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DEPARTMENT OF MINES

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BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF MARTIN No. 122 SASKATCHEWAN

BY

B. R. MacKay, H. N. Hainstock & P. D. Bugg

Water Supply Paper No. 78

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF MARTIN, NO. 122 SASKATCHEWAN

INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municapality of Martin, No. 122, comprises an area of 214 square miles in southeastern Saskatchewan. It consists of five full townships and three fractional townships lying adjacent on the east to the 2nd meridian. These are described as tps. 13, 14, and 15, range 32, tps. 13 and 14, and fractional tp. 15, range 33, and the two narrow strips that form fractional tps. 13 and 14, range 34, W. 1st mer. The town of Wapella, situated approximately 120 miles east of Regina on the main line of the Canadian Pacific railway, is in the northwestern corner of the municipality.

Pipestone creek enters the municipality on the west, and flows in an easterly direction through the northern part of township 15, range 33, then flows in a southeasterly direction, leaving the municipality near the southeastern corner of township 13, range 32. The general drainage of the municipality is toward Pipestone creek and an intermittent tributary creek that flows easterly through the central part of the municipality into Pipestone creek.

The municipality is mantled with glacial drift to a depth of 100 to 320 feet, the thickness gradually increasing from the southern to the northern part of the municipality. In the northwestern and southwestern corners, and in a long, narrow strip extending southeasterly along the eastern side of the municipality, the drift is in the form of moraine. With the exception of small narrow areas of Recent gravels along some of the valleys, the remainder of the municipality is covered by boulder clay or glacial till.

Water-Bearing Horizons in the Unconsolidated Deposits

The uppermost water-bearing horizon is formed by small, scattered pockets of sand and gravel that occur within the upper 30 feet of boulder clay and morainic deposits, and by small areas of sands and gravels deposited along Pipestone valley and its main tributary valley. Approximately one-half of the holes dug or bored

in this municipality in an attempt to locate water-bearing sand or gravel pockets have been dry holes. The amount of water derived from the aquifer varies in accordance with the areal extent of the pocket of water-bearing sand or gravel tapped, and with the amount of precipitation. In a few cases springs are found in the sands and gravels, and as a rule wells dug into these deposits yield a more abundant supply of water than those wells that tap isolated pockets of sand or gravel. The water derived from this horizon is more suitable for drinking and other domestic purposes than that obtained from the other water-bearing horizons in the municipality. The greatest difficulty is that during periods of drought many of the wells tapping this uppermost horizon may go dry.

The second water-bearing horizon occurs principally in township 15, range 32, at a depth of 30 to 60 feet, and is formed by a bed of gravel of small areal extent. It yields a fair supply of water that is used for drinking and general farm purposes.

The third water-bearing horizon is located in township 13, range 32, and townships 14 and 15, range 33. This aquifer is formed by a bed of sand and gravel at a depth of 100 to 150 feet below the surface. It is overlain by 60 to 100 feet of impervious, blue clay and underlain by 50 to 80 feet of blue clay. The water is used for household purposes, as water of better quality is not obtainable within reasonable distances. It is objectionable on account of its extreme hardness and high iron content. There is a sufficient amount of water from the individual wells tapping this horizon to supply 60 to 100 head of stock.

A fourth water-bearing horizon has been located in every township except township 15, range 33, at a depth of 160 to 300 feet below the surface, the deeper wells being in the northeastern part of the municipality. The aquifer is a bed of gravel that occurs between beds of blue clay. The water is extremely hard and highly mineralized, the iron being particularly objectionable. In almost every well the water

is being used for drinking and other household purposes, as water of better quality is not obtainable. The hydrostatic pressure is low, so that the water will only rise to a point 100 to 150 feet below the surface. Each well will usually supply 100 to 200 head of stock with water throughout the year.

Water-bearing Horizons in the Bedrock

The municipality is underlain throughout by the Marine Shale series. The bedrock is 90 to 100 feet below the surface in some places in township 13, ranges 32 and 33, but is generally deeper. The bedrock surface seems to slope downwards towards the north, as it is located in a number of wells in township 15, range 32, at a depth of 300 feet, or an elevation of about 1,560 feet above sea-level. The holes that penetrated the Marine Shale in the southern part of the municipality were dry, but in a few cases those in the northern part have encountered good supplies of water. It is probable that the water is being obtained from a sand bed laid down on the surface of the Marine Shale or from seepages into small cracks or fissures in the upper few feet of the shale. A few of these wells yield a soft but highly mineralized water, whereas in others the water is hard, having similar characteristics to that obtained from the deeper wells in the glacial drift. The water from a few of these wells cannot be used for drinking, and the water from others should not be used, but is used because better water is lacking. The uncertainty of obtaining water, the poor quality of water when obtained, and the low level to which it rises, do not warrant the expense of attempting to locate a water supply in this bedrock.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 13, Range 32

The valley of Pipestone creek passes in a southeasterly direction through the township. The creek meanders along the valley floor, which lies 50 to 100 feet below the average plain elevation of 1,900 feet above the sea-level. Springs are common along the many small tributary valleys and ravines.

The northeastern corner of the township is mantled in part by terminal moraine and its ground surface is quite rolling and characterized by many knolls and depressions. The remainder of the township is covered with boulder clay or glacial till.

Ground water is being obtained from three sources within the upper 30 feet of the drift, namely: from deposits of recent sands and gravels along the valleys, from which varying amounts of water can be obtained; from shallow holes dug in the boulder clay near springs; and from isolated pockets of sand and gravel that are embedded in the yellow and blue clays, and which yield intermittent supplies of water. Water obtained from these sources is generally suitable for domestic purposes, but the amount varies with each well and in many cases a shortage of water is experienced during periods of drought.

A few wells in different parts of the township have tapped a water-bearing horizon at a depth of 100 to 120 feet, or an elevation of 1,780 feet. The aquifer is a 10- to 15-foot bed of sand that is overlain by an 80-foot bed of impervious, blue clay and underlain by a bed of blue clay of unknown thickness. The water derived from this level has a high total dissolved mineral content but is locally described as being moderately hard. It is used for drinking with no apparent ill affects. The hydrostatic pressure is low, so that the water will only rise to a point 90 to 112 feet below the surface. The water from the individual wells is sufficient for about 100 head of

stock. It is probable that this water-bearing horizon could be tapped in other parts of the township.

A well on the NW.$\frac{1}{4}$, section 13, and a plugged and abandoned well located on the NW.$\frac{1}{4}$, section 1, tapped a water-bearing horizon at a depth of 195 and 200 feet respectively, or an elevation of 1,700 feet above sea-level. The water coming from the first-mentioned well is exceptionally hard and on standing in contact with the air turns a reddish colour due to its high iron content. The water is being used for household purposes at present, as water of better quality is not obtainable within reasonable distances.

The glacial drift of this township is underlain by the Marine Shale. It is reported in one well on the SE.$\frac{1}{4}$, section 34, to have been entered at a depth of 90 feet below the surface, or an elevation of 1,800 feet above sea-level. This elevation for bedrock is not uniform, as wells a short distance to the south have been sunk to an elevation of 1,700 feet and no bedrock reported. It is not advisable to continue drilling for water when this formation is encountered.

Township 13, Range 33

From the top of the steep-sided valley of Pipestone creek in the north, to the southern part of the township, there is a gradual rise in surface elevation of 100 feet. The bed of Pipestone creek is over 50 feet below the average plain elevation of 1,900 feet above sea-level.

With the exception of a small area in the southwestern corner of the township that is mantled by part of a small glacial moraine, the remainder of the township is overlain with boulder clay or glacial till.

The only known water-bearing horizon in this township is located in the upper 30 feet of flacial drift. Along Pipestone creek and other valleys, small deposits of gravels yield an excellent supply of water. Elsewhere, the wells tap isolated deposits of sand and gravel that occur as small lenses or pockets in the yellow clay. A few wells have an abundance of water, but the majority are affected by periods of drought and often become completely dry.

A few attempts have been made to locate water at depth. Holes from 50 to 100 feet in depth have been dug or drilled in the glacial drift but no water was located. On the SE.$\frac{1}{4}$, section 23, and the NE.$\frac{1}{4}$, section 24, holes 160 and 100 feet, respectively, were drilled into the Marine Shale, but no water was obtained. If no water-bearing horizons are located in the glacial drift there is little probability that any will be tapped in this bedrock. The best way to conserve water is to construct dams and dugouts.

Township 13, Range 34

This fractional township contains an area 6 miles long and $\frac{1}{4}$ mile wide between tp. 13, range 33, and the 2nd. mer. No wells have been located in this township, but water conditions are believed to be similar to those described above in the adjacent area, tp. 13, range 33, W. 1st mer.

Township 14, Range 32

This township is a rolling plain with an average elevation of 1,900 feet above sea-level. With the exception of a moraine-covered area, approximately 2 miles in width extending in a northerly direction through the central part of the township, the area is mantled by boulder clay or glacial till.

Two water-bearing horizons occur in the glacial drift of this township. A few feet of sand or gravel generally occurs between the yellow and blue clays, at depths of 10 to 30 feet. Water derived from this source is of good quality, but during periods of drought many of the wells may go dry. In two narrow areas extending north through sections 4, 9, and 16, and sections 19, 30, and 31, the gravel deposits are quite continuous and an abundance of clear, medium hard water is obtained within 15 to 20 feet of the surface. Less extensive pockets of sand and gravel have been tapped elsewhere throughout the township, but the amount of water obtained in many cases is only sufficient for domestic use.

In sections 2 and 24, holes have been drilled from 80 to 163 feet deep and no water-bearing horizons tapped. However, a well on the NW.$\frac{1}{4}$, section 13, 171 feet deep, tapped a sand bed at an elevation of 1,731 feet above sea-level, from which a hard, drinkable water is being obtained. This is the only indication of water at depth in this township, but it is possible that the horizon is quite extensive as water is being obtained from beds of sand at about the same elevation in adjoining townships.

This township has not a good supply of water and there is a grave shortage of water, particularly during long periods of drought. In many places dams could be constructed or dugouts excavated to conserve the run-off water.

Township 14, Range 33

The surface of this township is gently rolling except where it has been dissected by two valleys near the south and east sides of the township. The elevation rises from 1,850 feet in the valleys to 1,950 feet on the plain.

The township is overlain with glacial drift to a depth of 100 to 200 feet. Glacial moraine deposits mantle the northwestern corner of this township and the remainder is covered by boulder clay or glacial till.

Three water-bearing horizons are known to occur in the glacial drift. The first lies within the upper 10 to 30 feet of the surface and consists of sands and gravels in the two valleys mentioned above, and of the pockets of sand and gravel that are embedded in the yellow clay. The water derived from the sand and gravel beds along the valleys is of good quality, and the supply is usually fairly constant and is sufficient for 50 to 100 head of stock. The water is softer than that obtained from other water-bearing horizons of the township. Water derived from the isolated pockets of sand and gravel is generally of poor quality and the amount varies appreciably with seasonal precipitation.

The second water-bearing horizon occurs at a depth of 100 to 150 feet and is formed by a bed of gravel. The gravel bed is overlain by a 90-foot bed of blue clay and underlain by a second bed of blue clay. The water derived from this level is exceptionally hard and is described as being "alkaline". The iron content is also high. The individual wells will supply from 100 to 200 head of stock throughout the year. This water-bearing horizon may be fairly extensive.

Wells in the central part of the township have tapped a third water-bearing horizon at a depth of 200 feet or an elevation of 1,700 feet above sea-level. The aquifer is a bed of gravel that is overlain by impervious, blue clay and probably underlain by the Marine Shale series, as a shale bed is reported to occur at the bottom of the well on the NW.$\frac{1}{4}$, section 22, at an elevation of 1,730 feet above sea-level. There is an abundance of hard, usuable water that is under sufficient hydrostatic pressure to cause it to rise to a point 27 feet below the surface. The water is used for household purposes, although the iron content is exceptionally high. Wells of similar depth and character, located in tp. 15, range 32, suggest that this water-bearing horizon may have a large areal extent, particularly in the northwestern parts of the township.

Only two wells have encountered the Marine Shale bedrock in this township. It is pierced near the bottom of a well situated in the NW.$\frac{1}{4}$, section 4, or at an elevation of 1,800 feet, and in the NW.$\frac{1}{4}$, section 22, at an elevation of 1,730 feet above sea-level. The water that is derived from these wells is being obtained from an aquifer of glacial origin that was deposited on the pre-glacial bedrock land surface.

Township 14, Range 34

This fractional township contains an area 6 miles long and $\frac{1}{4}$ mile wide lying between tp. 14, range 33, and the 2nd mer.

A 20-foot well on the NE.$\frac{1}{4}$, section 13, and another 70-foot deep on the SE.$\frac{1}{4}$, section 25, obtain small supplies of water that are sufficient for local needs. The water-bearing conditions in this fractional township are probably similar to those in tp. 14, range 33.

Township 15, Range 32

This township is overlain by at least 250 feet of glacial drift. With the exception of an area in the east that is covered by part of a moraine, the township is mantled by boulder clay or glacial till. The whole area is a rolling plain quite suitable for cultivation and as a consequence the township is well settled.

At least three water-bearing horizons occur in the glacial drift of this township. The uppermost horizon occurs within the upper 30 feet of the glacial drift. It is composed of lenticular pockets of sand or gravel that occur within the yellow clay. These pockets are hard to locate and many dry holes are dug before any water is encountered. A few wells produce an abundant supply of water, but in most cases there is only a sufficient amount for domestic use.

A second water-bearing horizon is encountered at a depth of 30 to 60 feet and extends throughout the township. It is formed by a bed of gravel that occurs between beds of impervious, blue clay. The uppermost bed of blue clay gradually decreases in thickness toward the south, disappearing at a point approximately 2 miles from the southern boundary of the township and from this point south the gravel bed is immediately overlain with yellow clay. The water is of a very poor quality and the supply from most of the wells is only sufficient for a few head of stock.

A third water-bearing horizon that is continuous throughout the township occurs at a depth of approximately 250 feet, or an elevation of 1,650 feet above sea-level. This aquifer is a bed of quicksand that is overlain by a very compact, blue clay. There is an abundance of water, but some difficulty is experienced in keeping the fine sand from plugging the well. The water has a fairly high dissolved mineral content, but it is drinkable when one becomes accustomed to it. The hydrostatic pressure is low as the water will only rise to a point 150 feet below the surface. This aquifer is not a satisfactory source of water, due to the poor quality of the water, the difficulty in keeping the well from plugging with sand, and the added expense of pumping the water by power.

Because of the difficulties entailed in obtaining water from the third water-bearing horizon, a few farmers have drilled deeper to locate another source of supply. At a depth of 300 to 340 feet a few wells have encountered water in the bedrock. This is the Marine Shale series in which little or no water is generally encountered. In these wells the water is soft, but the total dissolved solid content is very high. It has a brackish taste due to the sodium chloride or commong salt content, and, therefore, the water is not used for drinking or other domestic purposes. The water rises to a point 160 feet below the surface and the amount is sufficient for 60 to 80 head of stock. From the information derived from these wells it does not appear advisable to drill over 200 feet in an effort to locate water.

Township 15, Range 33

This township comprises an area of 30 square miles, being a fractional township lying adjacent on the east to the Second meridian. The township is overlain with glacial drift that was mainly deposited in the form of a terminal moraine. A belt approximately 2 miles in width and trending north-south through the central part of the township, however, is mantled by boulder clay or glacial till.

Three water-bearing horizons have been located in the upper 150 feet of the drift. The uppermost occurs within the upper 30 feet of yellow clay and is composed of irregularly shaped lenses or pockets of sand. Intermittent supplies are obtained from this horizon and the water is used for drinking and other household purposes. This source of supply cannot be relied upon in times of drought.

The second water-bearing horizon occurs at a depth of 75 to 100 feet, or at an elevation of 1,850 feet. It is formed by a sand bed that occurs between layers of impervious, blue clay. The water has a high mineral content, being particularly high in iron. It is used for drinking and other household purposes, as in most instances water of better quality is not obtainable. The hydrostatic pressure is sufficient to cause the water to rise to a point 45 feet below the surface, at which point it maintains a fairly constant level.

A few other wells located in sections 8, 16, and 33, indicate the possible occurrence of an extensive water-bearing horizon at a depth of 150 feet or at an elevation of 1,800 feet. The aquifer is a bed of fine sand that is overlain by an impervious bed of blue clay. The water is quite highly mineralized but is used for all farming purposes except irrigation. The water rises to a level 40 feet below the surface and a sufficient amount is obtained from individual wells to supply 60 to 100 head of stock throughout the year. The distribution of the wells suggests that this water-bearing horizon is continuous over an extensive area.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF MARTIN, NO.122, SASKATCHEWAN

Township	13	13	13	14	14	14	15	15	Total No. in municipality
West of 1st meridian Range	32	33	34	32	33	34	32	33	
Total No. of Wells in Township	40	53	0	63	130	2	161	157	606
No. of wells in bedrock	0	4	0	0	1	0	3	0	8
No. of wells in glacial drift	40	49	0	63	129	2	158	157	598
No. of wells in alluvium	0	0	0	0	0	0	0	0	0
Permanency of Water Supply									
No. with permanent supply	33	35	0	29	53	2	76	59	287
No. with intermittent supply	2	7	0	8	8	0	11	14	50
No. dry holes	5	11	0	26	69	0	74	84	269
Types of Wells									
No. of flowing artesian wells	0	0	0	0	0	0	0	0	0
No. of non-flowing artesian wells	6	1	0	3	9	0	21	17	57
No. of non-artesian wells	29	41	0	34	52	2	66	56	280
Quality of Water									
No. with hard water	28	35	0	33	49	2	83	71	301
No. with soft water	7	7	0	4	12	0	4	2	36
No. with salty water	0	1	0	0	1	0	3	0	5
No. with "alkaline" water	2	1	0	6	3	0	16	16	44
Depths of Wells									
No. from 0 to 50 feet deep	27	48	0	58	105	1	136	135	510
No. from 51 to 100 feet deep	5	4	0	3	19	1	13	19	64
No. from 101 to 150 feet deep	5	0	0	1	2	0	0	2	10
No. from 151 to 200 feet deep	3	1	0	1	2	0	1	1	9
No. from 201 to 500 feet deep	0	0	0	0	2	0	11	0	13
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0
How the Water is Used									
No. usable for domestic purposes	32	38	0	35	54	2	80	59	300
No. not usable for domestic purposes	3	4	0	2	7	0	7	14	37
No. usable for stock	35	42	0	37	61	2	87	73	337
No. not usable for stock	0	0	0	0	0	0	0	0	0
Sufficiency of Water Supply									
No. sufficient for domestic needs	35	41	0	37	61	2	87	72	335
No. insufficient for domestic needs	0	1	0	0	0	0	0	1	2
No. sufficient for stock needs	27	30	0	24	39	2	37	36	195
No. insufficient for stock needs	8	12	0	13	22	0	50	37	142

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

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

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

Analyses of Water Samples from the Municipality of Martin, No. 122, Saskatchewan.

LOCATION						Depth of Well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS									Source of Water
No.	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alka-linity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1	NE.	9	15	33	1	96	546											(3)	(1)		(2)		(4)		(5)	*1

Water samples indicated thus, *1, are from glacial drift.
Analyses are reported in parts per million; where numbers (1), (2), (3), (4), and (5) are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).
Analysis No. 1, by Provincial Analyst.
For an interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

One sample of water was analysed by the Provincial Analyst at Regina and the results are listed in the accompanying table. This sample is from the town of Wapella and the water is obtained from a sand aquifer that is of small areal extent. The water from this water-bearing horizon is medium hard and is used by the Canadian Pacific railway for their locomotives, but it is reported as not being representative of water obtained from wells of similar depths in other sections of the township. Great variations are noted in the character of water from the glacial drift. Bitter, undrinkable water is often obtained from the same depth, and not far away from water that is suitable for all farm purposes. It must not be inferred, therefore, that because undesirable water is struck in one well poor water conditions must necessarily exist over a large area.

Generally, the water obtained from the upper water-bearing horizons has a lower total dissolved solid content than that obtained from deeper horizons. The water from shallow wells that tap small sand or gravel pockets is more objectionable than that from extensive sand or gravel beds. In this municipality, water is being used that has very high "total dissolved solid content", as a better quality of water is not obtainable within a reasonable distance of the farm buildings. It apparently has no ill effects on the residents, but it would probably have a laxative effect on those who are not accustomed to the use of highly mineralized water.

Water from the Bedrock

No samples of water from the Marine Shale bedrock were collected, but the water obtained from the upper part of the shale is mainly seepage water from the overlying glacial drift. Therefore, it would have the same characteristics as that obtained from the glacial

drift. Water that is derived from lower depths in the Marine Shale, is generally termed as "soft", but it is very highly mineralized, usually being high in sulphates and sodium chloride or common salt. It is rarely used for domestic purposes and in a few instances is not suitable for stock.

WELL RECORDS—Rural Municipality of MARTIN, NO. 122, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SE.	1	13	32	1	Dug	11	1,902	− 2	1,900	9	1,893	Glacial sand	Hard, clear		D, S	Oversufficient supply; stands steady pumping.
2	SW.	1	"	"	W	"	10	1,897	− 6	1,891	6	1,891	" gravel	" , "		D, S	" " ; " " " .
3	NW.	2	"	"	"	Spring		1,885	0	1,885	0	1,885	" "	Soft, "		D, S	Very strong supply; many other springs.
4	SE.	4	"	"	"	Dug	22	1,910	− 14	1,896	20	1,890	" "	Hard, clear, "alkaline"		S	Insufficient supply in dry years.
5	SW.	12	"	"	"	"	13	1,800	− 12	1,788	12	1,788	" drift	Hard, clear		D, S	Abundant supply.
6	NW.	12	"	"	"	Drilled	110	1,880	−100	1,780			Glacial drift	Hard, iron, clear		D, S	Abundant supply.
7	SW.	13	"	"	"	Dug	60	1,900					Glacial drift				Dry hole.
8	NW.	13	"	"	"	Drilled	193	1,895	− 90	1,805	70	1,825	Glacial sand	Hard, iron, cloudy		D, S	Sufficient for local needs; yields 4 tanks a day.
9	SW.	15	"	"	"	Dug	16	1,800	− 14	1,786	14	1,786	" gravel	Hard, clear		D, S	Oversufficient for 70 head stock.
10	NE.	15	"	"	"	Dug	26	1,870	− 14	1,856			" gravelly clay	" , "		D	Sufficient for domestic use only.
11	SW.	18	"	"	"	"	7	1,915	0	1,915	0	1,915	" drift	" , "		D, S	Sufficient for local needs· abundant supply.
12	SW.	19	"	"	"	Drilled	120	1,910	− 60	1,850			" gravel	Soft, "		D, S	Sufficient for 230 head stock.
13	SE.	20	"	"	"	Dug	11	1,910	− 7	1,903	7	1,903	" sand	" , "		D, S	" " 40 " " .
14	NW.	22	"	"	"	Drilled	116	1,900	− 56	1,844			" gravel	Hard, iron, cloudy		D, S	" " 20 " " .
15	SE.	23	"	"	"	"	120	1,890	−112	1,778			" "	Hard, cloudy		D, S	Yields 6 gallons a minute.
16	SE.	24	"	"	"	"	65	1,905	− 35	1,870	65	1,840	" "	Hard, cloudy		D, S	Insufficient for local needs; hauls water; very poor water conditions.
17	SW.	26	"	"	"	Dug	95	1,897	− 93	1,804	93	1,804	" "	Hard, cloudy		D, S	Oversufficient for local needs.
18	SW.	28	"	"	"	Dug	27	1,865	− 14	1,851	14	1,851	Glacial sand	Hard, clear "alkaline"		D, S	Intermittent supply; sufficient in wet years.
19	NW.	30	"	"	"	Drilled	150	1,905	− 45	1,860	100	1,805	Glacial gravel	Hard, iron, cloudy		D, S	Very strong supply; sufficient for local needs.
20	NE.	32	"	"	"	Dug	12	1,860					Glacial gravel	Hard, clear, sulphur		S	Strong, sufficient supply.
21	NE.	33	"	"	"	Drilled	110	1,895	− 90	1,805	90	1,805	Glacial sand	Hard, iron, cloudy		D, S	Sufficient for local needs.
22	SE.	34	"	"	"	Drilled	152	1,895	− 60	1,835	152	1,743	Marine shale	Hard, iron, cloudy		D, S	Sufficient for 40 head stock.
23	NW.	34	"	"	"	Dug	14	1,900	− 12	1,888	8	1,892	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; abundant supply.
24	SE.	35	"	"	"	Dug	12	1,897	− 8	1,889	8	1,889	Glacial gravel	Soft, clear		D, S	Insufficient for local needs.
25	NE.	35	"	"	"	Dug	8	1,900	− 5	1,895	7	1,893	Glacial sand	Hard, iron, clear		S	Insufficient for local needs.
26	SW.	36	"	"	"	Dug	65	1,898	− 25	1,873	60	1,838	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
27	NE.	36	"	"	"	Dug	14	1,895	− 6	1,889	6	1,889	Glacial gravel	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 MARTIN, NO.122, 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	13	33	1	Dug	14	1,950	- 10	1,940	10	1,940	Glacial gravel	Hard, clear		D, S	Sufficient for 50 head stock.
2	NW.	6	"	"	"	Dug	38	2,005	- 36	1,969	36	1,969	Glacial sand	Hard, clear		D	Sufficient for domestic use only.
3	SE.	6	"	"	"	Dug	8	1,987	- 4	1,983	4	1,983	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
4	SW.	6	"	"	"	Dug	40	2,000	- 20	1,980	20	1,980	Glacial sand	Hard, clear		D, S	Sufficient for 100 head stock.
5	NE.	7	"	"	"	Dug	12	1,985	- 8	1,977	8	1,977	Glacial gravel	Hard, clear		D, S	Oversufficient for 50 head stock.
6	NW.	8	"	"	"	Dug	16	1,935	- 8	1,927	8	1,927	Glacial gravel	Soft, clear		D, S	Intermittent supply; sufficient in wet years.
7	SE.	9	"	"	"	Dug	33	1,945	- 18	1,927	18	1,927	Glacial drift	Hard, clear		D, S	Sufficient for 100 head stock.
8	SW.	10	"	"	"	Dug	16	1,950	- 10	1,940	15	1,935	Glacial sand	Hard, clear, iron		D, S	Sufficient for 40 head stock.
9	SW.	12	"	"	"	Dug	18	1,935	- 15	1,920	15	1,920	Glacial drift	Hard, clear, iron		D, S	Sufficient for 30 head stock.
10	SW.	13	"	"	"	Dug	14	1,915	- 3	1,912	3	1,912	Glacial gravel	Hard, yellow		S	Sufficient for local needs.
11	NE.	14	"	"	"	Dug	12	1,915	- 8	1,907	8	1,907	Glacail gravel	Soft, clear		D, S	Intermittent supply; dry in dry years.
12	NW.	14	"	"	"	Dug	8	1,945	- 2	1,943	2	1,943	Glacial sand	Soft, clear		D, S	Sufficient for 75 head stock.
13	SW.	17	"	"	"	Dug	45	1,980					Glacial drift				Dry hole.
14	NE.	18	"	"	"	Dug	32	1,955	- 15	1,940	15	1,940	Glacial drift	Hard, salty, clear		S	Sufficient for 50 head stock.
15	SE.	20	"	"	"	Dug	23	1,950	- 2	1,948	15	1,935	Glacial gravelly clay	Hard, clear, "alkaline"		D, S	Sufficient for 35 head stock.
16	NW.	21	"	"	"	Dug	12	1,940	- 12	1,928	10	1,930	Glacial gravel	Hard, clear		D, S	Sufficient for 20 head stock.
17	SE.	22	"	"	"	Dug	14	1,840	- 7	1,833	7	1,833	Glacial gravel	Soft, clear		D, S	Sufficient for 30 head stock.
18	SW.	22	"	"	"	Spring		1,930	0	1,930	0	1,930	Glacial gravel	Hard, clear		D, S	Sufficient for 200 head stock.
19	SW.	23	"	"	"	Dug	30	1,920	- 30	1,890	15	1,905	Glacial gravel	Hard, clear, iron		D, S	Sufficient for local needs; very good supply.
20	SE.	23	"	"	"	Drilled	160	1,925					Marine shale				Dry hole.
21	NW.	24	"	"	"	Dug	20	1,920	- 3	1,917	20	1,900	Glacial clay	Hard, clear, iron		S	Intermittent supply; sufficient for 20 head stock in wet years.
22	NE.	24	"	"	"	Drilled	100	1,928					Marine shale				Dry hole.
23	SW.	24	"	"	"	Dug	12	1,925	- 7	1,918	7	1,918	Glacial gravel	Hard, clear		D, S	Sufficient for 100 head stock.
24	NE.	25	"	"	"	Bored	20	1,850					Glacial gravel	Hard, clear		D	Insufficient for local needs.
25	SE.	28	"	"	"	Spring		1,880	0	1,880	0	1,880	Glacial sand	Hard, clear		D, S	Very good supply.
26	NW.	30	"	"	"	Spring		1,845	0	1,845	0	1,845	Glacial drift	Hard, clear, iron		S	Sufficient for local needs; strong supply.
27	SW.	31	"	"	"	Dug	24	1,952	- 20	1,932	23	1,929	Glacial gravel	Hard, clear		D, S	Good supply; rarely used because of spring.

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 MARTIN, NO. 122, 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
28	SE.	32	13	33	1	Dug	12	1,900	- 8	1,892	12	1,888	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
29	SE.	34	"	"	"	Dug	10	1,900	- 5	1,895			Glacial gravel	Soft, clear		D, S	Sufficient for local needs.
30	SW.	34	"	"	"	Dug	10	1,840	- 4	1,836	4	1,836	Glacial sand	Soft, clear		D, S	Very strong supply.
31	SW.	36	"	"	"	Dug	25	1,900	- 17	1,883	17	1,883	Glacial clay	Hard, clear		D, S	Sufficient for local needs; stock water at creek.
1	SE.	1	14	32	1	Dug	20	1,897	- 2	1,895	20	1,877	Glacial clay	Hard, clear, "alkaline"		D, S	Good supply in wet years.
2	SW.	2	"	"	"	Dug	12	1,898	- 10	1,888	12	1,886	Glacial clay	Soft, clear		D, S	Fair supply; hauls some water. Several dry holes from 20 to 100 feet deep.
3	NW.	2	"	"	"	Dug	20	1,898	- 3	1,895	20	1,878	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock.
4	NE.	2	"	"	"	Dug	20	1,900	- 6	1,894	20	1,880	Glacial sand	Hard, clear		D, S	Intermittent supply; hauls in dry years.
5	SE.	4	"	"	"	Dug	25	1,900	- 22	1,878	25	1,875	Glacial sand	Hard, clear, iron		D, S	Intermittent supply; hauls water.
6	SW.	4	"	"	"	Dug	9	1,900	- 3	1,897	9	1,891	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
7	NW.	4	"	"	"	Dug	10	1,900	- 3	1,897	10	1,890	Glacial gravel	Hard, clear		D, S	Sufficient for 30 head stock.
8	SW.	9	"	"	"	Dug	27	1,901	- 24	1,877	27	1,874	Glacial sand	Soft, clear		D, S	Sufficient for 60 head stock.
9	NE.	9	"	"	"	Dug	30	1,908			30	1,878	Glacial clay	Hard, clear			Very poor supply.
10	NW.	11	"	"	"	Dug	12	1,900	- 10	1,890	12	1,888	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
11	SE.	12	"	"	"	Dug	22	1,900	- 18	1,882	22	1,878	Glacial clay	Hard, clear		D, S	Very poor supply.
12	NW.	13	"	"	"	Drilled	171	1,902	- 81	1,821	171	1,731	Glacial sand	Hard, clear		D, S	Sufficient for 80 head stock.
13	SE.	14	"	"	"	Dug	27	1,908	- 14	1,894	27	1,881	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 150 head stock.
14	SW.	16	"	"	"	Dug	18	1,900	- 16	1,884	18	1,882	Glacial gravel	Hard, clear		D, S	Sufficient for 30 head stock.
15	SE.	19	"	"	"	Dug	16	1,915	- 8	1,907	16	1,899	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
16	NE.	19	"	"	"	Dug	8	1,920	0	1,920	8	1,912	Glacial sand	Hard, clear		D, S	Sufficient for local needs; abundant supply.
17	NW.	20	"	"	"	Dug	30	1,912	- 7	1,905	30	1,882	Glacial clay	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
18	NE.	21	"	"	"	Dug	10	1,925	- 8	1,917	10	1,915	Glacial sand	Soft, clear		D, S	Sufficient for 100 head stock.
19	SW.	23	"	"	"	Dug	22	1,908	- 15	1,893	22	1,886	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
20	NW.	24	"	"	"	Dug	32	1,900	- 29	1,871	32	1,868	Glacial sand	Hard, clear		D, S	Insufficient for 40 head stock. Four dry holes to a depth of 80 feet.
21	SW.	25	"	"	"	Dug	34	1,900	- 28	1,872	34	1,866	Glacial clay	Hard, clear		D,	Sufficient for local needs.
22	SW.	26	"	"	"	Dug	18	1,904	- 17	1,887	18	1,886	Glacial sand	Hard, clear		D, S	Intermittent supply; yields only 8 pails a day.
23	NE.	29	"	"	"	Dug	30	1,930					Glacial drift				Dry hole; also many other dry holes.

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

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

WELL RECORDS—Rural Municipality of MARTIN NO. 122, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
24	NE.	30	14	32	1	Dug	30	1,928	- 21	1,907	30	1,898	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
25	SE.	31	"	"	"	Dug	17	1,935	- 12	1,923	17	1,918	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
26	NE.	32	"	"	"	Dug	10	1,922	- 6	1,916	10	1,912	Glacial clay	Hard, clear		D	Insufficient for local needs.
27	SW.	34	"	"	"	Dug	14	1,907	- 4	1,903	14	1,893	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
28	NW.	34	"	"	"	Dug	26	1,904	- 24	1,880	26	1,878	Glacial gravel	Soft, clear		D, S	Sufficient for 400 head stock.
29	NE.	36	"	"	"	Dug	20	1,840					Glacial drift				Dry hole; also many other dry holes.
1	NW.	1	14	33	1	Spring		1,898	0	1,898	0	1,898	Glacial gravel	Soft, clear		D, S	Sufficient for local needs; very strong supply.
2	SE.	2	"	"	"	Dug	18	1,900	- 10	1,890	14	1,886	Glacial sand	Hard, cloudy, iron, "alkaline"		D, S	Insufficient for local needs.
3	NE.	2	"	"	"	Dug	12	1,905	- 7	1,898	8	1,897	Glacial gravel	Soft, clear		D, S	Sufficient for 100 head stock.
4	SE.	3	"	"	"	Dug	12	1,904	- 8	1,896	8	1,896	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; abundant supply.
5	NW.	3	"	"	"	Dug	10	1,880	0	1,880	0	1,880	Glacial gravel	Hard, clear		D, S	Intermittent supply; good supply in wet years.
6	SE.	4	"	"	"	Dug	14	1,915	- 5	1,910	1	1,914	Glacial sand	Soft, clear		D, S	Insufficient supply; hauls water for stock.
7	SW.	4	"	"	"	Dug	9	1,911	- 4	1,907	1	1,910	Glacial sand	Soft, clear		D, S	Sufficient for 40 head stock.
8	NW.	4	"	"	"	Bored	112	1,910	- 40	1,870	112	1,798	Glacial drift	Hard, clear, iron		S	Sufficient for 300 head stock.
9	SW.	5	"	"	"	Dug	8	1,925	- 4	1,921	4	1,921	Glacial sand	Soft, clear		D, S	Sufficient for 50 head stock.
10	SE.	6	"	"	"	Dug	6	1,925	- 4	1,921	4	1,921	Glacial sand	Hard, clear		S	Sufficient supply; cannot be pumped dry.
11	SE.	7	"	"	"	Bored	35	1,940	- 25	1,915	33	1,907	Glacial sand	Hard, iron, clear		S	Insufficient for local needs.
12	NE.	8	"	"	"	Dug	23	1,940	- 12	1,928	12	1,928	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
13	SE.	10	"	"	"	Dug	25	1,920					Glacial drift				Dry hole; many similar dry holes.
14	SW.	10	"	"	"	Drilled	163	1,930	- 38	1,892	163	1,767	Glacial gravel	Hard, clear, iron		D, S	Sufficient for 200 head stock.
15	NW.	12	"	"	"	Dug	6	1,906	0	1,906	2	1,904	Glacial gravel	Soft, clear		D, S	Sufficient for local needs; very good supply.
16	SE.	14	"	"	"	Dug	14	1,905	- 6	1,899	2	1,903	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
17	NW.	14	"	"	"	Bored	97	1,912					Glacial drift				Dry hole.
18	SE.	15	"	"	"	Dug	40	1,920					Glacial drift				Dry hole.
19	SW.	15	"	"	"	Dug	16	1,930	- 13	1,917	12	1,918	Glacial sand	Soft, clear		D, S	Sufficient for 20 head stock.
20	NW.	16	"	"	"	Drilled	245	1,945	- 25	1,920	245	1,700	Glacial sand	Hard, iron		S	Good supply but plugged with sand.
21	NE.	16	"	"	"	Dug	16	1,935	- 11	1,924			Glacial gravel	Hard, clear		D, S	Intermittent supply; dry at times.

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 MARTIN, NO. 122, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
22	SE.	18	14	33	1	Bored	40	1,951	- 35	1,916	39	1,912	Glacial sand	Hard, iron, cloudy		D, S	Sufficient for domestic use only.
23	NW.	18	"	"	"	Bored	36	1,940	- 31	1,909	32	1,908	Glacial gravel	Hard, iron		D, S	Sufficient for local needs.
24	NE.	18	"	"	"	Drilled	97	1,946	- 28	1,918	97	1,849	Glacial gravel	Hard, clear, iron		S	Sufficient for local needs; abundant supply.
25	NW.	21	"	"	"	Drilled	141	1,940	- 7	1,833	7	1,833	Glacial sand	Soft, clear		D, S	Sufficient for 50 head stock.
26	SE.	22	"	"	"	Drilled	206	1,915	- 25	1,890	206	1,709	Glacial gravel	Soft, iron		D, S	Sufficient for 100 head stock.
27	NW.	22	"	"	"	Drilled	200	1,930	- 27	1,903	200	1,730	Marine shale	Hard, clear, iron		D, S	Sufficient for local needs.
28	NW.	24	"	"	"	Dug	17	1,905	- 2	1,903	12	1,893	Glacial gravel	Hard, clear		D, S	Sufficient for domestic use only.
29	NE.	26	"	"	"	Dug	12	1,910	- 5	1,905	5	1,905	Glacial gravel	Hard, clear		D, S	Sufficient for 100 head stock.
30	NW.	27	"	"	"	Drilled	100	1,925	- 25	1,900	100	1,825	Glacial gravel	Hard, clear, iron		D, S	Sufficient for 60 head stock.
31	NE.	28	"	"	"	Dug	14	1,930	- 3	1,927	10	1,920	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
32	SE.	29	"	"	"	Bored	31	1,950	- 11	1,939	18	1,932	Glacial gravel	Hard, clear		D, S	Sufficient for 50 head stock.
33	SW.	30	"	"	"	Bored	35	1,948	- 20	1,928	20	1,928	Glacial clay	Hard, clear		D, S	Insufficient for local needs; also another well.
34	NE.	30	"	"	"	Dug	8	1,947	- 5	1,942	0	1,947	Glacial sand	Soft, clear		D, S	Sufficient for local needs; good supply.
35	SW.	32	"	"	"	Dug	20	1,940	- 10	1,930	10	1,930	Glacial sand	Soft, clear		D, S	Oversufficient for 50 head stock.
36	NE.	32	"	"	"	Dug	34	1,930	- 30	1,900	34	1,896	Glacial sand	Hard, clear		D	Sufficient for domestic use only.
37	SW.	34	"	"	"	Dug	16	1,905	- 14	1,891	14	1,891	Glacial gravel	Hard, clear		D, S	Oversufficient for local needs.
38	NW.	35	"	"	"	Dug	20	1,920	- 16	1,904	12	1,908	Glacial gravel	Soft, clear		D, S	Oversufficient for local needs.
39	SW.	36	"	"	"	Dug	45	1,940	- 30	1,910	45	1,895	Glacial gravel	Hard, iron		S	Good in wet years, but poor in dry.
40	NW.	36	"	"	"	Dug	20	1,936	- 19	1,917			Glacial sand	Hard, clear		D	Insufficient for local needs; poor quality.
1	NE.	13	14	34	1	Dug	20	1,935	- 17	1,918	19	1,916	Glacial gravel	Hard, clear		S	Sufficient for local needs.
2	SE.	25	"	"	"	Bored	70	1,948	- 40	1,908	35	1,913	Glacial drift	Hard, iron		D, S	Sufficient for local needs.
1	SW.	1	15	32	1	Dug	20	1,870	- 4	1,866	4	1,866	Glacial gravel	Hard, clear, "alkaline"		D, S	Intermittent supply; insufficient in dry years.
2	NE.	1	"	"	"	Dug	10	1,840	- 5	1,835	5	1,835	Glacial gravel	Hard, clear		D, S, I	Sufficient for 60 head stock.
3	SE.	2	"	"	"	Dug	23	1,880	- 5	1,875	23	1,857	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 35 head stock.
4	NE.	2	"	"	"	Dug	35	1,885	- 30	1,855	9	1,876	Glacial sand	Hard, clear		D	Intermittent supply; dry in dry seasons.
5	SW.	3	"	"	"	Drilled	250	1,910	-160	1,750	250	1,660	Glacial sand	Hard, clear, iron		D, S	Sufficient for 50 head stock.
6	NW.	3	"	"	"	Drilled	290	1,910	-150	1,760	290	1,620	Glacial sand	Hard, clear, iron		D, S	Sufficient for 30 head stock.

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

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

WELL RECORDS—Rural Municipality of MARTIN, NO. 122, 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
7	NW.	4	15	32	1	Dug	30	1,910	- 28	1,882	28	1,882	Glacial sand	Hard, clear, "alkaline"		D	Insufficient for 33 head stock.
8	NE.	4	"	"	"	Drilled	262	1,925	-100	1,825	262	1,663	Glacial sand	Hard, soda, iron, clear		D, S	Sufficient for local needs.
9	SW.	5	"	"	"	Dug	22	1,940	- 19	1,921	16	1,924	Glacial gravel	Hard, clear		D	Sufficient for domestic use only.
10	NE.	6	"	"	"	Dug	40	1,880					Glacial drift	Hard, clear			Dry hole.
11	NW.	6	"	"	"	Dug	8	1,940	- 4	1,936	4	1,936	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; very strong supply.
12	NE.	7	"	"	"	Drilled	300	1,950	-150	1,800			Glacial gravel	Hard, cloddy, iron		D, S	Sufficient for local needs; very strong supply.
13	NE.	8	"	"	"	Drilled	213	1,915	-193	1,722	193	1,722	Glacial gravel	Hard, clear, iron		D, S, I	Oversufficient for local needs.
14	NE.	9	"	"	"	Dug	45	1,905	- 10	1,895	45	1,860	Glacial gravel	Hard, clear		D, S	Sufficient for 40 head stock.
15	SW.	10	"	"	"	Dug	40	1,875	- 33	1,842	19	1,856	Glacial gravel	Hard, clear		D, S	Insufficient for local needs.
16	NW.	10	"	"	"	Dug	50	1,900	- 30	1,870	30	1,870	Glacial sand	Hard, iron		D	Insufficient for local needs.
17	SE.	11	"	"	"	Dug	34	1,870	- 6	1,864	17	1,853	Glacial sand	Hard, clear		D	Insufficient for local needs.
18	SE.	12	"	"	"	Dug	32	1,830	- 30	1,800	30	1,800	Glacial gravel	Hard, clear, "alkaline"		D, S, I	Insufficient for local needs.
19	NE.	12	"	"	"	Dug	50	1,835	- 8	1,827			Glacial clay	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
20	NE.	13	"	"	"	Dug	26	1,840	- 20	1,820	20	1,820	Glacial gravel	Hard, clear, iron		D, S	Sufficient for 40 head stock.
21	SE.	13	"	"	"	Drilled	320	1,830	-160	1,670	314	1,516	Bearpaw shale	Soft, salty, clear		S	Oversufficient for local needs.
22	NE.	14	"	"	"	Dug	25	1,850	- 15	1,835	23	1,827	Glacial gravel	Hard, clear, "alkaline"		D, S, I	Insufficient supply; uses another well also.
23	SE.	15	"	"	"	Dug	30	1,880	- 15	1,865			Glacial sand	Hard, clear,		D, S, I	Sufficient for domestic use and some stock.
24	NE.	16	"	"	"	Dug	30	1,900	- 22	1,878	28	1,872	Glacial gravel	Hard, clear, iron, "alkaline"		D	Sufficient for domestic use; use dam for stock.
25	SW.	16	"	"	"	Dug	34	1,910	- 15	1,895	31	1,879	Glacial gravel	Hard, iron, clear		S	Sufficient for 30 head stock.
26	NW.	16	"	"	"	Dug	30	1,910	- 15	1,895	29	1,881	Glacial gravel	Hard, clear		D, S	Insufficient for local needs.
27	SE.	17	"	"	"	Dug	29	1,930	- 12	1,918	12	1,918	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient for 30 head stock.
28	SW.	18	"	"	"	Dug	32	1,955	- 27	1,928	30	1,925	Glacial gravel	Hard, clear		D, S	Oversufficient for 75 head stock.
29	NW.	20	"	"	"	Dug	26	1,926	- 20	1,906	15	1,911	Glacial gravel	Hard, clear, iron, "alkaline"		D, S	Sufficient for local needs.
30	NE.	20	"	"	"	Dug	50	1,910	0	1,910	40	1,870	Glacial gravel			D, S	Sufficient for local needs.
31	NW.	21	"	"	"	Dug	75	1,905	- 65	1,840	71	1,834	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
32	NE.	21	"	"	"	Dug	15	1,890	- 7	1,883	14	1,876	Glacial gravel	Hard, clear		D, S	Insufficient supply in dry seasons.

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 MARTIN NO. 122 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
33	NE.	23	15	32	1	Dug	19	1,850	- 11	1,839	17	1,833	Glacial sand	Hard, clear		D, S	Insufficient supply in dry seasons.
34	SE.	24	"	"	"	Dug	40	1,800	- 10	1,790	40	1,760	Glacial drift	Hard, clear, "alkaline"		D, S	Insufficient supply in dry seasons.
35	NE.	25	"	"	"	Drilled	250	1,810	- 40	1,770			Glacial sand	Hard, iron		D, S	Sufficient for 60 head stock.
36	SE.	25	"	"	"	Drilled	220	1,820	-160	1,660	200	1,620	Glacial sand	Hard, clear, iron		D, S	Sufficient for 50 head stock.
37	NW.	25	"	"	"	Dug	30	1,830	- 20	1,810	20	1,810	Glacial gravel	Hard, clear, "alkaline"		D, S	Insufficient supply in dry years.
38	SE.	27	"	"	"	Dug	11	1,865	- 6	1,859	6	1,859	Glacial gravel	Soft, clear		D, S, I	Oversufficient for local needs.
39	NE.	27	"	"	"	Dug	30	1,870	- 20	1,850	20	1,850	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
40	SW.	27	"	"	"	Dug	15	1,875	- 3	1,872	15	1,860	Glacial gravel	Hard, clear		D, S, I	Oversufficient for local needs.
41	NW.	28	"	"	"	Drilled	190	1,900	-125	1,775			Glacial sand	Hard, iron		D, S	Sufficient for 60 head stock.
42	NE.	28	"	"	"	Drilled	318	1,880	-160	1,720	318	1,562	Marine shale	Soft, clear, salty		S	Oversufficient for local needs.
43	SW.	28	"	"	"	Dug	20	1,890	0	1,890			Glacial clay	Soft, clear		S	Intermittent well, in ravine.
44	SE.	29	"	"	"	Dug	16	1,900	- 10	1,890			Glacial gravel	Hard, clear		D, S	Insufficient supply in dry years.
45	NW.	30	"	"	"	Dug	22	1,940	- 4	1,936	20	1,920	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
46	NE.	30	"	"	"	Drilled	340	1,925	-190	1,735	330	1,595	Marine shale	Hard, clear, salty		D, S	Sufficient for 60 head stock,
47	NW.	31	"	"	"	Dug	60	1,930	- 50	1,880	56	1,874	Glacial gravel	Hard, clear, iron		D, S, I	Oversufficient for local needs.
48	SE.	32	"	"	"	Dug	28	1,895	- 14	1,881	22	1,873	Glacial gravel	Hard, clear		D, S	Sufficient for 30 head stock.
49	NW.	34	"	"	"	Drilled	280	1,855	-205	1,650	280	1,575	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs, but not used at present.
50	SE.	35	"	"	"	Dug	20	1,825	- 10	1,815	20	1,805	Glacial sand	Hard, clear		S	Insufficient for local needs.
51	SW.	35	"	"	"	Dug	25	1,850	- 10	1,840	23	1,827	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
52	NE.	35	"	"	"	Dug	58	1,820	- 25	1,795	25	1,795	Glacial sandy clay	Hard, clear		D	Sufficient for domestic use only.
53	SE.	36	"	"	"	Dug	24	1,810	- 20	1,790	22	1,788	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
1	SE.	2	15	33	1	Dug	35	1,940	- 12	1,928	12	1,928	Glacial gravel	Hard, clear		D, S	Insufficient for local needs in dry years.
2	NW.	2	"	"	"	Dug	24	1,950	- 6	1,944	8	1,942	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock.
3	NE.	3	"	"	"	Drilled	83	1,955	- 30	1,925	83	1,872	Glacial sand	Hard, iron		D, S, I	Sufficient for local needs.
4	NW.	3	"	"	"	Drilled	95	1,965	- 49	1,916	93	1,872	Glacial sand	Hard, iron		D, S	Sufficient for local needs.
5	NE.	4	"	"	"	Dug	20	1,945	- 12	1,933	12	1,933	Glacial gravel	Hard, clear, iron		S	Oversufficient for local needs.
6	NE.	8	"	"	"	Drilled	150	1,940	- 50	1,890	120	1,820	Glacial sand	Hard, iron, clear, "alkaline"		D, S	Sufficient for 40 head stock
7	NE.	9	"	"	"	Bored	96	1,937	- 25	1,912	96	1,841	Glacial sand	Hard, iron		D, I	Sufficient for local needs. This is a town well. #.

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

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

WELL RECORDS—Rural Municipality of MARTIN, NO. 122, 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
8	NE.	9	15	33	1	Dug	90	1,937	- 30	1,907	90	1,847	Glacial sand	Hard, clear			C. P. R. Well. Used for engine boilers.
9	SE.	10	"	"	"	Dug	10	1,940	- 5	1,935	5	1,935	Glacial gravel	Hard, clear		D, S, I	Sufficient for 40 head stock.
10	SW.	11	"	"	"	Dug	20	1,960	- 15	1,945	15	1,945	Glacial sand	Hard, clear		D, S, I	Sufficient for local needs.
11	SE.	12	"	"	"	Dug	30	1,940					Glacial drift	Hard, clear		D, S	Insufficient for local needs.
12	SW.	12	"	"	"	Dug	20	1,950	- 12	1,938	16	1,934	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 26 head stock.
13	SW.	13	"	"	"	Dug	28	1,960	- 18	1,942	18	1,942	Glacial gravel	Hard, clear, "alkaline"		D, I	Oversufficient supply; has no stock.
14	NW.	13	"	"	"	Dug	28	1,950	- 24	1,926	24	1,926	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stodk.
15	NW.	14	"	"	"	Dug	10	1,940	0	1,940			Glacial gravel	Hard, clear		S	Insufficient for local needs in dry yeara.
16	NW.	15	"	"	"	Drilled	96	1,960	- 61	1,899	87	1,873	Glacial sand	Hard, iron		D, S, I	Sufficient for 30 head stock.
17	NE.	16	"	"	"	Drilled	98	1,950	- 45	1,905	98	1,852	Glacial sand	Hard, clear		D, S, I	Oversufficient for local needs.
18	SW.	16	"	"	"	Drilled	96	1,940	- 45	1,895	93	1,847	Glacial sand	Hard, clear		D, S	Oversufficient for local needs.
19	SE.	16	"	"	"	Drilled	154	1,950	- 40	1,910	150	1,800	Glacial sand	Hard, clear, "alkaline"		S	Casing now plugged with sand.
20	SE.	16	"	"	"	Dug	55	1,950	- 35	1,915	50	1,900	Glacial gravel	Hard, clear		D	Sufficient for domestic use only.
21	SE.	17	"	"	"	Bored	75	1,950	- 45	1,905			Glacial clay	Hard, clear		S	Insufficient for local needs.
22	SW.	20	"	"	"	Dug	20	1,950	- 12	1,938	14	1,936	Glacial gravel	Hard, clear		D, S, I	Sufficient for 40 head stock.
23	SW.	22	"	"	"	Drilled	96	1,960	- 45	1,915	86	1,874	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
24	NE.	23	"	"	"	Dug	16	1,950	- 10	1,940	14	1,936	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient supply in dry years.
25	SW.	23	"	"	"	Dug	12	1,945	- 8	1,937	8	1,937	Glacial clay	Soft, clear		D, S	Insufficient supply in dry years.
26	NE.	24	"	"	"	Dug	40	1,940	- 32	1,908	32	1,908	Glacial sand	Hard, clear		D, S	Insufficient supply in dry years.
27	SW.	24	"	"	"	Dug	19	1,950	- 14	1,936	14	1,936	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
28	SW.	25	"	"	"	Dug	20	1,950	- 14	1,936	17	1,933	Glacial sand	Hard, clear		D, S, I	Sufficient for 15 head stock.
29	SE.	26	"	"	"	Dug	27	1,940	- 18	1,922	27	1,913	Glacial gravel	Soft, clear, iron		D, S, I	Oversufficient for local needs.
30	NW.	28	"	"	"	Dug	38	1,960	- 30	1,930	38	1,922	Glacial sand	Hard, clear, iron		S	Sufficient for 100 head stock.
31	NW.	29	"	"	"	Bored	84	1,960	- 29	1,931	84	1,876	Glacial sand	Hard, clear, iron		D, S, I	Sufficient for 100 head stock.
32	NW.	32	"	"	"	Bored	40	1,960	- 30	1,930			Glacial drift	Hard, clear, "alkaline"		D, S	Oversufficient for local needs.
33	NE.	32	"	"	"	Dug	20	1,960	- 12	1,948	18	1,942	Glacial sand	Hard, clear		D, S	Sufficient for 30 head stock.
34	NE.	33	"	"	"	Drilled	150	1,960	- 45	1,915	150	1,810	Glacial sand	Hard, iron, clear		D, S, I	Oversufficient for local needs.
35	NW.	34	"	"	"	Bored	42	1,962	- 22	1,940	40	1,922	Glacial gravel	Hard, iron, clear, "alkaline		D, S	Sufficient for 50 head stock.
36	NW.	36	"	"	"	Drilled	80	1,960	- 50	1,910	80	1,880	Glacial gravel	Hard, clear		D, S	Sufficient for 50 head stock.
37	SW.	36	"	"	"	Dug	20	1,950	- 16	1,934	16	1,934	Glacial gravel	Hard, clear		D, S	Oversufficient 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.