CANADA
DEPARTMENT OF MINES

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

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF CALEDONIA No. 99 SASKATCHEWAN

BY

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

Water Supply Paper No. 2

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INTRODUCTION

Lack of rainfall during the years 1930 to 1934 over a large par. 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.

<u>Escarpment</u>. A cliff or a relatively steep slope separating level or gently sloping areas.

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

<u>Glacial Drift</u>. 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) <u>Ground Moraine</u>. A boulder clay or till plain (includes areas where the glacial drift is very thin and the surface uneven).

(2) <u>Terminal Moraine or Moraine</u>. 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) <u>Glacial Outwash</u>. Sand and gravel plains or deltas formed by streams that issued from the continental ice-sheet.

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

<u>Ground Water</u>. Sub-surface water, or water that occurs below the surface of the land.

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

<u>Impervious or Impermeable</u>. 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.

<u>Belly River Formation</u>. 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.

<u>Marine Shale Series</u>. 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 Caledonia covers an area of 324 square miles in the south-central part of Saskatchewan. It is a nearly square block consisting of nine townships described as tps. 10, 11, and 12, ranges 19, 20, and 21, W. 2nd mer. The Moose Jaw-Weyburn line of the Canadian Pacific railway, on which is situated the town of Milestone, extends diagonally across the northeast corner, and the Moose Jaw-Radville branch of the Canadian National railways cuts across the extreme southwestern part of the municipality. A low escarpment forms an irregular topographic feature extending diagonally across the municipality from the southwest corner of township 12, range 21, to the southeast corner of the municipality. This escarpment formed a part of the southwestern shore-line of a glacial lake which many thousands of years ago occupied a large area in southeastern Saskatchewan. The northeastern half of this municipality is covered by lake deposits. Only a few gentle rolls occur over an otherwise remarkably flat surface, which for many miles varies by not more than 20 feet from an elevation of 1,900 feet above sea-level. The southwestern half of the municipality is covered by glacial till with a more irregular rolling type of land surface. Moosejaw creek and Avonlea creek, and their small, intermittent tributaries, constitute the only drainage features of the area.

Ground water is not plentiful and much of it has a high dissolved mineral salt content and is unsuitable for domestic and stock-raising requirements. Ground water supplies are derived from stream deposits, from glacial drift, and from the Ravenscrag and Eastend bedrock formations. The dark grey Marine shale underlies the Ravenscrag and Eastend formations in the extreme southwest corner of the municipality and the glacial deposits throughout the remainder of the area. The generally impervious nature of the shale and the very poor quantity of the small seepages derived from it confine the search for water, suitable for farm use, to the overlying bedrock formations and the unconsolidated Recent and glacial deposits.

Water-bearing Horizons in the Unconsolidated Deposits

Stream deposits occur along the narrow valleys of Moosejaw and Avonlea creeks and several of their larger tributaries and along the bottoms of many of the ravines cut into the face of the escarpment. These deposits form the best source of water for farm use in the northeastern half of the municipality. Dug or bored wells sunk to depths of 15 to 20 feet along any of the streams in this part of the area can be expected to yield sufficient water for 15 to 25 head of stock. The dissolved mineral salt content of the water varies considerably within short distances, depending upon the character of the material underlying the stream deposits. Water from this source nearly always contains sodium sulphate (Glauber's salt), but is not usually in sufficient quantity to exclude the water from household use. Stream deposits in the bottoms of the ravines along the escarpment are usually coarser than deposits along the eastern creeks. Fairly large supplies of good water are to be expected at shallow depths from these gravels. Care should be taken not to sink wells through the gravels into the immediately underlying Marine shale bedrock which usually contains a concentration of mineral salts sufficient to contaminate otherwise drinkable water. The stream deposits are very thin along the creek near the town of Dummer and in the extreme northwest corner of the municipality, where the Marine shale either appears at the surface or is encountered at depths of less than 10 feet. In these localities very shallow dugouts excavated in the silt and gravel beside the creeks, in the narrow valleys yield a water with a lower mineral salt content than is obtained from dug wells.

Many thousands of years ago the dark grey Marine shale that now forms the bedrock beneath the drift occurred at the surface throughout almost the entire municipality. The ground surface was rough and irregularly dissected by narrow ravines and resembled somewhat the low escarpment in the west-central part of the municipality. With the southwesterly advance of the continental ice-sheet across Saskatchewan a layer of glacial drift composed largely of boulder clay was deposited over the area, filling the previously existing ravines and valleys. The thickness of the deposits varies from place to place. Although it is nearly 40 feet thick over parts of this municipality it is scarcely more than a foot or two thick over the shale bedrock along parts of the low escarpment refered to above. With the gradual melting and retreat of the ice-sheet a lake was formed covering a large area in the south-central part of the province. The escarpment formed a part of the western shore-line of this lake. Fine silts and sands washed into the lake and gradually formed the layer of bluish grey lake clays that now covers the northeastern half of the municipality, with gradually increasing thickness from a few feet along the base of the escarpment to 40 or 50 feet in the northeast corner of the area. The clay is very compact and generally impervious to the passage of ground water and only very small seepages of highly mineralized, undrinkable water can be expected from it. The impervious nature of the clay, however, makes dugouts excavated in it suitable for retaining a water supply for considerable periods of time. Both before and during the deposition of the lake clay, streams flowing from the highland to the west transported considerable amounts of sands and gravels into the area. These deposits now appear as thin beds interspersed through the lake clay or lying between the lake clay and the underlying boulder clay or between the boulder clay and the Marine shale.

Several low, generally northwesterly trending, ridges occur over the northeast half of township 11, range 19, and along the eastern border of township 11, range 20. These ridges are composed of sandy clay or irregular beds of sands and gravels.

Within the area bounded by the "A" line shown on Figure 1, wells sunk to shallow depths on or near these ridges generally yield fair supplies of water in sufficient quantities for domestic needs and for 5 to 25 head of stock. Thin layers of sand occur between the yellow lake clay and the underlying blue-grey boulder clay over the northeastern half of township 12, range 20 and the west half of township 12, range 19. This sand is encountered at depths of 35 to 65 feet. Many wells sunk to this horizon yield supplies of only slightly mineralized water in sufficient quantities for local requirements. The sand bed has been traced to the north and east of this area, but its water yield is very small and generally too highly charged with mineral salts in solution for farm use.

A buried stream channel not exceeding 2½ miles in width is believed to extend northwesterly across the southern part of township 12, range 19, from the southeast corner north to its western boundary. Thence the main channel extends northeasterly beyond the central part of the northern boundary of the township. Several wells sunk to depths of 85 to 165 feet yield fairly large supplies of hard water from a thin sand bed on the bottom of the buried channel. The mineral salt content of the water is low, and the water is quite suitable for human consumption. The water is under hydrostatic pressure, and rises in wells to within 50 feet of the surface. Many dry holes sunk to depths of 300 to 500 feet at Milestone, and to the northeast and east, indicate that this channel does not underlie the eastern part of township 12, range 19.

Lake clay, and possibly underlying boulder clay, immediately overlies the Marine shale in township 12, range 21, SW.½, tp. 12, range 20, and NE.½, tp. 11, range 20. Little water can be expected at any depth from wells not located near stream courses in these areas.

Isolated pockets of sand and gravel interspersed through the boulder clay act as water-bearing beds in the till covered southwestern half of the municipality. Since these pockets do not form continuous horizons over large areas, and their presence is not always indicated on the surface, careful prospecting is often necessary before an adequate water supply is obtained. Shallow wells sunk on or near knolls and low ridges generally yield soft, or medium hard, drinkable water. The supply from wells so located is reported to be in all places sufficient for domestic needs, and in many places the yield is in excess of 2,000 gallons a day. Here, as in other areas throughout this municipality, wells should not be sunk through the drift into the Marine shale, which underlies this part of the municipality at depths varying from 10 to 30 feet.

Although boulder clay is known to underlie the lake clay throughout the northeastern half of the municipality few sand and gravel pockets suitable for the retention of any large amount of water occur in it. The majority of the wells sunk through the lake clay into the boulder clay in this part of the area are dry.

Water-bearing Horizons in the Bedrock

The Ravenscrag formation, consisting of yellowish brown clays and shales, blue-grey sand, and thin coal seams, immediately underlies the drift in the extreme southwestern part of township 10, range 21. Fairly large supplies of soft, "soda-bearing" water are obtained from the coal seams and sandy beds at depths not exceeding 50 feet. This formation is underlain in turn by some 25 feet or more of fine, grey sands and silts which belong to the Eastend formation. This formation yields small quantities of water similar in quality to that obtained from the overlying Ravenscrag. The Eastend grades downward into the Marine shale series at depths of 60 to 75 feet in the extreme southwest corner of the municipality. Throughout the remainder of the municipality the Marine shale forms the uppermost bedrock. It is encountered at depths not exceeding 25 feet throughout the greater part of the area west of the escarpment, and comes to the surface at many points along the face of the escarpment and along the sides of Avonlea Creek valley. The shale underlies the lake clays and boulder clay in the northeastern half of the municipality, the depth increasing gradually in a northeasterly direction from the escarpment. It is struck at depths of 30 to 40 feet at the northern boundary of the area and along the western edge of the buried pre-glacial channel. Along the bottom of this channel the shale probably lies from 175 to 200 feet below the surface, but over the eastern part of township 12, range 19, it is within 90 feet of the surface. The shale is easily recognized in drilling by its dark grey colour when wet and by the well-jointed, roughly cubical fragments into which it crumbles on drying. These fragments often have an orange or reddish coating of iron oxide. Water from the Marine shale contains large amounts of Glauber's salt (Na_2SO_4) and common salt (NaCl) in solution. These mineral salts impart a very bitter taste to the water, and render it unfit for farm use. Sinking of wells into the shale for the purpose of obtaining supplies for domestic or stock-raising requirements is, therefore, not recommended.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 10, Range 19

Ground water supplies of this township are confined almost entirely to the thin beds of silt, gravel, and sand occurring along the sides of small intermittent creeks, which drain northeasterly from the ravines along the face of the low escarpment that trends in a northwesterly direction across the township. Fairly extensive beds of gravel occur in the bottoms of the larger ravines and as flood-plain deposits along the base of the escarpment. Shallow wells sunk into these gravels yield large quantities of medium hard, drinkable water. The supply in some instances is sufficient for more than 100 head of stock. Farther away from the escarpment, along the creeks, the stream deposits become more silty and the water supply obtainable is materially less. Lake clays cover a small area in the northeast corner of the township. Although no wells have been sunk in this area, it is probable that small supplies of water are obtainable from sandy beds interspersed through the clay at depths not exceeding 25 feet. The remaining part of the township is covered by a very thin layer of glacial till or boulder clay, which directly overlies the Marine shale. Both the boulder clay and the shale are almost entirely lacking in ground water. It is probable that little water will be found in this township in areas remote from the stream courses, with the possible exception of the more rolling, drift-covered area in the extreme southwest corner of the township. The Marine shale underlies the entire township at depths varying from a foot or two along the escarpment to approximately 30 feet along the eastern border. Many wells have been sunk to depths of 30 feet or more into the shale without obtaining water. It is improbable that any water suitable for farm use will be obtained from the shale in any part of this township.

Township 10, Range 20

Ground water supplies of this township are obtained from sand and gravel deposits bordering the creeks, and from the mantle of glacial drift in the southwestern half of the township, at depths which probably nowhere exceed 30 feet. Supplies derived from shallow wells dug into the stream gravel are usually sufficient for 25 to 30 head of stock. Dams are built at intervals along the creeks when larger supplies are required. The water is hard and quite high in dissolved sulphate salts and is generally unsuitable for household use. The glacial drift overlying the bedrock is very thin in the areas between the creeks in the northeastern half of the township. Hence it is improbable that adequate supplies of water for either domestic or stock requirements will be found in these intervening areas. The surface of the southwestern half of the township is characterized by low knolls and northwesterly trending sand and gravel ridges. Wells sunk to depths of 30 feet or less on or near these slight prominences within the area, outlined by the "B" line on Figure 1, yield medium hard, drinkable water in quantities sufficient for at least 15 head of stock. The areas between the knolls are underlain by boulder clay containing only occasional small pockets of gravel. Wells dug into the clay generally yield only small seepages of highly mineralized water. Dugouts excavated in this area hold water for considerable periods of time, due to the impervious nature of the boulder clay.

The Marine shale bedrock underlies the till at depths of about 30 feet in the southwestern half of the township. It is encountered at gradually decreasing depths in a northeasterly direction and outcrops along the sides of many of the stream valleys in the northeastern corner of the township. Several holes dug into the shale were either dry or yielded only small seepages of bitter, salty water, unfit for domestic or stock use. Further digging or drilling into the shale is not recommended.

Township 10, Range 21

Ground water is not plentiful in this township. The supplies are derived from thin layers of sand and gravel which occur sparingly along Avonlea creek and some of its tributaries; from the glacial drift, and from the Ravenscrag and Eastend formations in the southwest corner of the township. Several wells dug to depths of less than 10 feet in the small beds of gravel along the upper reaches of Avonlea creek yield sufficient quantities of slightly mineralized water for household use and for a few head of stock. Water from wells similarly situated along the northern part of the creek is invariably too high in dissolved Glauber's salt to be used in the household, and it is reported to be unsatisfactory for watering stock. A thin layer of glacial drift, consisting of yellow and blue boulder clay with occasional isolated pockets of sand and gravel, covers the interstream areas. The drift rarely is more than 10 to 15 feet thick. Sand and gravel pockets are fairly numerous in the glacial drift along the eastern edge of the township and occasionally form low knolls and ridges. Shallow wells dug on or near these ridges generally yield enough drinkable water for local farm requirements. Throughout the remainder of the township, with the exception of the southwest quarter, the gravel pockets are small and often many holes are dug before even a small supply is obtained. This water is usually mineralized, but in most places can be used for drinking.

The Ravenscrag and Eastend formations immediately underlie the glacial drift in southwestern sections of the township. Fairly large supplies of soft water are obtainable from these formations at depths of 20 to 40 feet in sections 7 and 18, and at slightly greater depths in section 6. The water contains considerable amounts of mineral salts in solution, but is usually drinkable. Care should be taken in drilling not to penetrate the underlying Marine shale which in this part of the area is encountered at an elevation of about 2,120 feet above sea-level, or at a depth of 100 feet in the extreme southwest corner. Throughout the remainder of the township the shale is struck at depths of 15 to 20 feet except along Avonlea creek just east of the town of Dummer where the shale is exposed at the surface. Small supplies of water are obtainable from the shale, but the high sodium sulphate and common salt content of the water renders it quite unfit for household or stock use. Sinking of wells in this township should, therefore, be confined to the unconsolidated deposits, or to the Ravenscrag and Eastend formations, which are confined to the southwestern corner of the township. It is unlikely that deep drilling in any part of the township will yield satisfactory supplies for either household or stock use.

Township 11, Range 19

The entire ground water supply of this township is derived from the thin beds of sands and gravels that occur along Moosejaw creek and from glacial deposits that cover the remainder of the area. Shallow wells sunk to depths of 10 to 20 feet in the creek gravels yield sufficient water for 10 to 15 head of stock. The yield from these wells has decreased during the drought period but as yet they have never gone completely dry. The water is hard and has a high dissolved mineral salt content, but in general it is suitable for household use.

A layer of blue-grey lake clay of undetermined thickness, though probably not exceeding 40 feet, covers all but the southwestern third of the township. Small layers of sands and gravels occur irregularly interspersed through this clay and in many places form low knolls and ridges. Wells sunk to depths of 25 to 40 feet on or near these small prominences in general yield good supplies of only slightly mineralized, drinkable water. This horizon, which is confined to an area indicated on Figure 1 by the "A" line, is considered to be the best source of ground water in the township.

The southwestern third of the township is covered by 10 to 30 feet of glacial drift, composed largely of yellow boulder clay. Sand pockets are not numerous in the drift and the boulder clay itself does not generally yield more than small seepages of hard, highly mineralized water. The Marine shale bedrock underlies the drift at depths varying from 8 to 30 feet. Practically all holes drilled or bored into the shale are dry or produce only small quantities of salty water containing large amounts of Glauber's salt. It is improbable that any adequate supplies of drinkable water will be found either in the mantle of drift or in the underlying bedrock of this part of the township. In the north-eastern half of the township, no deep drilling has been done so that the depth to the Marine shale has not been determined.

Two wells located in NE.$\frac{1}{4}$, section 32, and NW.$\frac{1}{4}$, section 35, yield fair supplies of hard, iron-bearing water from depths of 116 and 190 feet, respectively. It is probable that they do not indicate the presence of extensive aquifers in this township, but rather mark the southern boundary of a buried stream channel that is believed to extend across the township to the north.

Township 11, Range 20

Ground water supplies in this township are confined almost entirely to the beds of sand and gravels that are encountered at depths of 10 to 15 feet along the sides of the creeks and in the bottoms of the larger ravines. Water from this source is soft or medium hard and usually only slightly mineralized and is suitable for household use. The yield varies with the seasonal fluctuations of the creeks. It is generally not sufficient for more than 10 head of stock. Dugouts have been excavated and small dams built across the ravines where large supplies are required. Efforts to locate water in the areas away from creeks, both on the low escarpment and over the lake clay covered, flat lowlands of the northern half of the township, have proved almost entirely fruitless. The upland area lying to the southwest of the escarpment is covered by a thin layer of boulder clay, rarely exceeding 15 feet in thickness, in which only occasional small layers of water-bearing sands and gravels occur. Many dry holes may be dug entirely in clay before a water-bearing sand pocket is struck. It is improbable that any large supplies of drinkable water will be obtained from the drift, or from the dark grey Marine shale immediately underlying it, anywhere in this part of the township.

A layer of heavy, blue-grey lake clay 35 to 40 feet thick covers the entire northern half of the township. Wells sunk into the clay yield only small seepages of highly mineralized water, unfit for domestic use. A few knolls and ridges occur in sections 24 and 25. These knolls are generally composed of lake clay interspersed with irregular pockets of sands and gravels. Wells located on or near these knolls and ridges frequently yield small supplies of drinkable water. The Marine shale is everywhere encountered immediately beneath the clay in this part of the township. Here, as in the southwestern half of the township, the poor water conditions encountered in the shale make the sinking of wells into it inadvisable.

Township 11, Range 21

Supplies of ground water in this township, suitable for domestic use and for watering of stock, are largely confined to the beds of sand and gravel that occur in the bottoms of coulées in the "badland" area along the low escarpment and along the few intermittent streams in the northeastern lowlands. Very shallow wells dug in the coulées yield a medium hard water containing small amounts of Glauber's salt. The supply is sufficient for household requirements and for a few head of stock. Where larger supplies are required dams, to conserve the spring run-off, can be constructed to advantage across the coulées. Wells along the stream channels over the lowlands generally yield water of similar quality and in quantities sufficient for local needs. It is improbable that the areas lying between the coulées throughout the "badlands" area will produce more than very small supplies of water due to the proximity of the Marine shale bedrock to the surface. The central and eastern parts of the township are covered by a mantle of heavy yellow and blue boulder clay which contains occasional isolated sand pockets. Wells sunk into the clay yield small seepages of bitter, highly "alkaline" water that is unfit for household requirements and is considered undesirable for stock. Sand pockets yield small supplies of water of much better quality. It may be necessary, however, to sink several wells before a productive sand pocket is encountered. Natural sloughs and excavated dugouts hold water for considerable periods of time in this part of the township on account of the impervious nature of the drift. Many farms derive their household supplies from shallow seepage wells sunk near sloughs or dugouts. Small ridges and knolls composed of sandy clay, and occasionally small pockets of gravel, occur in the southeastern corner of the township within the area indicated on Figure 1 by the "B" line. Small quantities of good water have been obtained from shallow wells sunk on, or near, similar knolls in the townships adjacent on the southeast and east. It is probable that wells similarly located in this township will prove to be equally productive. The Marine shale underlies the glacial deposits of the entire township at depths not generally exceeding 30 feet, and outcrops along the sides of many of the coulées in the "badlands" area and along Avonlea creek in the southwest corner. Of the many wells that have been sunk into the shale in adjoining townships the majority are dry. A few wells, however, yield a bitter, salty water with a high dissolved mineral salt content. It is altogether probable that similar conditions exist in the Marine shale bedrock in this township.

Township 12, Range 19

Ground water supplies of this township are derived from three horizons in the unconsolidated deposits that cover the area. These horizons are limited in their areal extent. There are two large areas in the northwest and northeast corners of the township in which a large number of wells have been sunk without obtaining adequate supplies of water.

The first water-bearing horizon is confined to the thin layers of sands and gravels that are encountered at depths not exceeding 40 feet along the valley of Moosejaw creek. Wells sunk into these deposits yield sufficient quantities of hard, slightly mineralized water for local domestic and stock requirements. Dams have been constructed across the creek where large supplies are required. The remainder of the area is covered by 20 to 30 feet of heavy blue lake clay, which is in turn underlain by 75 to 100 feet of boulder clay. The second productive horizon occurs in the fairly extensive layers of sand and gravel that lie at the contact of the lake clay and the underlying boulder clay throughout the southwestern and north-central parts of the area. Wells sunk to approximate depths of 30 to 40 feet to these sand beds yield sufficient supplies of water for average farm requirements. The water in many places contains appreciable amounts of sodium sulphate and other mineral salts in solution, but is not usually objectionable for use in the household. This horizon is not productive in the northern corners of the township. The third horizon is confined to a thin bed of sand that lies along the rock bottom and sides of a buried pre-glacial channel which has an average width of 2½ miles and extends from the southeast corner of the township to the centre of its western boundary, and thence northeasterly to beyond the centre of the northern boundary of the township. The bottom of the channel is at an approximate depth of 150 feet from the surface, and its sides slope gradually upward to within about 60 feet of the surface at the edges of the channel. The supply of water derived from this sand bed is usually quite sufficient for local requirements. The water is under hydrostatic pressure and rises in wells to within 60 feet of the surface. It is reported to be of good quality, and comparatively low in dissolved mineral salts.

The Marine shale is believed to lie immediately beneath the sand bed at the bottom of the drift-filled channel. Throughout the remainder of the township the shale is encountered at depths ranging from 40 to 60 feet from the surface. Many wells have been sunk into the shale to depths of 100 to 300 feet, and one well located in SW.$\frac{1}{4}$, section 14, was drilled to a depth of 505 feet without encountering more than small seepages of bitter, salty water. Further drilling into the bedrock in any part of the township will not likely produce adequate supplies of water. The amount of deep drilling that has been done in the town of Milestone seems to indicate that no adequate supplies will be found at depth. Careful prospecting for sand beds in the lake clay or at the contact between the lake clay and the boulder clay offers better possibilities, but here again prospects are by no means good.

Township 12, Range 20

The thin beds of sand and gravel encountered at depths of 15 to 35 feet along the valley of Moosejaw creek provide the best sources of water for domestic and stock use in this township. The water is medium hard and contains varying amounts of mineral salts in solution, but in few places is the water considered unsuitable for drinking. The supply obtainable is usually sufficient for local farm needs and some wells are reported to yield as much as 2,000 gallons a day. Throughout the rest of the township considerable difficulty is experienced in obtaining adequate quantities of water sufficiently low in mineral salts to be suitable even for the watering of stock. A blanket of yellow to blue-grey lake clay covers the entire area to depths of 10 to 35 feet. This in turn is underlain by boulder clay in which occur occasional small pockets of sand and gravels. The boulder clay is very thin throughout the part of the township lying southwest of Moosejaw creek and the lake clay in many places rests directly upon the Marine shale at depths of 15 to 35 feet from the surface. It is improbable that more than small seepages of undrinkable "alkaline" water will be found in wells sunk either into the lake clay or the underlying Marine shale in this area. Water conditions are appreciably better to the northeast of the creek. Several fairly extensive sand and gravel pockets are encountered in the boulder clay underlying the lake clay. Wells sunk to depths of 40 to 65 feet in all but the extreme northern sections of the northeastern half of the township encounter these horizons, which yield ample supplies of water for local stock requirements. The water is hard, "alkaline", and iron-bearing, and not always suitable for human consumption. It is not definitely known whether these sand horizons occur in the lower part of the boulder clay or rest immediately upon the surface of the underlying Marine shale bedrock. Many holes have been sunk to depths of 100 to 350 feet into the Marine shale in the northern sections without yielding more than mere seepages of bitter water that is unfit for man or stock. The Marine shale outcrops along the sides of ravines in the southwestern corner of the township and is encountered at gradually increasing depths in a northeasterly direction. It occurs at an approximate depth of 65 feet in the northeastern part of the township. Two wells located in the southwest and southeast quarters of section 24 produce fairly large supplies of drinkable water from sand beds, at depths of 108 and 160 feet, respectively. It is improbable that these wells are producing from aquifers having any large areal extent in this township, but rather from a western branch of the buried pre-glacial stream channel that extends across the township adjacent to the east and underlies only a small area in this township. Deep drilling for water seems inadvisable in all parts of this township due to the non-water-bearing nature of the underlying Marine shale.

Township 12, Range 21

Considerable difficulty is experienced in obtaining supplies of water adequate for local requirements throughout the greater part of this township. This is due to the fact that both the glacial deposits and the underlying bedrock are composed almost entirely of impervious beds without intervening layers of sand or gravel necessary for the storage of any large amounts of ground water.

A few thin beds of sands and gravels are known to lie along the beds of the small, intermittent creeks that trend in a northeasterly direction from the upland area in the southwestern part of the township. Dams constructed in the larger coulées that occur along the low, northwesterly trending escarpment conserve sufficient supplies for household use, and for a few head of stock throughout the summer months. The entire area, with the exception of the extreme southwestern corner, is overlain by approximately 30 feet of heavy yellow or blue lake clay containing very little if any sand or gravel. It is improbable that wells sunk into this material will yield more than very small seepages of highly mineralized water which is unfit for household use and not in sufficient quantities for more than a few head of stock. A more sandy phase of the lake clay is known to exist in sections 4, 8, and 9, but as the two wells sunk in this area are dry holes the water possibilities are not encouraging. A well producing small quantities of medium hard water from sand at a depth of 20 feet in SE.$\frac{1}{4}$, section 10, may derive its supply from an eastward extension of this sandy phase of the clay, or from an isolated sand pocket.

The Marine shale underlies the entire township at an average depth of about 30 feet. The surface of the shale rises slightly toward the southwest corner, where it outcrops along the sides of many of the coulées. Holes have been bored or drilled to depths of 50 to 100 feet into the shale in many sections throughout the township. The majority of these wells were dry and others yielded only small supplies of bitter, salty water which is unfit for drinking and generally unfit for stock watering. It is improbable that deeper drilling into the shale in any part of the township will produce supplies of water suitable for farm use.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF CALEDONIA, NO. 99, SASKATCHEWAN

Township	10	10	10	11	11	12	12	12	12	Total No. in Municipality
West of 2nd mer. Range	19	20	21	19	20	21	19	20	21	
Total No. of Wells in Township	19	23	45	90	19	16	103	27	20	362
No. of wells in bedrock	10	2	27	45	2	9	55	7	16	173
No. of wells in glacial drift	6	18	15	35	9	5	42	16	4	150
No. of wells in alluvium	3	3	3	10	8	2	6	4		39
Permanency of Water Supply										
No. with permanent supply	6	17	32	26	15	10	39	19	5	169
No. with intermittent supply	4	4	3	7		2	11		2	33
No. dry holes	9	2	10	57	4	4	53	8	13	160
Types of Wells										
No. of flowing artesian wells										
No. of non-flowing artesian wells		3	7	2		2	4	7		25
No. of non-artesian wells	10	18	28	31	15	10	46	12	7	177
Quality of Water										
No. with hard water	8	17	32	32	13	12	50	19	7	190
No. with soft water	2	4	3	1	2					12
No. with salty water		1	12	1	1	8	5	2	5	35
No. with alkaline water	3	13	24	21	6	10	17	7	5	106
Depths of Wells										
No. from 0 to 50 feet deep	19	22	44	84	19	16	39	13	11	267
No. from 51 to 100 feet deep				1			38	7	8	54
No. from 101 to 150 feet deep		1		2			16	1		20
No. from 151 to 200 feet deep				2			6	3	1	12
No. from 201 to 500 feet deep				1			3	3		7
No. from 501 to 1,000 feet deep			1				1			2
No. over 1,000 feet deep										
How the Water is used										
No. usable for domestic purposes	8	14	18	28	12	4	37	13	5	139
No. not usable for domestic purposes	2	7	17	5	3	8	13	6	2	63
No. usable for stock	9	19	24	31	14	9	44	18	5	173
No. not usable for stock	1	2	11	2	1	3	6	1	2	29
Sufficiency of Water Supply										
No. sufficient for domestic needs	8	13	28	32	15	12	41	17	5	171
No. insufficient for domestic needs	2	8	7	1			9	2	2	31
No. sufficient for stock needs	7	12	17	23	11	10	37	16	4	137
No. insufficient for stock needs	3	9	18	10	4	2	13	3	3	65

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.

Analysis of Water Samples from the Municipality of Caledonia, No. 99 Saskatchewan

NO.	LOCATION					Depth of Well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS										Source of Water
	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	Fe	
1.	SW.	24	12	20	2	175	2,980	1,000	1000	nil	253	150	120	173	1599	947	2,980	150	87		516		1,644	418		x 1

Water samples indicated thus, x 1, are from glacial drift.
Analyses are reported in parts per million.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).

For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

As only one sample of ground water was collected and analysed from this municipality the following discussion of the character of the water derived from the unconsolidated deposits and the bedrock formations is based largely on generalizations made from analyses of water collected in adjoining municipalities, in which the Recent and Glacial deposits and bedrock formations show a close similarity.

Water obtained from shallow wells sunk into the Recent sand and gravel deposits along Moosejaw creek and its tributaries and along the upper part of Avonlea creek is hard, and although containing small amounts of mineral salts in solution is of better quality on the whole than supplies derived from either the lake clay or boulder clay. Such water, if uncontaminated by decaying organic matter, is quite suitable for domestic use. Along the northern part of Avonlea creek and in the bottoms of many of the coulees along the escarpment the water derived from the Recent deposits is of very poor quality. The water has been rendered unfit for domestic use by small seepages of highly mineralized water from the Marine shale bedrock outcropping in these areas. In several places both in the coulées and along Avonlea creek the continued use of this water is reported to have had an injurious effect upon stock.

The small seepages of ground water derived from the compact lake clay are in general much more highly mineralized than water from the stream deposits. The mineral salts most commonly found in waters from the clays are the following, their relative quantities decreasing in the order given: sodium sulphate (Na_2SO_4), magnesium sulphate ($MgSO_4$), calcium carbonate ($CaCO_3$), calcium sulphate ($CaSO_4$), magnesium carbonate ($MgCO_3$), sodium chloride ($NaCl$), and sodium carbonate (Na_2CO_3). The water is generally exceedingly hard, having a total hardness in some places of over 1,000 parts per million. The dissolved sulphate salt content is also high.

Several analyses of waters from the clays in different parts of the lake basin show an excess of 2,000 parts per million of combined sodium and magnesium sulphate in solution. Water containing more than 1,000 parts per million of these two salts often has a laxative effect on humans, tends to produce scour in stock, and is not suitable for watering plants. Water derived from the compact boulder clay is generally similar to supplies from the lake clays. Sand or gravel pockets interspersed through the lake clays and the boulder clay yield a water that is usually very hard, the total hardness often being in excess of 750 parts per million. The combined sulphate salts are not generally high, however, and where these deposits are encountered at shallow depths they yield water that is suitable for both domestic and stock use.

The glacial deposits, and particularly the till, show marked variations in character within short distances and at different depths. Corresponding variations in the quality of the ground water derived from the drift are to be expected. One well may yield a moderately hard, slightly mineralized water, whereas another sunk to a similar depth only 100 feet away may give water that is too high in dissolved sulphate salts to be used either for drinking or watering stock. It should not be inferred, therefore, that if water of poor quality is struck in one well, such conditions must necessarily exist over a large area.

Water obtained from the basal sand beds of the pre-glacial stream channel that extends across the northeastern township of the municipality is very hard, due to the presence of calcium and magnesium salts, but shows considerable variation in the amounts of the other mineral salts present. The sulphate salts and common salt form the greater part of total solids in solution in waters from the channel. Iron forms another objectionable constituent in waters from many wells tapping this horizon. Much of this iron may be removed by letting the water stand for a period of time in a trough or other containers allowing a large water surface to be exposed to the air. The iron gradually settles as a brown precipitate. Agitation of the water is also helpful in removing iron.

Water from the Bedrock

No analyses were made on water from the Ravenscrag or Eastend bedrock formations which occur beneath the drift in the southwest corner of this municipality. Farmers deriving their supplies from these horizons report that the water is much softer than water from the drift or from stream deposits and in many cases has a slight "soda" taste. It is considered to be good drinking water.

Less variation exists in the quality of water from the Marine shale than in supplies obtained from the unconsolidated stream bed and glacial deposits, and from the Ravenscrag and Eastend formations. This is due to the fact that the shale itself is consistently uniform throughout the entire municipality, whereas the overlying deposits show marked variation in character over a small area. Water from the shale has a very high dissolved mineral salt content. Analyses of eight samples of ground water from the Marine shale, taken at widely separated localities in this part of the province, all show an excess of 2,000 parts per million of total solids, and in one instance 4,120 parts per million. The combined sulphate salts of sodium and magnesium (Glauber's salt and Epsom salts) very between 1,000 and 3,000 parts per million. Common salt averages 500 parts per million. These high figures are to be expected in waters from a formation known definitely to be of marine origin. The greatest variation in the character of the waters from the shale is noted in the hardness. Several samples are slightly to moderately hard, i.e. the total hardness is less than 200 parts per million, whereas in other samples the water is excessively hard having a total hardness of 1,000 to 3,000 parts per million.

The analysis given on the accompanying table is of water from a 175-foot well located on SW.$\frac{1}{4}$, sec. 24, tp. 12, range 20. It has not been definitely determined whether the water from this well is being derived from the basal sand beds in the pre-glacial channel or in part from the underlying Marine shale. This water is being used for stock, but the high sulphate salt and common salt content makes it objectionable for drinking. Water from the shale generally has a strong laxative effect and is quite unsuitable for domestic use, and in many places is regarded as being unfit for watering stock.

WELL RECORDS—Rural Municipality of CALEDONIA NO. 99.

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.	8	10	19	2	Bored	50	2,050			12	2,038	Marine shale	Hard, clear, very alkaline		S.	Small supply. Too alkaline for use. Several dry holes 20' deep.
2	NE.	9	"	"	"	Auger	34	2,000					" "				Several dry holes 16'-34' deep.
3	SE.	9	"	"	"	"	34	2,050					" "				" " " 16'-34' ".
4	SW.	9	"	"	"	"	16	2,050					" "			N.	Dry hole.
5	NW.	9	"	"	"	"	34	2,025					" "				" ".
6	NE.	10	"	"	"	Dug	27	2,000			27	1,973	Glacial, sand	Hard, clear		D. S.	Small yield.
7	NE.	16	"	"	"	Bored	35	2,000					Marine shale			N.	Several dry holes 10'-35' deep.
8	SW.	16	"	"	"	"	30	2,020					" "			N.	2 dry holes 30' deep. Also dry holes on NW.¼.
9	SE.	17	"	"	"	"	16	2,040					" "			N.	Only very small seepage of very bitter water. Also a dry hole 40' deep.
10	SE.	18	"	"	"	Dug	9	2,030			9	2,021	Glacial, clay	Hard, clear		D. S.	Well in creek bed sufficient for local needs.
11	NE.	20	"	"	"	"	8	1,990	0	1,990	8	1,982	Stream sand	" alkaline, iron, orange colour		S.	Sufficient for local needs, laxative. Fit for horses but not for cattle. Well in creek bed.
12	NE.	21	"	"	"	"	10	1,980			6	1,974	Glacial "	Hard, clear		D. S.	Sufficient for local needs.
13	NW.	21	"	"	"	"	10	1,990			10	1,980	Stream "	Soft, "		D. S.	Good supply; well in creek bed waters 90 head of stock.
14	SW.	31	"	"	"	"	25	1,950			25	1,925	" "	Hard, iron		D. S.	Well in creek bed, sufficient for local needs.
15	NW.	32	"	"	"	"	20	1,950			20	1,930	Glacial "	" clear		D. S.	Very little water.
16	NE.	32	"	"	"	"	16	1,950	0	1,950	16	1,934	" "	Hard, slightly alkaline		D. S.	Good supply.
17	NW.	33	"	"	"	"	16	1,950	− 4	1,946	12	1,938	" "	Soft, clear		D. S.	Sufficient for local needs. Test holes 15'-20' deep, 500' north give alkaline water.
1	SE.	2	10	20	2	Dug	18	2,125	− 10	2,125	18	2,107	Glacial, sand	Hard, clear		D. S.	Sufficient for local needs.
2	SE.	3	"	"	"	"	12	2,115	− 3	2,112	8	2,107	" "	Soft, "		D. S.	Waters 40 head of stock.
3	SE.	4	"	"	"	"	23	2,125	− 13	2,112	23	2,102	" "	Hard, "		D.	Sufficient for house use.
4	SW.	7	"	"	"	"	18	2,095	− 2	2,093	14	2,081	" gravel	", slightly alkaline, clear		D. S.	" " local needs.
5	SE.	9	"	"	"	"	14	2,100			12	2,088	" sand	Soft, clear		D. S.	Well situated in a slough. Sufficient for local needs.
6	SW.	10	"	"	"	"	25	2,100	0	2,100	22	2,078	" "	Hard, alkaline clear		S.	Waters 20 head of stock, laxative.
7	NE.	10	"	"	"	"	24	2,120	− 14	2,106	20	2,100	" "	Hard, clear		D.	Small yield. Supplies several families with drinking water.
8	NE.	15	"	"	"	"	18	2,100	?	?	18	2,082	" "	" alkaline		S.	Limited supply.
9	NW.	16	"	"	"	Bored	30	2,120					Marine shale			N.	Dry hole. Struck bedrock at 20' (1,880').

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 CALEDONIA NO. 99.

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
10	NE.	17	10	20	2	Dug	30	2,125			15	2,110	Glacial drift	Hard, slightly alkaline, clear		D. S.	Waters 500 sheep. Slightly laxative.
11	NE.	18	"	"	"	"	20	2,100	- 16	2,084	16	2,084	Glacial, sandy clay	Soft, clear		D.	Very small supply. Insufficient supply for stock.
12	NW.	19	"	"	"	"	28	2,130	- 14	2,116	28	2,102	Glacial, gravel	Hard, alkaline clear		D. S.	Sufficient for local needs.
13	NE.	19	"	"	"	Bored	115	2,120					Marine shale	Bitter, salty		N.	Dry hole. Also several other dry holes 25'-30' deep.
14	NE.	20	"	"	"	Test Auger	35	2,100			35	2,065	Sandy clay	Clear			Good supply, but too bitter for human beings or stock use.
15	SE.	20	"	"	"	Dug	16	2,100	- 4	2,096	15	2,085	Glacial, gravel	Hard, clear, alkaline		D. S.	Good supply.
16	NW.	24	"	"	"	"	10	2,030	- 5	2,025	10	2,020	" sand	Hard, clear, alkaline		S.	Waters 25 head of stock.
17	NE.	25	"	"	"	"	18	1,980	- 10	1,970	12	1,968	Recent alluvium	Alkaline, hard clear		S.	Laxative.
18	SW.	28	"	"	"	"	28	2,100	- 22	2,078	28	2,072	Blue clay	Hard, clear, alkaline		N.	Poor supply, laxative.
19	SW.	30	"	"	"	"	20	2,100	- 12	2,088	4	2,096	Glacial, sand	Soft, clear		D. S.	Waters 20 head of stock.
20	SE.	35	"	"	"	"	10	1,990	- 6	1,984	10	1,980	Recent gravel	Hard, clear, alkaline		D. S.	Well on flood plain of Willow Creek. Poor supply
21	SE.	35	"	"	"	Auger	50	1,990			50	1,940	Glacial, clay	Hard, bitter, clear		N.	Very little water. Unfit for stock use.
22	SE.	36	"	"	"	Dug	18	1,960			11	1,949	Recent gravel	Hard, clear, alkaline		S.	Waters 70 head of stock.
1	SE.	1	10	21	2	Dug	22	2,100	- 16	2,084	22	2,078	Glacial, sand	Medium, hard, clear	42	D.	Yields 20 bbls. a day.
2	NW.	2	"	"	"	Bored	15	2,110	- 13	2,097	15	2,095	" "	Medium hard, clear		D. S.	Sufficient for local needs.
3	SE.	5	"	"	"	Dug	17	2,185?	- 13	2,172	17	2,168	" gravel	Medium hard, iron, clear	40	D. S.	Insufficient for local needs.
4	NW.	6	"	"	"	Bored	50	2,230	- 30	2,200	50	2,180	Ravenscrag, shale	Hard, clear, alkaline		D. S.	Sufficient for local needs; poor drinking water.
5	NW.	7	"	"		Dug	18	2,200			12	2,188	" , sandy shale	Soft, clear	42	D. S.	Yields about 2 tanks an hour.
6	SW.	8	"	"	"	"	28	2,175			20	2,155	Glacial, sand	Hard, alkaline salty, clear		D. S.	Good supply but very poor drinking water. Used to have good drinking water until 1930, then became alkaline.
7	SW.	9	"	"	"	"	30	2,150	- 20	2,120	30	2,130	" gravel	Hard, alkaline clear		D. S.	Sufficient for local needs; poor drinking water.
8	SE.	10	"	"	"	"	15	2,100	- 15	2,085	15	2,085	Marine shale	Hard, bitter, salty		N.	Good supply, but unfit for human beings or stock. Spring supplies good water.
9	SE.	12	"	"	"	"	16	2,100					" "			N.	Dry hole.
10	SE.	14	"	"	"	"	18	2,100	- 3	2,097	13	2,087	Glacial, yellow sand	Hard, clear	42	D. S.	Sufficient for 11 head of stock. Many dry holes into bedrock.
11	NE.	15	"	"	"	"	16	2,060	- 9	2,051	16	2,044	Glacial, gravel	" "	43	D. S.	Sufficient for 20 head of stock.
12	SW.	18	"	"	"	"	18	2,150						Soft, "		N.	Well not used.
13	SW.	19	"	"	"	"	22	2,130	- 20	2,110	22	2,108		Hard, alkaline		S.	Poor supply; not fit for household use.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CALEDONIA NO. 99

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
14	SE.	22	10	21	2	Dug	10	2,100			10	2,090	Marine shale	Hard, alkaline bitter, salty		N.	Good supply, but unfit for man or stock
15	SW.	23	"	"	"	"	40	2,100			12	2,088	" "	Hard, clear, alkaline			Very small supply. Unfit for man or stock. Several dry holes.
16	SW.	24	"	"	"	"	22	2,100	− 4	2,096	8	2,092	" " ?	Hard, clear, alkaline	46	D.	Sufficient for local house use.
17	NE.	24	"	"	"	Bored	24	2,100					Gravel in blue clay	Soft, clear		D. S.	Test hole indicates a good supply of water.
18	NW.	25	"	"	"	Dug	20	2,120	− 16	2,104	20	2,100	Glacial, clay	Hard, alkaline clear	43	D. S.	Insufficient for local needs.
19	SE.	26	"	"	"	"	20	2,110	− 20	2,090	20	2,090	" sand, gravel	Hard, alkaline clear	42	D. S.	Sufficient for house use and 16 head of stock.
20	SE.	27	"	"	"	"	20	2,100					Marine, sandy shale	Hard, alkaline clear	45	D. S.	Waters 20 head of stock.
21	SE.	30	"	"	"	"	20	2,088	− 17	2,071	20	2,068	Marine, shale	Hard, bitter, alkaline, clear		N.	Poor supply. Unfit for man or stock. Dry hole 800' deep sunk into Marine shale.
22	SW.	30	"	"	"	"	12	2,075	− 4	2,071	12	2,063	Recent alluvium	Hard, clear, alkaline	42	S.	Sufficient for local needs; situated on bank of creek.
23	SE.	34	"	"	"	"	32	2,175					Marine, shale	Hard, alkaline bitter, salty	42	D. S.	Insufficient for local needs. Laxative.
24	SE.	34	"	"	"	Bored	40	2,125					" "	Hard, alkaline bitter, salty		N.	Poor supply. Unfit for household or stock needs.
25	SW.	34	"	"	"	Dug	24	2,100	− 24	2,076	24	2,076	Glacial, sand, clay	Hard, clear		D.	Sufficient for house use. Another well 10' deep into bedrock gives small supply of bitter alkaline water unfit for man or stock.
26		35	"	"	"	Bored	32	2,120					Marine shale	Hard, salty, cloudy		S.	Sufficient for local stock needs.
1	NW.	1	11	19	2	Dug	26	1,935			26	1,909	Glacial, lake clay	Hard, alkaline iron		D. S.	Insufficient for local needs; slightly laxative. Several dry holes near by.
2	SE.	10	"	"	"	"	30	1,945	− 26	1,919	30	1,915	" sand	Hard, clear, alkaline		D. S.	Insufficient for local needs; Marine shale struck at depth of 30'.
3	NE.	10	"	"	"	"	28	1,920	− 25	1,895	28	1,892	" clay	Hard, clear, alkaline		S.	Insufficient for local needs.
4	SE.	14	"	"	"	"	20	1,925	− 16	1,909	20	1,905	" sand	Hard, clear		D. S.	Sufficient for local needs.
5	NW.	17	"	"	"	Bored	60	1,940								N.	10 dry holes into Marine shale.
6	SW.	18	"	"	"	Dug	10	1,930	− 6	1,924	10	1,920	Recent "	" "		S.	Sufficient for local needs; situated in creek valley.
7	NW.	18	"	"	"	"	16	1,935	− 14	1,921	16	1,919	Glacial "	" "		S.	Insufficient for local needs; used for stock in winter.
8	SW.	19	"	"	"	"	16	1,935	− 10	1,925	16	1,919	" "	" "		D. S.	Sufficient for local needs. 12' well yields 50 bbls. of good water a day.
9	NE.	19	"	"	"	Bored	200	1,940					Marine shale			N.	Dry hole; struck gas at a depth of 200'.
10	NW.	20	"	"	"	Auger	42	1,920	− 32	1,888	42	1,878	Glacial, clay	" alkaline, clear		N.	Plenty of water but too alkaline for man or stock. Marine shale struck at 25' in several dry holes.
11	SE.	22	"	"	"	Dug	35	1,940	− 30	1,910	35	1,905	" sand	Hard, clear		D. S.	Sufficient for local needs.
12	NW.	23	"	"	"	"	35	1,940	− 30	1,910	35	1,905	" "	" "		D. S. I.	" " " ", slightly laxative.

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WELL RECORDS—Rural Municipality of CALEDONIA NO. 99.

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
13	NE.	24	11	19	2	Dug	3	1,900					Glacial, sand	Fairly soft, clear		D. S.	Sufficient for local needs; near creek.
14	SW.	25	"	"	"	"	22	1,905	- 13	1,892	22	1,883	" "	Hard, clear, alkaline		D. S.	" " " " .
15	NW.	26	"	"	"	Drilled	140	1,890	- 80	1,810	140	1,750	" gravel	Hard, iron, bad odour		D. S.	" " " " ; 12' well near creek gives fair yield of good water.
16	SE.	28	"	"	"	Dug	30	1,940	- 23	1,917	30	1,910	" sand	Hard, clear, alkaline		D. S.	Waters over 500 head of sheep.
17	SE.	30	"	"	"	"	14	1,915	- 7	1,908	7	1,908	" "	Hard, clear		D. S.	Only a small seepage. Bedrock struck 8' from top in 4 dry holes each 100' deep.
18	NE.	30	"	"	"	Drilled	250	1,915					Marine shale			N.	13 dry holes, and one with a small seepage of very bitter water.
19	NW.	31	"	"	"	Dug	42	1,910			42	1,868	Glacial gravel	Hard, clear, iron		D. S.	Watered 150 head of stock; well now plugged.
20	NE.	31	"	"	"	"	50	1,925	- 45	1,880	50	1,875	" sand	Hard, alkaline, clear, iron	42	D. S.	Yields about 14 bbls. a day.
21	NW.	32	"	"	"	"	46	1,925	- 36	1,889	46	1,879	" "	Hard, clear, alkaline	42	D. S.	Waters 200 head of stock.
22	NE.	32	"	"	"	Bored	116	1,925	- 56	1,869	116	1,809	" "	Hard, iron, clear		D. S.	Sufficient for local needs.
23	SE.	33	"	"	"	Dug	35	1,920	- 28	1,892	35	1,885	" "	Hard, iron, alkaline	42	D. S.	" " " " .
24	NE.	34	"	"	"	"	23	1,910	- 14	1,896	23	1,887	" gravel	Hard, clear, alkaline		D. S.	" " " " ; slightly laxative.
25	NW.	35	"	"	"	Drilled	190	1,900	- 40	1,860	120	1,780	?	Hard, cloudy, alkaline		S.	" " " " .
26	SW.	36	"	"	"	Dug	30	1,910	- 24	1,886	25	1,885	" sand	Hard, clear, alkaline		D. S.	" " " " ; yields about 20 bbls a day.
1	NE.	4	11	20	2	Dug	12	2,050	- 3	2,047	12	2,038	" "	Soft, clear		D. S.	Sufficient for local needs; yields about 5 tanks a day.
2	NE.	6	"	"	"	"	16	2,100			16	2,084	" drift	Hard, "		N.	Was sufficient for local needs; cave-in in 1929
3	SE.	13	"	"	"	"	12	1,920	- 11	1,909	12	1,908	" sand, gravel	Soft, slightly alkaline		D. S.	Sufficient for local needs.
4	NW.	14	"	"	"	"	12	1,940	- 8	1,932	12	1,928	Glacial, sand	Hard, clear		D. S.	" " " " .
5	SE.	15	"	"	"	"	18	1,950			18	1,932	Recent silt	Fairly hard, clear		D. S.	Well at edge of creek; sufficient for local needs; waters 10 head of stock.
6	NE.	19	"	"	"	"	12	1,950	- 6	1,944	12	1,938	" sand	Hard, clear, alkaline		D. S.	Well level varies with creek; only sufficient supply for household needs.
7	NW.	20	"	"	"	"	18	1,950			18	1,932	" "	Fairly hard, clear	41	D. S.	Well at edge of creek; sufficient for local needs.
8	SE.	22	"	"	"	"	14	1,940			14	1,926	Glacial sand, clay	Hard, clear		D. S.	Sufficient for local needs.
9	NE.	22	"	"	"	"	17	1,940	- 10	1,930	15	1,925	Recent sand	" "		D. S.	Near creek; sufficient for local needs.
10	SE.	24	"	"	"	"	35	1,950			35	1,915	Glacial "	" " alkaline		D. S.	Insufficient for local needs.
11	SW.	24	"	"	"	"	18	1,950	- 15	1,935	18	1,932	Recent "	Hard, clear, alkaline		D. S.	" " 5 head of stock; slightly laxative.
12	NE.	25	"	"	"	"	39	1,920								N.	Several dry holes.

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WELL RECORDS—Rural Municipality of CALEDONIA NO. 99.

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
13	SW.	26	11	20	2	Dug	12	1,910	- 8	1,902	12	1,898	Glacial, sand	Moderately hard, clear		D. S.	Yields 2 bbls. a day.
14	NE.	28	"	"	"	"	35	1,930					Marine shale			N.	Dry hole.
15	NE.	30	"	"	"	"	16	1,945			16	1,929	Glacial, sand	Hard, clear, alkaline		D. S.	Seepage from creek; sufficient for local needs.
16	SW.	35	"	"	"	"	16	1,910			8	1,902	" "	Hard, clear, iron		S.	" " " ; waters 100 head of stock.
1	SW.	1	11	21	2	Bored	33	2,140	- 13	2,127	16	2,124	Glacial, gravel	Hard, clear, alkaline		N.	Well not in use.
2	NW.	2	"	"	"	"	32	2,110	- 7	2,103	20	2,090	" sand (?)	Hard, clear, alkaline		D. S.	Sufficient for local needs.
3	SE.	18	"	"	"	"	21	2,050	- 16	2,034	16	2,034	Marine shale	Hard, salty, bitter, alkaline, clear		N.	Small supply; not fit for man or stock.
4	NW.	23	"	"	"	Dug	30	2,050	- 28	2,022	28	2,022	" "	Hard, bitter, alkaline, salty, clear	42	S.	Waters 20 head of cattle.
5	NE.	23	"	"	"	Auger	30	2,050			30	2,020	Glacial, clay	Hard, salty, alkaline		D. S.	Good supply.
6	NE.	26	"	"	"	Dug	13	2,000	- 8	1,992	8	1,992	Marine shale	Hard, sweet, alkaline, clear		N.	Small supply; water unfit for man or stock. Several dry holes into be[illegible]ock.
7	SW.	36	"	"	"	"	12	1,945	- 6	1,939	12	1,933	Glacial, red sand	Hard, clear		N.	Well caved in.
8	SW.	36	"	"	"	"	18	1,945	- 10	1,935	18	1,927	Recent gravel	" "		D. S.	Well near creek; sufficient for local needs.
1	SW.	1	12	19	2	Drilled	130	1,900	- 85	1,815	130	1,770	Glacial quicksand	" " iron		D. S.	Sufficient for local needs; poor drinking water
2	NW.	1	"	"	"	"	170	1,910	- 40	1,870	160	1,750	" sand on bedrock	Hard, salty, iron, reddish color	40	S. D.	" " " " ; slightly laxative.
3	NE.	1	"	"	"	Dug	26	1,910	- 11	1,899	16	1,894	Glacial, sand	Hard, clear	40	S.	" " " " .
4	NW.	2	"	"	"	Bored	96	1,910	- 36	1,874	96	1,814	" "	" " iron		S.	" " " " .
5	SW.	3	"	"	"	Dug	20	1,920	- 8	1,912	20	1,900	Stream gravel	Hard, clear, iron		D. S.	" " " " .
6	SE.	4	"	"	"	"	25	1,900			25	1,875	" sand	Hard, clear, iron		D. S.	" " " " . Another similar well
7	NW.	5	"	"	"	Bored	100	1,900	- 45	1,855	100	1,800	Glacial "	Hard, clear, iron		D. S.	" " " " .
8	NE.	6	"	"	"	Dug	35	1,900	- 29	1,871	35	1,865	Stream "	Hard, clear, iron		D. S.	Well on side of creek valley; sufficient for local needs.
9	SW.	7	"	"	"	"	35	1,900	- 30	1,870	35	1,865	" "	Hard, clear, alkaline		D. S.	Well on side of creek valley; " " local needs.
10	SE.	8	"	"	"	"	35	1,900	- 32	1,868	35	1,865	" "	Hard, clear, iron		D. S.	Well on side of creek valley; sufficient for local needs.
11	NW.	10	"	"	"	Drilled	179	1,910	- 80	1,830	179	1,731	Glacial "	Hard, clear, iron		S.	Poor supply; only waters 4 head of stock.
12	NE.	10	"	"	"	Bored	158	1,915	- 40	1,875	158	1,757	" " gravel	Hard, clear, iron		S.	Sufficient for local stock needs.
13	NE.	10	"	"	"	Dug	50	1,915	- 45	1,870	50	1,865	" "	Hard, "	40	D. S.	" " " needs. Yields 3 tanks a day.

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WELL RECORDS—Rural Municipality of CALEDONIA NO. 99.

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
14	SW.	12	12	19	2	Dug	30	1,920	− 22	1,898	30	1,890	Glacial, sand	Hard, clear		D. S.	Large supply.
15	NW.	12	"	"	"	Bored	30	1,910	− 24	1,886	30	1,880	" gravel	" "		D. S.	Sufficient for local needs.
16	NE.	12	"	"	"	Drilled	100	1,900					Marine shale			N.	Several dry holes 50'-100' deep.
17	W½.	13	"	"	"	"	327	1,900					Marine shale			N.	Dry hole.
18	NE.	13	"	"	"	"	100	1,900					" "			N.	Several dry holes. Bedrock struck at depth of 90' (1,810').
19	NW.	14	"	"	"	"	100	1,900					" "			N.	Several dry holes. " " " " " 58' (1,842').
20	SW.	14	"	"	"	"	505	1,900					" "			N.	Dry hole.
21	SE.	15	"	"	"	"	300	1,900					" "			N.	Several dry holes 140'-300' deep. Bedrock struck at depth of 40' (1,860').
22	NW.	15	"	"	"	Dug	26	1,900	− 3	1,897	14	1,886	Glacial, sand	Hard, clear	45	D. S.	Well near creek; sufficient for local needs.
23	SW.	15	"	"	"	"	70	1,900					Marine shale			N.	Dry hole. Another similar hole on NE.¼.
24	SE.	15	"	"	"	Drilled	143	1,910	− 67	1,843	137	1,773	Glacial, sand	" salty		N.	Yields 200 bbls. a day; too salty to be used. 9 dry holes from 60'-300' deep.
25	SE.	16	"	"	"	Bored	67	1,910	− 64	1,846	67	1,843	" clay	" iron		S.	Waters 75 head of stock.
26	SW.	16	"	"	"	"	77	1,910	− 38	1,872	77	1,833	" sand	Slightly hard iron, clear	42	D. S.	Sufficient for local needs. Water also struck at depth of 50' (1,860).
27	SE.	17	"	"	"	Dug	45	1,910	− 35	1,875	45	1,865	" gravel	Hard, iron		D. S.	Sufficient for local needs.
28	SW.	19	"	"	"	"	40	1,900	− 31	1,869	40	1,860	" sand	Slightly hard clear		D. S.	Yields about 300 gals. a day.
29	SE.	20	"	"	"	Bored	40	1,910	− 25	1,885	40	1,870	" gravel	Hard, iron, clear		D. S.	Sufficient for local needs.
30	NW.	20	"	"	"	Drilled	232	1,900	− 50	1,850	232	1,668	" " (?)	Hard, iron, clear		D. S.	Yields 30 gals. a day.
31	SE.	22	"	"	"	Bored	40	1,900					Glacial clay (?)			N.	Dry hole.
32	SW.	22	"	"	"	Dug	45	1,900			45	1,855	", gravel, sand	Hard, clear, alkaline		D. S.	Yields 5 tanks a day.
33	SW.	23	"	"	"	"	60	1,900	− 54	1,846	60	1,840	" "	Hard, alkaline iron, clear		S.	Very poor supply; laxative.
34	SE.	24	"	"	"	Bored	80	1,900					Glacial, clay, sand, Marine shale			N.	Dry hole. Also several other dry holes 70'-90'. deep.
35	SW.	24	"	"	"	Dug	60	1,900	− 55	1,845	60	1,840	Glacial, clay	Hard, iron, clear		D. S.	Insufficient for local needs. Yields 15-20 bbls. a day.
36	SE.	25	"	"	"	Drilled	100	1,900					Marine shale			N.	Dry hole.
37	SE.	26	"	"	"	Bored	40	1,900						Hard, alkaline		N.	Water unfit for use; has not been used in many years.
38	SW.	26	"	"	"	"	120	1,900					Glacial (?)	Hard, iron, salty		N.	Strong supply; has not been used in years.
39	NW.	26	"	"	"	"	100	1,900			100	1,800	Buried stream channel	Hard, iron, alkaline		N.	" " ; " " " " " " .

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

WELL RECORDS—Rural Municipality of CALEDONIA NO. 99.

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
40	NE.	26	12	19	2	Bored	75	1,900			75	1,825	Marine shale			N.	3 dry holes 39',57', and 75' deep.
41	SE.	27	"	"	"	"	40	1,910			40	1,870	Glacial, sand	Hard, clear		N.	Insufficient for local needs; not used.
42	SW.	27	"	"	"	"	28	1,910	- 25	1,885	28	1,882	" gravel	" alkaline iron		S.	Insufficient supply. Only waters 5 or 6 head of stock.
43	SE.	28	"	"	"	"	100	1,910	- 70	1,840	100	1,810	Marine shale	Salty reddish colour.		S.	Sufficient for local stock needs.
44	NE.	30	"	"	"	Dug	28	1,910	- 18	1,892	28	1,882	Glacial, sand	Hard, clear	40	D. S.	" " " " " . Also another similar well 21' deep.
45	SW.	31	"	"	"	"	44	1,900	- 24	1,876	44	1,856	" "	" " alkaline		S.	Sufficient for local stock needs. Also 8 other dry holes 34'-125' deep.
46	SW.	32	"	"	"	Drilled	125	1,910					Marine shale			N.	9 dry holes from 100'-125' deep.
47	NE.	32	"	"	"	"	125	1,900					" "			N.	4 " " " 80'-125' " . Bedrock struck at 42' (1,858').
48	NE.	33	"	"	"	Bored	88	1,920	- 63	1,857	88	1,832	Glacial, sand, gravel	Hard, iron, clear		S.	Sufficient for local needs.
49	SE.	35	"	"	"	"	60	1,900					Glacial, sand, gravel			N.	Dry hole.
50	SW.	35	"	"	"	Drilled	100	1,920			100	1,820	Glacial, sand	Hard, iron, clear	34	D. S.	Sufficient for local needs.
51	SE.	36	"	"	"	?	60	1,900					Marine shale			N.	Dry hole.
52	SW.	36	"	"	"	Drilled	90	1,900					Probably into bedrock			N.	" " ;
53	NW.	36	"	"	"	"	80	1,900					Marine shale			N.	" " .
1	NW.	2	12	20	2	Bored	140	1,890					Marine shale			N.	Dry hole. Also 4 other similar dry holes. Bedrock struck at 80' (1,810').
2	E½	5	"	"	"	Dug	80	1,900			80	1,820	Glacial clay	Hard, black colour, iron		N.	Good supply but could not be used due to high iron content. Several test holes 16' deep near creek gave similar water.
3	NW.	5	"	"	"	"	35	1,910	- 30	1,880	35	1,875	" "	Hard, soda, clear		S.	Sufficient for stock use in winter.
4	NW.	11	"	"	"	"	18	1,890	- 10	1,880	18	1,872	Recent "	Hard, clear		D. S.	" " local needs.
5	NE.	12	"	"	"	"	25	1,890			25	1,865	" sand	Very hard, iron, clear		S.	Insufficient for local needs.
6	SW.	13	"	"	"	"	45	1,900	- 40	1,860	45	1,855	Glacial "	Hard, iron, clear		D. S.	Sufficient for local needs.
7	SE.	14	"	"	"	"	27	1,900			27	1,873	" clay	Hard, clear	40	D. S.	" " " " .
8	SW.	14	"	"	"	"	16	1,880	- 10	1,870	14	1,866	" gravel	" "		D. S.	Large supply of water; at least 20 tanks a day.
9	NE.	16	"	"	"	"	35	1,890			35	1,855	" sand	" alkaline		D. S.	Sufficient for local needs.
10	SW.	20	"	"	"	Bored	170	1,900					Marine, shale			N.	Dry hole
11	SE.	22	"	"	"	"	40	1,900	- 34	1,877	40	1,860	Glacial, sand	" " clear		S.	Insufficient for local needs. Only waters 12 head of stock.
12	NE.	22	"	"	"	Dug	40	1,920	- 30	1,890	40	1,880	" " silt	Hard, clear, alkaline		S.	Sufficient for local needs. Yields 1 tank a day.
13	NE.	23	"	"	"	"	60	1,900			60	1,840	Glacial, sand	Hard, alkaline iron, clear		S.	Sufficient for stock needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CALEDONIA NO. 99.

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
14	SE.	24	12	20	2	Drilled	180	1,900	- 40	1,860	108	1,792	Glacial, sand, gravel	Hard, iron, clear		S.	Sufficient for local needs.
15	SW.	24	"	"	"	"	220	1,900	- 60	1,840	165	1,735	Glacial, sand	Hard, iron, clear		S.	" " " stock needs; #.
16	SW.	25	"	"	"	"	65	1,900			65	1,835	" gravel	Hard, iron, clear		D. S.	" " " needs. Yields 6 or 7 tanks a day.
17	NE.	26	"	"	"	Bored	100	1,900	- 80	1,820	100	1,800	" sand	Hard, iron, alkaline, dark colour		S.	Insufficient for local needs. Yields 1 tank a day.
18	SE.	27	"	"	"	"	50	1,910			50	1,860	" "	Hard, clear alkaline		S.	Sufficient for stock needs. Have drinking water.
19	NW.	28	"	"	"	Dug	15	1,900			15	1,885	" clay	Hard, clear		D. S.	Sufficient for local needs.
20	SE.	31	"	"	"	Bored	80	1,900	- 78	1,822	80	1,820	" gravel	Hard, salty, alkaline clear		S.	" " " stock needs.
21	NE.	31	"	"	"	"	180	1,900					Marine shale			N.	Dry hole.
22	NW.	32	"	"	"	"	50	1,900					?			N.	Dry hole.
23	NW.	33	"	"	"	Drilled	400	1,900					" "			N.	" " ; also several other similar dry holes 50'-60' deep.
1	NE.	4	12	21	2	Dug	20	1,940					" "			N.	Dry hole. Bedrock struck at depth of 20'.
2	NW.	8	"	"	"	"		1,940					" "			N.	" " . " " " " 20'.
3	SE.	10	"	"	"	"	20	1,945			16	1,929	Glacial, sand	Medium hard, clear, salty	42	D. S.	Sufficient for house use. Waters 10 head of stock.
4	NW.	12	"	"	"	"	16	1,980	- 14	1,966	16	1,964	" red sand			N.	Not fit for man or stock.
5	SE.	14	"	"	"	Drilled	62	1,910					Marine shale			N.	Dry hole. 3 other similar dry holes 47' deep. Struck bedrock at depth of 47'.
6	NW.	17	"	"	"	Auger	45	1,905					" "	Very salty		N.	Not fit for man or stock. Struck bedrock at depth of 20'.
7	NE.	18	"	"	"	Bored	40	1,960					Probably Marine shale, white clay			N.	Dry hole.
8	SW.	20	"	"	"	"	60	1,900					Marine shale	Hard, alkaline clear, salty		N.	Good supply but unfit for man or stock.
9	SW.	20	"	"	"	"	55	1,900					" "			N.	Dry hole. Bedrock struck at depth of 30'.
10	NE.	20	"	"	"			1,895					" "	Hard, alkaline		N.	Fair supply, but unfit for man or stock.
11	NW.	21	"	"	"	Drilled	100	1,895					" "			N.	Several dry holes 100' or less in depth.
12	NW.	24	"	"	"	Bored	55	1,890					Marine shale,			N.	Dry hole. Struck bedrock at depth of 50'.
13	NE.	25	"	"	"	Drilled	60	1,890					Glacial, sand			N.	" " .
14	SW.	28	"	"	"	"	200	1,900					Marine shale			N.	Dry hole. Struck bedrock at depth of 20' (1,880').
15	SE.	30	"	"	"	Dug	15	1,900	- 5	1,895			Glacial, sand	Medium hard, clear	42	D. S.	Sufficient for local needs.

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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
16	SW.	30	12	21	2	Bored	50	1,900					Hard, white clay	Hard, clear, alkaline, salty		N.	Large supply but unfit for human beings or stock.
17	SE.	32	"	"	"	"	98	1,895					Marine shale			N.	Dry hole.
18	SW.	32	"	"	"	"		1,895					" "			N.	Several dry holes of unknown depth.
19	SE.	34	"	"	"	Test Auger	20	1,875					Marine shale			N.	Dry hole. Bedrock struck at depth of 20'. (1,885').

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(#) Sample taken for analysis.