In some places where the cover is thin the supply is directly dependant on the amount of rainfall, and in dry years a shortage of water is experienced. The situation could be ameliorated by the sinking of additional wells or the construction of dams in coulées to conserve the surface run-off. The water, except one well that has a disagreeable taste, is used for all household purposes.

The upper part of the Eastend formation in this township consists essentially of fine sands and silts. These sands furnish a water supply to a 52-foot well on the NE.$\frac{1}{4}$, section 31, and to two wells 35 and 50 feet deep, on section 36. Due to local variations in the formation, the water occurs at different elevations in different areas. The water-bearing horizons range in elevation from 2,614 to 2,660 feet above sea-level. The supplies are sufficient for the household and stock needs of the residents.

Two 60-foot wells bored on sections 29 and 32 obtain a water supply from thin, sandy, shale beds in the Bearpaw formation. A fairly large supply of water is obtained in both wells, but the water from the well on section 32 is so highly mineralized that it is not considered suitable for domestic purposes. Should residents in sinking wells into the shales be fortunate enough to tap a thick sand bed near the surface, large supplies of drinkable water are assured, but where wells have been sunk entirely in shale, only highly mineralized water can be expected. Deep drilling into the shales in any part of this township cannot be expected to yield an adequate supply of ground water.

Township 5, Range 5

It is possible to obtain ground water from three sources in this township. These are the Recent deposits lying along the bottoms of the stream valleys, the thin mantle of glacial drift, and the water-bearing horizons in the underlying bedrock formations. At present, the Recent deposits are not being used as a source, but for residents located near stream valleys these deposits in certain places would possibly serve as a source of small domestic supplies. The glacial drift yields small supplies suitable for domestic use in a few places, but is generally too thin to warrant extensive prospecting. Sand or gravel pockets in boulder clay lying generally at depths less than 20 feet yield adequate supplies of water for both household and stock needs. Two wells on sections 35 and 36, however, do not obtain a sufficiently large supply to meet requirements and the water is highly mineralized. The residents on section 35 find it necessary to haul water during the winter months and the resident on section 36 is obliged to haul his supplies of drinking water during the entire year.

Bedrock is not far below the surface in any part of the township, and is exposed along the sides of several of the coulées. The Ravenscrag, the highest formation stratigraphically in the township, occurs only in two small interstream areas of high surface elevation. One of these areas is located on the eastern boundary in sections 12 and 13, and the other in sections 1 and 2 along the southern boundary. The Ravenscrag formation is too thin in this township to be considered as a source of supplies.

The Eastend formation underlies the glacial drift over most of the remaining upland areas that occur between the stream valleys in the eastern and southern parts of the township. Only one well taps the Eastend formation; this is 86 feet deep and is the source of the water supply for the town of Fir Mountain. The water is hard and clear and comes from sand near the base of the formation. The water has been analysed and pronounced satisfactory for household use.

The Bearpaw, the lowest formation outcropping in the area, lies below the Eastend in the southeast, and beneath either Recent deposits or glacial drift in the northwest part of the township. It consists essentially of shales and compact clays and sand beds and is the main source of water supplies for stock in the township. The water from this formation comes from sand or sandy clay pockets that are usually of local occurrence. The pockets appear to occur in two persistent horizons, each of fairly constant elevation. The higher of these sandy horizons is productive in an area extending over the southwest corner and central parts of the township. The horizon occurs at an approximate elevation of 2,610 feet above sea-level and is reached by wells varying in depth from 18 to 80 feet, depending upon the difference in surface elevation. The yield is usually sufficient for 10 head of stock. The water from this horizon is highly charged with dissolved mineral salts and is, in many places, considered unsuitable for domestic use. Where the supply is inadequate for farm requirements deeper drilling to the lower horizon may secure larger yields, but this is not advisable due to the even poorer quality of the water to be expected at greater depths. It seems preferable to supplement the existing supplies by sinking additional wells to tap the upper horizon.

The lower horizon has been found at an approximate elevation of 2,530 feet on sections 19, 21, 27, and 36, in the northern part of the township and at slightly lower elevations in the northwest corner. Wells reaching it vary in depth from 14 to 70 feet depending on the difference of surface elevations. Supplies are adequate for 10 to 15 head of stock. In some places where the sands are thin the water is largely seepage from the shales and is highly charged with sulphate salts and common salt. It is unfit for domestic use and some residents have reported that its continued use has even killed stock. Deeper drilling will not produce a better supply of water. If the wells sunk in the bedrock on farms throughout the northwestern part of the township yield only highly mineralized water, residents must consider the construction of dams in coulées to conserve surface water. Dugouts may be necessary on farms remote from creeks. Shallow wells located so as to derive a seepage supply from the dams or dugouts would provide water for domestic use.

Township 5, Range 6

The small amounts of water contained in the Recent sands, silts, and gravels along the stream valleys in this township have not been tapped, and at present the entire ground water supply of the area is obtained from the glacial drift and from water-bearing horizons in the bedrock.

The Recent deposits occur only in thin layers, but in places along the valleys they may reach a sufficient thickness to warrant being prospected as a possible source for small supplies for domestic use.

The glacial drift mantles the area to a thickness ranging from 20 feet or less on the southeastern uplands, to 50 feet or more in the northwest corner. In the lowland parts in the northwest corner and along the western border of the township a layer of light bluish grey lake clay overlies the boulder clay to depths of 10 to 15 feet. Little water is to be expected from the lake clays due to their compact nature, but water-bearing pockets of sands and gravels generally of limited areal extent occur at the contact of the lake clays and the underlying boulder clays. Several wells in the area have tapped these pockets at depths of 10 to 20 feet and yield small supplies of drinkable water. Digging several shallow wells is considered more advisable than attempting to get water at depths, as wells below an approximate depth of 40 feet in this area probably will penetrate the shales of the Eastend or Bearpaw formations from which little water suitable for any farm use can be expected.

Similarly, in the till-covered areas, isolated pockets of sands and gravels that occur at depths of a few feet to 40 feet below the surface form the best source of water supply. One well located on the NE.$\frac{1}{4}$, section 4, is reported to yield sufficient water, from a gravel bed at a depth of 35 feet, for 100 head of stock. Other wells are as a rule much less productive, but can generally be depended upon to yield sufficient water for 16 to 25 head of stock. A considerable variation in the quality of the water from the drift occurs even within small areas due to the difference in character of the drift material. For example, two wells may be sunk to similar depths in boulder clay on the same section, one of which may yield a hard, highly mineralized water unfit for drinking, whereas the other may give a soft or moderately hard water that is satisfactory for all farm requirements.

The Bearpaw formation forms the bedrock throughout the township, except for a small area of high relief along the southern boundary where it is overlain by thin beds of the Eastend formation. The Eastend is a possible source of water supplies at shallow depths in this small area, but at present it is not being tapped.

The Bearpaw formation consists essentially of clays and shale, but contains local pockets of sand or sandy clay which are the source of water in several places in this township. The occurrence or depth of these pockets in any particular locality cannot be predicted. The existing wells vary in depths from 35 to 48 feet and are located in the southeast corner of the township. They obtain a sufficient supply for the stock needs of the residents. The water is hard and highly mineralized and is being used for the household with one exception. There the mineral salt content is so high as to render the water unfit even for stock use. Throughout the greater part of the township sand beds are either very thin or absent in the shales of this formation. Prospecting for water at shallow depths in the glacial deposits is recommended rather than sinking wells to depths greater than 50 feet in any part of the township.

Township 6, Range 4

Ground water conditions are very poor throughout the greater part of this township. The yields of many wells are small and the quality of the water in places is such as to make it unsuitable for domestic use. Extensive search for water at shallow depths is more advisable than deep drilling in many parts of the area.

As in the other townships thin deposits of sands, silts, and occasionally gravels occur along the stream valleys. It is probable that the silt deposits will yield only small supplies of water, but the gravel deposits should contain moderate supplies and the quality of the water to be expected from them will probably be better than those obtained from many of the wells sunk in the glacial deposits.

A 14-foot well located on the NE.$\frac{1}{4}$, section 26, was sunk through the silts and obtains a supply from a sand bed in the glacial drift. The water is highly mineralized and unfit for domestic use. It is believed that this well is representative of water conditions at most places along Lynthorpe Creek valley, where gravels are not encountered at shallow depths. Deposits covering the bottoms of coulées in the southern uplands area are expected to yield small supplies of water of better quality than deposits along the valleys crossing the lowlands, because sources of contaminating mineral salts such as the lake clays and boulder clays are to a large extent absent from the uplands.

The glacial drift is in the form of a till plain over most of the township, but an area of moraine extends as a belt of 1 to $1\frac{1}{2}$ miles in width along the west side of Lynthorpe Creek valley into the north-central part of the township. Glacial lake clays cover a small area extending on both sides of Lynthorpe creek, in the northwest corner of the township. No wells are known to be deriving their supplies from the moraine, but more recent gravels deposited in the depressions or occurring at the bases of slopes are worthy of prospecting. Little water can be expected from the blue-grey lake clays. A well, dug to a depth of 20 feet in the NW.$\frac{1}{4}$, section 25, obtains supplies of drinkable water adequate for local requirements from sands lying immediately below the clays. Similarly, productive sand beds may be encountered at depths not exceeding 25 feet in the lake clay-covered area. The sand beds may not be continuous over the entire area and hence careful prospecting will be necessary to find them in some parts.

In the southwestern part of the township wells varying in depth from 12 to 35 feet obtain water supplies from isolated sand and gravel pockets interspersed through the boulder clay. These wells obtain adequate supplies of water for the stock of the individual residents. The water is highly mineralized, but with few exceptions it is used for domestic purposes.

A small area in the southeast corner of the township is overlain by a thin layer of the Ravenscrag formation. The Ravenscrag is probably too thin to be a source of any appreciable water supplies. With this exception, the upland areas on the southern and eastern parts of the township are underlain by the Eastend formation. The Eastend formation yields supplies to three wells in the southeast corner. The water comes from a fine sand horizon lying at an average elevation of 2,643 feet above sea-level. The wells reach the horizon at depths of 17, 44, and 65 feet. The third well, on section 2, was continued to a depth of 99 feet, where water was also found in sands in the upper part of the underlying Bearpaw formation. The supplies from the two deeper wells are ample, but that from the 17-foot well on the SW.$\frac{1}{4}$, section 12, is inadequate for local requirements. An additional well, sunk to a greater depth, would probably satisfy the water requirements on this farm. Drilling to depths greater than 100 feet in areas overlain by the Eastend formation is not recommended, as it is believed that below this depth the compact shales of the Bearpaw will be encountered from which satisfactory water supplies are not to be expected.

The Bearpaw formation underlies the Eastend and is the uppermost bedrock throughout the northern and western parts of the township. It is the source of ground water for the greatest number of residents in this township. The formation consists essentially of beds of clays and shales, and sandy beds that are water bearing at several horizons. A few wells 20 or 30 feet in depth tap these sand beds, but on sections 18, 20, 21, 22, 28, and 34, wells were sunk to depths between 70 and 90 feet before obtaining supplies. Wells penetrating the thicker sand beds yield adequate supplies of water, which, although highly charged with mineral salts, is being used for drinking. In wells in which the sand beds are thin or absent, the seepages from the shales are highly mineralized and not drinkable. At no place in the township can suitable water supplies be expected at depths greater than 100 feet from the surface.

Township 6, Range 5

Ground water supplies in this township are in a few places derived from the Recent deposits that occur along the bottoms of the stream valleys, but most wells in the area obtain their supplies from the glacial drift that covers most of the area, or from water-bearing horizons in the underlying Bearpaw formation.

Recent deposits of sands, silts, or gravels cover the valley floors and have a maximum thickness of 15 feet. They probably contain only small amounts of water, but are a possible source of domestic supplies for residents along the valleys. The supplies from the wells that tap this source together with water for stock from the creek are reported as adequate for the local needs on the farms on which they are situated.

Glacial till mantles the entire area except in the extreme northeast corner where it is covered by a thin layer of glacial lake clay. Water supplies are obtained from sand and gravel pockets interspersed through the boulder clay and in the northeast corner from sand and gravel beds that lie between the lake clays above and boulder clay below. The wells vary in depth from 12 to 55 feet and yield generally adequate supplies. The water in places is so highly mineralized as to be unfit for household use. The construction of dugouts to conserve the rainfall and the spring run-off is suggested as a means of increasing the available water supply. Wells sunk beside the dugouts from which they can derive water by slow seepage are a possible source for a domestic supply.

The Bearpaw is the uppermost bedrock formation, except in a narrow area of higher elevation in the southeast corner where it is overlain by the Eastend formation. The Eastend as far as known is too thin to be a source of ground water. The sandy pockets interspersed through the clays and shales of the upper part of the Bearpaw formation yield all supplies taken from the bedrock in this township.

Wells tap these pockets within 75 feet and generally obtain a fair supply of water. The water is, however, of poor quality so that for household supplies another source must be used. A 70-foot well on the NW.$\frac{1}{4}$, section 10, failed to encounter a productive pocket and derives only a small supply from a horizon in the glacial drift. Another hole in the drift sunk in a different part of the quarter section may prove more productive. Deeper drilling below depths of 60 to 75 feet in any part of the township cannot be expected to yield an adequate water supply.

Township 6, Range 6

The Recent deposits of sands, silts, and gravels lying along the valleys of Wood river and its tributaries have not as yet been tested as possible sources of water supplies in this township. The present water supply of the area is being taken from the glacial deposits with the one exception of a well tapping a water-bearing horizon in the underlying Bearpaw formation.

A mantle of glacial till covers the bedrock to depths of 30 to 50 feet throughout the eastern part of the township. West of the east branch of Wood river the till is in turn overlain by 15 to 35 feet of light bluish grey lake clay. Little water can be expected from the lake clay in this region, but water-bearing lenses and pockets of sand occur between this clay and the underlying boulder clay or till, and interspersed through the till itself. These pockets are individually of limited areal extent, but little difficulty has been experienced in locating them. Some of the shallow wells tapping the sands immediately beneath the lake clays yield a soft water. The majority of the wells in the western half of the township have been sunk to depths of 20 to 55 feet into the till and yield supplies of hard, generally only slightly mineralized, water. The yield from individual wells is not large but is generally adequate for 10 to 15 head of stock. Deeper wells will encounter the shales of the Bearpaw formation, from which it is highly improbable that any adequate supplies of water suitable for household use will be obtained. In the area east of the lake clay-covered area, the water supplies are obtained from sand and gravel pockets irregularly interspersed through the boulder clay. Due to the irregularity of the occurrence of the productive sand beds water cannot be expected at all points.

Several wells were sunk to depths of 40 to 80 feet on the NE.$\frac{1}{4}$, section 14, without encountering a productive bed either in the drift or the underlying bedrock. At other places wells 40 to 65 feet deep have produced water. The quantity of water depends largely upon the areal extent of the aquifer. The quality too, is variable. Wells that have penetrated only boulder clay yield small supplies of hard, undrinkable water suitable only for stock use, other wells encountering sand beds yield drinkable water in sufficient quantities for 10 to 20 head of stock. It is possible that the bitter, undrinkable waters found in the 60-foot well located on the NE.$\frac{1}{4}$, section 23, and in the 65-foot well on the SW.$\frac{1}{4}$, section 36, come from the shales of the underlying Bearpaw formation. A lack of detailed information regarding the material passed through in these wells makes it impossible at the present time to postulate the source of water.

An 80-foot well bored on the NW.$\frac{1}{4}$, section 30, reached a productive sand bed in the Bearpaw formation. The yield is adequate for stock requirements, but the quantity of dissolved mineral salts in the water renders it unfit for household use. Similar sand beds may occur in the upper 20 to 40 feet of the shales in other parts of the township, but although the water found will probably be suitable for stock it will not be drinkable. Wells sunk below a depth of 80 to 100 feet in any part of the township are not likely to yield water suitable for either domestic use or for stock. Intensive prospecting at shallow depths and the construction of dugouts are to be preferred.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF WAVERLEY NO.44, SASKATCHEWAN

Township	4	4	4	5	5	5	6	6	6	Total No. in Municipality
West of 3rd mer. Range	4	5	6	4	5	6	4	5	6	
Total No. of Wells in Township	31	50	23	22	33	25	36	35	27	282
No. of wells in bedrock	28	24	22	21	23	4	22	7	3	154
No. of wells in glacial drift	3	25	0	1	10	21	14	26	24	124
No. of wells in alluvim	0	1	1	0	0	0	0	2	0	4
Permanency of Water Supply										
No. with permanent supply	24	50	22	21	33	25	35	31	24	265
No. with intermittent supply	1	0	0	1	0	0	0	0	1	3
No. dry holes	6	0	1	0	0	0	1	4	2	14
Types of Wells										
No. of flowing artesian wells	0	0	0	1	1	0	0	0	0	2
No. of non-flowing artesian wells	2	4	7	5	8	5	10	5	8	54
No. of non-artesian wells	23	46	15	16	24	20	25	26	17	212
Quality of Water										
No. with hard water	22	44	12	16	24	20	26	29	21	214
No. with soft water	3	6	10	6	9	5	9	2	4	54
No. with salty water	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	0	1	3	2	17	8	16	24	13	84
Depths of Wells										
No. from 0 to 50 feet deep	20	47	19	16	25	25	24	30	22	228
No. from 51 to 100 feet deep	11	2	4	6	8	0	12	5	5	53
No. from 101 to 150 feet deep	0	1	0	0	0	0	0	0	0	1
No. from 151 to 200 feet deep	0	0	0	0	0	0	0	0	0	0
No. from 201 to 500 feet deep	0	0	0	0	0	0	0	0	0	0
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. usable for domestic purposes	25	50	20	17	21	21	20	17	20	211
No. not usable for domestic purposes	0	0	2	5	12	4	15	14	5	57
No. usable for stock	25	50	22	22	28	24	34	31	25	261
No. not usable for stock	0	0	0	0	5	1	1	0	0	7
Sufficiency of Water Supply										
No. sufficient for domestic needs	24	50	22	21	33	25	35	31	24	265
No. insufficient for domestic needs	1	0	0	1	0	0	0	0	1	3
No. sufficient for stock needs	22	47	20	17	28	20	25	22	18	219
No. insufficient for stock needs	3	3	2	5	5	5	10	9	7	49

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 boilders 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 hardness to the sulphates and chlorides of calcium and magnesium. The permanent hardness can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. 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 Waverley, No.44, Saskatchewan

LOCATION						Depth	Total	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS									Source
No.	Qtr.	Sec.	Tp.	Rge.	Mer.	of well, Ft.	dis'vd solids	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	$CaCl_2$	of water
1	NE	7	4	6	3rd	40	840	300	280	80	9	360	50	72	320	271	825	90		150		96	474	15		*2
2	NW	2	5	4	3rd	Spring	470	450	120	330	6	285	90	68	139	67	472	161		105	54		142	10		*2
3	NW	36	5	4	3rd	50	400	40	-	-	6	295	30	7	53	177	393	54		15		236	78	10		*3
4	SE	13	5	5	3rd	86	2,103												(4)		(5)	(2)	(1)	(3)		*3
5	NW	15	5	5	3rd	Spring	1,800	45	-	-	10	545	10	11	800	781	1,772	18		23		530	1,184	17		*4
6	NE	32	5	6	3rd	33	2,086											(4)	(1)		(2)		(3)		(5)	*1
7	NE	22	6	4	3rd	85	6,000	2,000	1,400	600	55	760	30	424	3,288	1,958	5,531	54		596	414		4,376	91		*4
8	NE	32	6	5	3rd	45	5,040	2,600	2,200	400	40	200	330	504	3,059	990	4,490	200	530		1,502		2,192	66		*1

Water samples indicated thus, *1, are from glacial drift.
Water samples indicated thus, *2, are from bedrock, Ravenscrag formation
Water samples indicated thus, *3, are from bedrock, Eastend formation
Water samples indicated thus, *4, are from bedrock, Bearpaw 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. 4 and 6 by Provincial Analyst, Regina;
For interpretation of this table read the section on Analyses and Quality of Water.

WATER FROM THE UNCONSOLIDATED DEPOSITS

As analyses of only two samples of ground water from the unconsolidated deposits in this municipality are available, the following generalizations are based largely upon the reports of residents of the district and observations at wells.

Ground water derived from the Recent deposits of sands, silts, and gravels lying along the stream valleys, generally does not contain a large amount of mineral salts in solution, and rarely is any salt in sufficient concentration to produce harmful effects. Water from this source, if free from contamination by sewage is generally suitable for all ordinary farm purposes. The original source of the ground water in the Recent deposits is the dominating factor determining its quality. If the water is derived from springs or seepages from the Ravenscrag or Eastend formation it should be of good quality, if the stream has exposures of the Bearpaw formation along its banks or immediately under the thin covering of stream deposits, a more bitter water is to be expected.

Large variations in the quality of waters from the glacial drift are found even within limited areas due to the great variation in the composition of the glacial deposits. The boulder clay is believed to be the main source of the sulphate salts, which are mainly responsible for the high mineral content of the waters from the drift. Wells sunk entirely in boulder clay yield a very hard water, invariably containing a high concentration of dissolved sodium and magnesium sulphate salts. Gravel or sand deposits encountered at very shallow depths yield a soft, or only moderately hard, drinkable water. If, however, these porous beds are covered by any considerable thickness of boulder clay supplies of poorer quality are found, as the waters percolating down from the surface take salts into solution. Hence, throughout the lowlands areas, shallow wells provide the best source of water for domestic use. Such wells are readily contaminated by accumulations of sewage or decaying organic matter on the surface, and care should be exercised in the selection of a well site so that contaminated surface waters do not drain into the well.

The eighth analysis given on the accompanying table is of water from a 45-foot well tapping a gravel bed. The overlying material is compact boulder clay. This water contains 5,040 parts per million of dissolved solids, of which sodium sulphate (Na_2SO_4), and magnesium sulphate ($MgSO_4$), form the greater part. This water is undrinkable, but it is being used for watering stock without any reported ill effects.

The sixth analysis recorded is considered to be typical of waters derived from sands immediately underlying the lake clays. Here again sulphate salts form the greater part of the 2,086 parts per million of the total solids. This water contains less than one-half the quantity of mineral salts in solution as does the sample of water from the drift discussed above. This is due to the fact that little or no clay overlies the aquifer. The lake clays do, however, to a lesser degree, contribute mineral salts, and this water, although used in the household, cannot be regarded as satisfactory. Very shallow wells sunk in lake clay or boulder clay, and which derive their water by seepage from dams or dugouts, yield supplies of better quality. Here, again, care must be exercised against possible pollution by surface water containing sewage.

Water from the Bedrock

Ground water obtained from sand beds or coal seams in the Ravenscrag formation within 100 feet of the surface is fairly hard and generally in this area does not contain a large amount of mineral salts in solution. The first two analyses in the table may be typical of water from this source. The total solid contents are not high, less than 840 parts per million; both waters are hard, but contain no salt in sufficient concentration to have harmful effects upon persons or stock.

Water obtained below an approximate depth of 100 feet in the Ravenscrag is, in many places, soft. This soft water contains appreciable amounts of sodium carbonate (black alkali). Sodium carbonate is harmful to plants and waters containing any large amounts of it are unfit for garden irrigation. In general, however, the Ravenscrag provides a water that is much better suited to all farm requirements than does either the Eastend or the Bearpaw formations, or the overlying boulder clay.

Analyses Nos. 3 and 4 in the table are of waters from the Eastend formation. Analysis No. 3 is of a sample from a 50-foot well, on the NW.$\frac{1}{4}$, sec. 36, tp. 5, range 4, which is deriving its supply from the upper sandy beds of the formation. The water, consequently, resembles water from the lower part of the Ravenscrag. It is soft, and not highly mineralized. Sodium carbonate is present as 236 parts per million of the total solids. Such a concentration of this salt may prove harmful to vegetation after prolonged use of the water, but otherwise the water is satisfactory for domestic and stock use. Analysis No. 4, is from an 86-foot well on sec. 13, tp. 5, range 5. This water comes from the lower, shaly part of the formation, and hence more closely resembles supplies from the underlying Bearpaw formation. The water has a salty taste, but is being used by residents of Fir Mountain without reported ill-effects. The magnesium sulphate is not in sufficient concentration to cause any marked laxative effects on persons accustomed to the use of highly mineralized waters. Should water be obtainable at shallower depths in the town, however, it will probably be of better quality.

The Bearpaw formation contains larger quantities of readily dissolvable mineral salts than the other bedrock formations or the glacial deposits. Such a condition is to be expected in a formation of marine origin. Waters from the Bearpaw invariably contain large amounts of mineral salts in solution. At shallow depths in the formation, sandy beds are present, and water taken from them is not so highly mineralized as are seepages from the compact shale. The spring on the NW.$\frac{1}{4}$, sec. 15, tp. 5, range 5, derives its supply from such a sand bed. This water is very soft, but nevertheless contains more than 1,000 part of sodium sulphate (Na_2SO_4), and 530 parts per million of sodium carbonate (black alkali). The water is drinkable, but would prove harmful to vegetation. The seventh analysis given on the table is of water from a thin bed of sand overlain by a considerable thickness of shale. This water is extremely hard and very highly mineralized, and is regarded as being unfit for either household or stock use. In addition to a large concentration of sodium sulphate and magnesium sulphate, it contains 91 parts per million of common salt (NaCl), and appreciable quantities of iron. All of these salts in solution are characteristic of waters from the shale. Still greater concentrations of the sulphate salts and common salt will be found at greater depths in the shale. For this reason, residents of the lowlands are strongly advised against sinking wells below the upper sandy beds of this formation.

WELL RECORDS—Rural Municipality of WAVERLEY NO.44, 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	NW.	2	4	4	3	Bored	40	3,208	- 31	3,177	32	3,176	Ravenscrag clay	Hard, clear		D, S	Insufficient for local needs.
2	NE.	5	"	"	"	Bored	75	3,224					Ravenscrag coal				Dry hole. Several other dry holes.
3	SW.	6	"	"	"	Bored	28	3,131	- 26	3,105	26	3,105	Ravenscrag sand	Soft, clear		D, S	Sufficient for local needs.
4	SW.	16	"	"	"	Dug	46	3,080	- 40	3,040	40	3,040	Ravenscrag coal seam	Hard, clear		D, S	Sufficient for local needs.
5	SW.	18	"	"	"	Dug	27	3,100	- 20	3,080	20	3,080	Ravenscrag coal seam	Hard, clear		D, S	Sufficient for 50 head stock. Also several springs.
6	NW.	19	"	"	"	Bored	57	2,970	- 47	2,923	55	2,915	Ravenscrag coal	Soft, clear		D, S	Sufficient in summer for 6 head stock. Intermittent supply.
7	SE.	19	"	"	"	Bored	68	3,010	- 53	2,957	68	2,942	Ravenscrag coal seam	Hard, clear		D	Sufficient for local needs. Also another shallow well and several springs.
8	NW.	20	"	"	"	Spring		2,936	0	2,936	0	2,936	Ravenscrag sand				Sufficient for local needs; spring runs all winter.
9	NW.	28	"	"	"	Dug	16	2,888	- 13	2,875	13	2,875	Ravenscrag sand	Hard, clear		D, S	Sufficient for 10 head stock.
10	NE.	29	"	"	"	Dug	16	2,980	- 13	2,967	14	2,966	Glacial gravel	Hard, clear		D, S	Sufficient for 15 head stock. Also two springs.
11	NW.	30	"	"	"	Bored	60	2,930	- 56	2,874	56	2,874	Ravenscrag coal	Hard, clear		D, S	
12	NE.	32	"	"	"	Bored	60	2,870	- 40	2,830	60	2,810	Ravenscrag coal	Hard, clear		D, S	Sufficient for 15 head stock. Also spring.
13	NE.	33	"	"	"	Bored	100	2,920	- 85	2,835	90	2,830	Ravenscrag coal	Hard, clear		D, S	Sufficient for 12 head stock.
1	SW.	2	4	5	3	Bored	17	3,188	- 14	3,174	14	3,174	Ravenscrag gravel	Hard, clear		D, S	Sufficient for 50 head stock.
2	NE.	3	"	"	"	Spring		3,090	0	3,090	0	3,090	Ravenscrag clay and sand	Hard, clear		D, S	Sufficient for 20 head stock and 200 sheep.
3	SE.	5	"	"	"	Bored	102	3,258	- 80	3,178	98	3,160	Ravenscrag sand	Hard, clear		D, S	Insufficient for local needs.
4	NE.	10	"	"	"	Dug	8	3,004	- 4	3,000	4	3,000	Ravenscrag sandstone	Soft, clear		D	Sufficient for local needs. Also several springs.
5	SE.	13	"	"	"	Dug	4	3,045	- 1	3,044	1	3,044	Recent clay	Soft, clear		D, S	
6	SW.	15	"	"	"	Dug	12	3,008	- 8	3,000	8	3,000	Ravenscrag sandstone	Hard, clear		D,	Sufficient for local needs. Also several springs.
7	NE.	16	"	"	"	Spring		2,870	0	2,870	0	2,870	Glacial gravel	Hard, clear, iron, "alkaline"		D, S	Sufficient for local needs. Several other springs.
8	NE.	19	"	"	"	Dug	15	2,810	- 10	2,800	12	2,798	Glacial sand	Hard, clear		D, S	Sufficient for 30 head stock.
9	NE.	20	"	"	"	Spring		2,805	0	2,805	0	2,805	Glacial gravel	Soft, clear		D, S	Sufficient for 25 head stock.
10	NW.	21	"	"	"	Bored	20	2,810	- 15	2,795	15	2,795	Glacial gravel	Hard, clear		D, S	Sufficient for 22 head stock. Also several springs.
11	NE.	28	"	"	"	Dug	8	2,748	- 4	2,744	4	2,722	Glacial gravel	Hard, clear, iron		D, S	Sufficient for local needs. Also several springs.
12	SE.	30	"	"	"	Dug	22	2,810	- 17	2,793	17	2,793	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock. Also three springs.
13	NE.	31	"	"	"	Dug	32	2,700	- 21	2,679	28	2,672	Bearpaw shale	Hard, clear		D, S	Sufficient for 30 head stock. Also several springs.
14	SE.	33	"	"	"	Spring		2,710	0	2,710	0	2,710	Glacial gravel	Soft, clear		D, S	Sufficient for 25 head stock.

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

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

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WELL RECORDS—Rural Municipality of WAVERLEY NO. 44 SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
15	NE.	35	4	5	3	Dug	40	2,776	- 28	2,748	40	2,736	Ravenscrag hard sand	Soft, clear		D, S	Sufficient for 40 head stock. Another similar well 60 feet deep.
16	NW.	36	"	"	"	Bored	65	2,788	- 60	2,728	60	2,728	Ravenscrag sand	Hard, clear		D, S	Sufficient for 10 head stock.
1	NW.	6	4	6	3	Bored	42	2,915	- 8	2,907	42	2,873	Ravenscrag gravel	Soft, clear		D, S	Sufficient for 30 head stock.
2	NE.	7	"	"	"	Bored	40	2,850	- 30	2,820	38	2,812	Ravenscrag gravel	Soft, clear	50	D, S	Sufficient for local needs. #
3	NW.	9	"	"	"	Spring	3	2,880	0	2,880	0	2,880	Ravenscrag coal	Soft, clear		D, S	Sufficient for 25 head stock.
4	SE.	17	"	"	"	Bored	48	2,836	- 39	2,797	48	2,788	Bearpaw shale	Soft, clear		D, S	Sufficient for 6 head stock. Also two springs in coulee.
5	NW.	17	"	"	"	Bored	38	2,830	- 29	2,801	38	2,792	Bearpaw shale	Hard, clear		D, S	Sufficient for 12 head stock.
6	NW.	20	"	"	"	Bored	45	2,750	- 30	2,720	30	2,720	Bearpaw blue shale	Hard, clear, "alkaline"		S	Sufficient for 15 head stock. Also a spring.
7	NE.	21	"	"	"	Dug	32	2,745	- 29	2,716	29	2,716	Bearpaw blue clay	Hard, clear		D, S	Sufficient for 10 head stock.
8	NW.	22	"	"	"	Dug	36	2,756	- 34	2,722	34	2,722	Bearpaw sand	Soft, clear		D, S	Insufficient for 13 head stock. Also a spring.
9	NE.	23	"	"	"	Dug	40	2,923	- 30	2,893	30	2,893	Ravenscrag clay	Hard, clear		D, S	Insufficient for 12 head stock. Several other wells with insufficient supply.
10	NE.	24	"	"	"	Dug	21	2,900	- 16	2,884	16	2,884	Ravenscrag sand	Hard, clear		D, S	Sufficient for 12 head stock.
11	NW.	27	"	"	"	Bored	100	2,800	- 75	2,725	100	2,700	Bearpaw	Soft, clear		D, S	Sufficient for local needs. Also a shallow well for stock needs.
12	NE.	28	"	"	"	Dug	12	2,650	- 8	2,642	10	2,640	Bearpaw sand	Soft, clear		D	Sufficient for domestic needs.
13	SE.	30	"	"	"	Bored	32	2,650	- 22	2,628	32	2,618	Bearpaw shale	Hard, clear, "alkaline"		S	Sufficient for local needs.
14	NW.	30	"	"	"	Dug	12	2,600	- 6	2,594	8	2,592	Recent sand	Hard, clear		D, S	Sufficient for 12 head stock.
15	NW.	34	"	"	"	Bored	22	2,676	- 14	2,662	14	2,662	Bearpaw clay	Soft, clear		D, S	Sufficient for 100 head stock.
16	SE.	36	"	"	"	Bored	52	2,780	- 39	2,741	52	2,728	Ravenscrag clay sand	Hard, clear		D, S	Sufficient for 25 head stock.
17	NE.	36	"	"	"	Dug	36	2,760	- 31	2,729	31	2,729	Ravenscrag clay	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
1	NW.	2	5	4	3	Spring		2,775	0	2,775	0	2,775	Ravenscrag	Hard, clear, iron		S	Flows year round, used for stock. #
2	SE.	3	"	"	"	Bored	96	2,887	- 40	2,847	96	2,791	Ravenscrag sand	Hard, clear		D, S	Sufficient for local needs.
3	SW.	5	"	"	"	Spring		2,824	0	2,824	0	2,824	Ravenscrag	Hard, clear		D, S	Flows year round.
4	SE.	6	"	"	"	Dug	16	2,740	- 12	2,728	14	2,726	Ravenscrag coal	Hard, clear		D,	Sufficient for household needs only.
5	NW.	6	"	"	"	Dug	4	2,710	- 1	2,709	3	2,707	Ravenscrag clay	Soft, clear		D, S	Insufficient in dry seasons.
6	NW.	8	"	"	"	Bored	80	2,770	- 40	2,730	60	2,710	Ravenscrag sandstone	Hard, clear		D, S	Sufficient for local needs.
7	SW.	10	"	"	"	Spring		2,787	+ 2	2,789			Ravenscrag	Hard, iron, "alkaline"		S	Watered stock all winter.
8	SE.	10	"	"	"	Dug	16	2,798	- 6	2,792	6	2,792	Ravenscrag clay	Hard, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of WAVERLEY NO. 44, 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.	13	5	4	3	Dug	27	2,725	- 22	2,703	24	2,701	Ravenscrag sand	Hard, clear		D, S	Insufficient for local needs.
10	SW.	17	"	"	"	Bored	60	2,760	- 40	2,720	60	2,700	Ravenscrag sand-stone	Hard, clear		D, S	Sufficient for 35 head stock.
11	SW.	19	"	"	"	Bored	32	2,673	- 22	2,651	27	2,646	Glacial clay	Hard, clear		D, S	Sufficient for local needs.
12	SE.	23	"	"	"	Dug	26	2,739	- 13	2,726	26	2,713	Ravenscrag grey clay	Hard, clear		D, S	Sufficient for 5 head stock; intermittent.
13	SE.	25	"	"	"	Dug	12	2,614	- 6	2,608	15	2,608	Ravenscrag sand	Soft.		S	Sufficient for local needs.
14	SE.	25	"	"	"	Bored	50	2,658	- 37	2,621	30	2,621	Ravenscrag clay	Soft, yellowish, yellow sediment		D, S	Sufficient for local needs.
15	NE.	25	"	"	"	Spring		2,600	0	2,600	0	2,600	Ravenscrag	Hard, clear, iron, red sediment		S	Sufficient for local needs.
16	NW.	29	"	"	"	Bored	60	2,670	- 30	2,640	60	2,610	Bearpaw blue soapstone	Soft, clear		D, S	Sufficient for local needs.
17	NE.	31	"	"	"	Bored	52	2,730	- 38	2,692	44	2,686	Eastend clay	Hard, clear		D, S	Another well 10 feet deep is used for domestic needs.
18	NE.	32	"	"	"	Bored	60	2,586					Bearpaw shale	Hard, clear, "alkaline"		S	Sufficient for local needs. Another well 15 feet deep.
19	NW.	36	"	"	"	Bored	50	2,660	- 25	2,635	24	2,636	Eastend clay	Soft, clear		D, S	Sufficient for 50 head stock. #
20	NE.	36	"	"	"	Dug	35	2,655	- 31	2,624	22	2,633	Eastend sand	Hard, clear		D, S	Sufficient for 10 head stock.
1	SW.	3	5	5	3	Spring		2,675	0	2,675	0	2,675	Glacial drift	Hard, clear		D, S	
2	NE.	5	"	"	"	Dug	35	2,648	- 30	2,618	30	2,618	Bearpaw shale	Hard, clear, "alkaline"		D, S	Sufficient for 6 head stock.
3	SE.	6	"	"	"	Bored	72	2,665	- 42	2,623	65	2,600	Bearpaw shale	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
4	NW.	8	"	"	"	Dug	20	2,788	- 14	2,774	14	2,774	Glacial sand	Hard, clear		D, S	Has watered 35 head stock.
5	SE.	9	"	"	"	Bored	60	2,670	- 42	2,628	45	2,625	Bearpaw shale	Hard, clear, "alkaline"		S	Sufficient for about 10 head stock.
6	NW.	10	"	"	"	Dug	30	2,602	- 22	2,580	27	2,575	Bearpaw sand	Hard, clear, "alkaline"		S	Sufficient for 10 head stock.
7	NW.	12	"	"	"	Bored	44	2,678	- 32	2,646	42	2,636	Bearpaw shale	Hard, clear, iron		D, S	Sufficient for household needs only. Another 10-foot well is sufficient for 100 head stock.
8	SE.	13	"	"	"	Bored	86	2,746	- 70	2,676	70	2,676	Eastend? sand-stone	Hard, clear		D, S	Sufficient supply; town well. #
9	NE.	13	"	"	"	Bored	8[illegible]	2,726					Bearpaw	Hard, clear		D, S	Sufficient for local needs.
10	SW.	14	"	"	"	Dug	[illegible]	2,616	- 4	2,61[illegible]	4	2,612	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 7 head stock. Another well 27 feet with highly mineralized water.
11	NW.	1[illegible]	"	"	"	Spring		2,606	0	2,6[illegible]	0	2,606	B[illegible]arpa[illegible]	Soft, clear, soda		D, S	Sufficient for 15 head stock. #
[illegible]	[illegible]	[illegible]	[illegible]	"	"	Dug	[illegible]	2,62[illegible]	- 23	2,[illegible]7	23	2,597	[illegible]arpaw shale	Hard, clear, "alkaline"		N	Too "[illegible]lkaline" for use.
13	[illegible]	[illegible]	[illegible]	[illegible]	"	Dug	14	2,546	- 10	2,[illegible]6	14	2,532	[illegible]arpaw shale	Soft, clear		D, S	Sufficient for 10 head stock. Used by neighbours.
14	SW.	[illegible]	[illegible]	[illegible]	"	Bored	4[illegible]	2,562	- 36	2,[illegible]6	36	2,526	[illegible]arpaw shale	Hard, clear, "alkaline"		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of WAVERLEY NO. 44, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
15	NE.	19	5	5	3	Spring		2,508	+ 5	2,513	0	2,508	Bearpaw			D, S	Sufficient for local needs.
16	NW.	19	"	"	"	Bored	60	2,594	- 48	2,546	48	2,546	Bearpaw	Hard, clear, "alkaline" iron		D, S	Sufficient for 6 head stock.
17	SW.	21	"	"	"	Dug	26	2,554	- 20	2,534	25	2,529	Bearpaw sand	Hard, clear, "alkaline"		N	Unfit for use. Another similar well 10 feet dee
18	NE.	21	"	"	"	Bored	52	2,644	- 17	2,627	52	2,592	Bearpaw shale	Hard, clear, "alkaline" iron		S	Sufficient for 25 head stock. Another well 14 feet deep is used for domestic needs.
19	NE.	24	"	"	"	Spring		2,617	0	2,617	0	2,617	Bearpaw	Soft		S	Freezes in winter.
20	NE.	24	"	"	"	Dug	18	2,624	- 11	2,613	17	2,607	Bearpaw shale	Soft, clear, "alkaline"		D, S	Sufficient for local needs.
21	NE.	27	"	"	"	Bored	70	2,580	- 40	2,540	50	2,530	Bearpaw shale	Soft, clear		D, S	Sufficient for 15 head stock; caved in 1931.
22	SW.	31	"	"	"	Dug	6	2,470	- 2	2,468	2	2,468	Glacial gravel	Soft, clear		D, S	Filled in with quicksand so not used. Used to supply Glentworth.
23	NW.	32	"	"	"	Bored	50	2,532	- 25	2,507	25	2,507	Bearpaw shale	Hard, clear, "alkaline"		S	Water is nearly useless. Another well 10 feet deep is used for domestic needs.
24	SE.	32	"	"	"	Bored	46	2,534	- 21	2,513	30	2,504	Bearpaw shale	Hard, bluish "alkaline"		S	Sufficient; used by neighbours. Another well 7 feet deep on NW.¼, section 28.
25	NE.	35	"	"	"	Bored	10	2,526	- 8	2,518	8	2,518	Glacial sand	Hard, clear		D, S	Sufficient only in summer.
26	SW.	36	"	"	"	Bored	32	2,565	- 12	2,553	29	2,536	Bearpaw soft shale	Soft, clear, soda, whitish sediment		N	Unfit since 1931. Formerly a supply sufficient for 100 head stock.
27	SW.	36	"	"	"	Dug	16	2,560	- 10	2,550	16	2,544	Glacial sandy clay	Soft, clear, soda, white sediment		S, S	Sufficient for 30 head stock.
1	NW.	1	5	6	3	Dug	15	2,770	- 10	2,760	15	2,755	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
2	NW.	1	"	"	"	Spring		2,765	0	2,765			Glacial drift	Soft, clear		S	Sufficient for 20 head stock.
3	SE.	4	"	"	"	Bored	48	2,670	- 34	2,636	38	2,632	Bearpaw shale	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
4	NE.	4	"	"	"	Bored	35	2,676	- 15	2,661	32	2,644	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 100 head stock.
5	SE.	5	"	"	"	Bored	43	2,652	- 25	2,627	26	2,626	Bearpaw shale	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
6	NW.	7	"	"	"	Dug	14	2,510	- 10	2,500	12	2,498	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 14 head stock. A 12-foot well i used for domestic needs.
7	NE.	9	"	"	"	Dug	13	2,620	- 10	2,610	12	2,608	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
8	SW.	12	"	"	"	Bored	37	2,762	- 22	2,740	22	2,740	Bearpaw shale	Hard, clear		D, S	Sufficient for local needs.
9	SE.	14	"	"	"	Dug	6	2,570	0	2,570	0	2,570	Glacial drift	Soft, clear		D, S	26 barrels per day.
10	SW.	18	"	"	"	Dug	9	2,500	- 5	2,495	5	2,495	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for household needs only.
11	NW.	23	"	"	"	Dug	7	2,520	- 3	2,517	3	2,517	Glacial clay	Hard, clear		D, S	Sufficient for local needs. Is a tractor farmer.
12	SW.	24	"	"	"	Bored	35	2,595	- 30	2,565	30	2,565	Bearpaw sand	Hard, clear, "alkaline"		N	Sufficient, but not fit for use.

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 WAVERLEY NO. 44, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	HEIGHT TO WHICH WATER WILL RISE Elev.	PRINCIPAL WATER-BEARING BED Depth	PRINCIPAL WATER-BEARING BED Elev.	PRINCIPAL WATER-BEARING BED Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
13	NE.	27	5	6	3	Bored	22	2,508	- 8	2,500	18	2,490	Glacial sand	Soft, clear		D, S	Sufficient; used by neighbours.
14	SE.	28	"	"	"	Dug	29	2,600	- 12	2,588	13	2,587	Glacial sand	Hard, clear		D, S	Insufficient for 4 head stock.
15	NW.	31	"	"	"	Dug	20	2,450	0	2,450	18	2,432	Glacial sand	Hard, clear,		D, S	Insufficient for local needs in 1934. Several other wells which are not used.
16	NE.	32	"	"	"	Bored	33	2,498	- 15	2,483	33	2,465	Glacial drift	Hard, cloudy, iron, red sediment		D, S	Sufficient for local needs. #
17	SE.	33	"	"	"	Bored	35	2,595	- 20	2,575	25	2,570	Glacial gravel	Hard, clear		D, S	Sufficient for local needs. Used by neighbours.
18	NW.	34	"	"	"	Dug	24	2,550	- 21	2,529	20	2,530	Glacial gravel	Soft, clear		D, S	Sufficient for 6 horses.
19	SW.	34	"	"	"	Bored	30	2,560	- 18	2,542	18	2,542	Glacial gravel	Soft, clear		D, S	Sufficient for 25 head stock.
20	SE.	34	"	"	"	Bored	50	2,540	- 30	2,510	30	2,510	Glacial clay	Hard, clear		D, S	Sufficient for 14 head stock.
21	NW.	35	"	"	"	Dug	18	2,490	- 13	2,477	10	2,480	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
22	SE.	36	"	"	"	Dug	14	2,490	- 12	2,478	12	2,478	Glacial sand	Hard, clear		D	Sufficient for local needs.
23	SE.	36	"	"	"	Dug	14	2,490	- 11	2,479	12	2,478	Glacial blue sand	Hard, clear		S	Sufficient for local needs.
1	SE.	1	6	4	3	Bored	46	2,700	- 16	2,684			Eastend	Soft, clear		S	Sufficient for 52 head stock.
2	SE.	2	"	"	"	Bored	99	2,715	- 83	2,632	83	2,632	Eastend sand	Soft, clear		D, S	Sufficient for local needs.
3	NW.	2	"	"	"	Bored	68	2,660	- 48	2,612	48	2,612	Bearpaw shale	Hard, clear		D, S	Sufficient for local needs.
4	SW.	3	"	"	"	Bored	60	2,626	- 30	2,596	48	2,578	Bearpaw shale	Hard, clear, "alkaline"	40	D, S	Sufficient for 20 head stock.
5	NW.	4	"	"	"	Dug	12	2,566	- 10	2,556	10	2,556	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for local needs.
6	NE.	5	"	"	"	Bored	35	2,574	- 25	2,549	31	2,543	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 13 head stock.
7	NE.	7	"	"	"	Dug	18	2,556	- 10	2,546	18	2,538	Glacial gravel	Hard, clear		D, S	Sufficient for 15 head stock.
8	NW.	9	"	"	"	Bored	30	2,500	- 14	2,486	20	2,480	Bearpaw sand	Hard, clear, "alkaline"		S	Sufficient for local needs. Haul drinking water. Another similar well 20 feet deep.
9	SW.	12	"	"	"	Drilled	17	2,640	- 13	2,627	15	2,625	Eastend clay	Soft, clear		D, S	Insufficinet; enough for 2 head stock.
10	NE.	13	"	"	"	Dug	40	2,478	- 30	2,448	30	2,448	Bearpaw sandy yellow clay	Hard, clear, "alkaline"		S	Sufficient for 30 head stock. A seepage well is used for domestic needs.
11	NE.	14	"	"	"	Bored	31	2,584	- 17	2,567	30	2,554	Glacial sand	Soft, clear		D, S	Sufficient for 30 head stock.
12	SE.	17	"	"	"	Bored	30	2,490	- 10	2,480	25	2,465	Glacial sand and gravel	Hard, clear, "alkaline" white sediment		S	Sufficient for 35 head stock. A 12-foot seepage well is used for domestic needs.
13	SW.	1	"	"	"	Bored	24	2,518	- 9	2,509	24	2,494	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
14	NW.	18	"	"	"	Bored	80	2,534	- 55	2,479	80	2,454	Bearpaw sand	Soft, clear		S	Sufficient; cannot pump dry. Another well 24 feet deep is used for domestic needs.

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

WELL RECORDS—Rural Municipality of WAVERLY NO. 44, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
15	SE.	19	6	4	3	Bored	50	2,514	- 20	2,494	20	2,494	Bearpaw sand	Hard, clear, "alkaline"		S	Sufficient for local needs.
16	NW.	20	"	"	"	Bored	48	2,507	- 24	2,483	33	2,474	Bearpaw blue shale	Hard, clear, "alkaline"		N	Not fit for use. Sufficient supply.
17	NE.	20	"	"	"	Bored	70	2,593	- 40	2,553	62	2,531	Bearpaw	Soft, clear		D, S	Sufficient for local needs. Another similar well.
18	NW.	21	"	"	"	Bored	90	2,593	- 40	2,553	90	2,503	Bearpaw	Soft, clear		D, S	Sufficient for 10 head stock.
19	NE.	21	"	"	"	Bored	80	2,582	- 60	2,522	60	2,522	Bearpaw shale	Hard, clear, "alkaline"		S	Sufficient for local needs.
20	NE.	22	"	"	"	Bored	85	2,590	- 70	2,520	70	2,520	Bearpaw shale	Hard, clear, "alkaline" iron, red sediment		S	Sufficient for local needs. #
21	NW.	25	"	"	"	Dug	20	2,542	- 17	2,525	18	2,524	Glacial sand	Hard, clear		D, S	Sufficient for local needs. Also a 25-foot dry hole.
22	NE.	26	"	"	"	Dug	14	2,420	- 10	2,410	14	2,406	Glacial sand and gravel	Hard, clear, "alkaline" white sediment		S	Sufficient for local needs.
23	SW.	28	"	"	"	Bored	64	2,566	- 39	2,527	60	2,506	Bearpaw shale	Hard, clear, "alkaline"		S	Insufficient. Water bitter and useless.
24	NE.	28	"	"	"	Bored	20	2,560	- 10	2,550	10	2,550	Bearpaw shale	Hard, clear, "alkaline"		S	Sufficient for 7 head stock.
25	NW.	34	"	"	"	Bored	80	2,590	- 63	2,527	80	2,510	Bearpaw shale	Soft, clear,		D, S	Insufficient for 18 head stock.
26	SE.	34	"	"	"	Drilled	76	2,555	- 30	2,525			Bearpaw shale	Hard, iron		D, S	Insufficient for local needs.
27	SW.	36	"	"	"	Bored	40	2,600	- 20	2,580	20	2,580	Bearpaw yellow shale	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
1	SE.	1	6	5	3	Bored	44	2,654	- 30	2,624	30	2,624	Glacial? gravel	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
2	SE.	1	"	"	"	Spring		2,616	0	2,616	0	2,616	Glacial gravel	Hard, clear, "alkaline"		S	
3	NE.	6	"	"	"	Bored	75	2,578	- 35	2,543	50	2,528	Bearpaw shale	Hard, clear, "alkaline" iron		S	Insufficient, enough for 10 head stock all the time. A 25-foot well on NE. ¼, section 5, is used for domestic needs.
4	NW.	7	"	"	"	Dug	16	2,573	- 11	2,562	12	2,561	Glacial gravel	Hard, clear		D, S	Sufficient for 10 head stock.
5	NE.	9	"	"	"	Dug	12	2,500	- 7	2,493			Glacial? sand	Hard, clear, "alkaline"		D, S	Sufficient for household needs only.
6	NW.	10	"	"	"	Bored	70	2,502					Bearpaw				Dry hole.
7	SE.	17	"	"	"	Bored	45	2,508	- 35	2,473	35	2,473	Bearpaw	Hard, clear, "alkaline" iron		D, S	Sufficient for 12 head stock. A shallow well near creek is used for domestic needs.
8	NW.	18	"	"	"	Dug	23	2,550	- 18	2,532	19	2,531	Glacial gravel	Hard, clear, "alkaline"		S	Insufficient for 15 head stock.
9	SW.	20	"	"	"	Dug	28	2,500	- 24	2,476	24	2,476	Glacial sand	Hard, clear "alkaline"		D, S	Sufficient for local needs. Another similar well.
10	SE.	20	"	"	"	Dug	12	2,480	- 4	2,476	10	2,470	Recent silts	Hard, clear, "alkaline"		D, S	Sufficient for 30 head stock.
11	NE.	21	"	"	"	Bored	66	2,540	- 50	2,490	50	2,490	Bearpaw bluish sand	Hard, clear, "alkaline" iron		S	Insufficient; enough for 6 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of WAVERLEY NO. 44, 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
12	SE.	22	6	5	3	Bored	50	2,596	- 40	2,556	40	2,556	Bearpaw clay	Hard, clear, "alkaline"		D, S	Insufficient in dry years.
13	SE.	25	"	"	"	Dug	30	2,514	- 15	2,499			Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for over 30 head stock.
14	SE.	27	"	"	"	Bored	73	2,540	- 13	2,527	73	2,467	Bearpaw shale	Hard, clear, "alkaline"		S	Sufficient for 100 head stock.
15	SW.	29	"	"	"	Bored	25	2,522	- 15	2,507	25	2,497	Glacial sand	Soft, clear, "alkaline"		S	Sufficient for local needs.
16	SW.	31	"	"	"	Bored	15	2,454	- 8	[illegible]46	9	2,445	Glacial sand	Soft, clear		D, S	Insufficient for 30 head stock. Clogs due to quicksand.
17	NE.	31	"	"	"	Dug	18	2,459	- 11	2,448	9	2,450	Glacial gravel	Hard, clear		D, S	Insufficient for local needs.
18	NE.	32	"	"	"	Bored	45	2,510	- 27	2,483	42	2,468	Glacial gravel	Hard, clear		S	Sufficient for local needs. #
19	NE.	34	"	"	"	Bored	48	2,472	- 12	2,460	17	2,455	Glacial drift	Hard, clear "alkaline"		S	Sufficient for 40 head stock. Several similar wells.
20	NW.	36	"	"	"	Bored	35	2,514	- 23	2,491	23	2,491	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
21	SE.	36	"	"	"	Dug	30	2,510	- 16	2,494	16	2,494	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for local needs. Another well 7 feet deep is used for domestic needs.
1	NE.	4	6	6	3	Bored	36	2,492	- 31	2,461	34	2,458	Glacial sandy clay	Hard, clear		D, S	Sufficient for local needs.
2	SE.	9	"	"	"	Dug	30	2,470	- 20	2,450	27	2,443	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock.
3	SW.	10	"	"	"	Dug	20	2,465	- 14	2,451	5	2,460	Glacial clay and sand	Hard, clear, iron, red, sediment		D, S	Insufficient for 16 head stock. Similar well 20 feet deep.
4	NE.	10	"	"	"	Dug	34	2,445	- 13	2,432	34	2,411	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs. A seepage well is used for domestic needs.
5	NE.	14	"	"	"	Bored	40	2,570					Bearpaw				Dry hole. Several other dry holes 40 to 80 feet deep.
6	NW.	15	"	"	"	Bored	46	2,432	- 7	2,425	46	2,386	Glacial clay	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
7	SE.	16	"	"	"	Dug	17	2,430	- 13	2,417	15	2,415	Glacial gravel	Soft, clear		D, S	Sufficient for 4 head of horses.
8	SW.	19	"	"	"	Dug	12	2,419	- 9	2,410	8	2,411	Glacial sand	Hard, yellow, iron, "alkaline"		S	Sufficient for local needs.
9	NE.	19	"	"	"	Dug	24	2,420	- 19	2,401	20	2,400	Glacial gravel	Soft, clear,		D, S	Sufficient for 6 head stock.
10	NE.	20	"	"	"	Bored	33	2,425	- 17	2,408	16	2,409	Glacial sand	Hard, dark iron "alkaline"		D, S	Sufficient for 14 head stock.
11	NW.	21	"	"	"	Bored	44	2,425	- 18	2,407	44	2,381	Glacial sand	Hard, cloudy, iron, "alkaline"		D, S	Sufficient for 20 head stock. Another well 18 feet deep.
12	SE.	21	"	"	"	Bored	40	2,430	- 33	2,397	40	2,390	Glacial clay	Hard, cloudy, iron, "alkaline"		D, S	Sufficient for 12 head stock.
13	N[illegible].	22	"	"	"	Dug	40	2,432	- 24	2,408	40	2,392	Glacial sand	Soft, cloudy iron, red sediment		D, S	Sufficient for 25 head stock.
14	NE.	23	"	"	"	Bored	60	2,500	- 22	2,[illegible]78	22	2,478	Glacial drift	Hard, cloudy, "alkaline"		D, S	Sufficient for 20 head stock.

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

WELL RECORDS—Rural Municipality of WAVERLEY NO.44 SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE: Above (+) Below (–) Surface	HEIGHT TO WHICH WATER WILL RISE: Elev.	PRINCIPAL WATER-BEARING BED: Depth	PRINCIPAL WATER-BEARING BED: Elev.	PRINCIPAL WATER-BEARING BED: Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
15	SE.	26	6	6	3	Bored	37	2,475	- 17	2,458	10	2,465	Glacial sand	Hard, clear, "alkaline" white sediment		S	Sufficient for 30 head stock.
16	SW.	27	"	"	"	Bored	35	2,425	- 20	2,405	20	2,405	Glacial clay	Soft, yellowish iron		D, S	Sufficient for 20 head stock.
17	SE.	28	"	"	"	Bored	55	2,420	- 45	2,375	55	2,365	Glacial gravel	Hard, iron, brownish		D, S	Sufficient for 12 head stock.
18	NW.	30	"	"	"	Bored	80	2,425	- 40	2,385	80	2,345	Bearpaw shale	Hard, clear		S	Sufficient for local needs. Another well 20 feet deep is used for domestic needs.
19	NW.	32	"	"	"	Dug	22	2,407	- 18	2,389	18	2,389	Glacial sand	Hard, clear		D, S	Sufficient for 22 head stock. Several similar wells.
20	NE.	32	"	"	"	Dug	22	2,400	- 18	2,382	18	2,382	Glacial sand	Hard, black "alkaline"		S	Sufficient for local needs.
21	SW.	36	"	"	"	Bored	65	2,467	- 60	2,407	63	2,404	Glacial gravel	Hard, clear, "alkaline"		D, S	Insufficient for local needs. Intermittent well.

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