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WATER SUPPLY PAPER No. 301

GROUND-WATER RESOURCES OF TOWNSHIPS 1 to 6, RANGES 18 to 21, MANITOBA

(Boissevain Area)

By

J. A. Elson and E. C. Halstead

OTTAWA

1949

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PART I

INTRODUCTION

The present report is an attempt to assemble the data on ground-water resources in a form that will be useful to well drillers, farmers, municipal authorities, and others interested in obtaining adequate water supplies.

Publication of Results

The essential information pertaining to ground-water conditions is being issued in reports that, in Manitoba, cover a square block of sixteen townships lying between the correction lines and beginning at the Saskatchewan boundary. The reports on the most southerly strip of the province include in addition the two townships lying north of the International Boundary. The secretary-treasurer of each municipality will be supplied with the information covering that municipality, and copies of the reports will also be available for study at offices of the Provincial and Federal Departments. Further assistance in interpreting the reports may be obtained by applying to the Chief Geologist, Geological Survey of Canada, Ottawa.

How to Use the Report

Anyone desiring information concerning ground-water in any particular locality will find the available data listed in the well records, and other pertinent information on the maps of the area. For those unfamiliar with these reports it is, perhaps, advisable that that part dealing with the area as a whole be read first, so as to be in a better position to understand the more particular descriptions of each township that follow. Also, the map accompanying the report should prove a useful source of reference when reading the text.

The map consists of two figures. Figure I shows bedrock and surface geology. The water-bearing properties of the bedrock change from formation to formation, and are referred to in subsequent pages. The type of glacial deposit at the surface may be determined from the map, and its possibilities as an aquifer are also discussed in this report.

Figure 2 shows the location and types of wells in the area, the land relief (topography), and the drainage pattern. Not every well is plotted on the map, but most of those giving pertinent information are shown, and probably include 90 per cent of the wells in the area. Where ground water is not readily available, or carries too much dissolved salts to be used, dugouts often form the only means of supply. The topography is shown by contours, or lines of equal elevation, spaced at vertical intervals of 50 feet.

The well records are compiled from data obtained by interviewing farmers, and in many cases their accuracy depends upon the farmer's memory. Wherever possible data were checked by plumb-line measurement to the nearest foot. The wells are tabulated by townships and sections, and the total depth of the well, depths to the water level at high and low stages, and, where possible, the depth at which the water-bearing horizon occurs, are all listed. The general character of the water is stated, and the use to which it can be put. Wells from which samples were taken for analysis are indicated on the well-record sheets. An idea of how much water a well can be expected to yield is suggested by the number of stock (cattle and horses only) that can be watered at it. One head is assumed to consume between 8 and 10 gallons of water a day. Unless followed by the word "only"

the figure for the number of stock watered is not necessarily the maximum yield of the well, but simply the greatest amount that the present user has required. The word "only" indicates that the figure given is the maximum yield of the well. To obtain the position of an aquifer at any given point, the elevation of the point should be determined from the contours on Figure 2 of the map. Elevations of adjacent wells may be found in the well records and the depth to the aquifer can usually be determined from them. By comparing elevations the depth of the aquifer below the unknown point may be estimated. This method is particularly applicable to bedrock wells, but may not be successful where information is too limited, or where the glacial drift is thick and of an irregular character. In such instances a person searching for water should refer to the text for information on the nature of the deposits in that area.

GLOSSARY OF TERMS USED

Alkaline. The term 'alkaline' or 'alkali' water has been applied rather loosely to waters having a peculiar and disagreeable taste, and commonly a laxative effect. The waters so described in the Prairie Provinces are those heavily charged with sulphates of magnesium and sodium (respectively Epsom salts and Glauber's salts) and are more correctly termed sulphate waters. Truly 'alkaline' waters owe that property to the presence of calcium carbonate and calcium bicarbonate. In this report an attempt to adhere to local terminology is made by referring to sulphate waters as 'alkali' in the well records, and the term 'alkaline' is avoided.

Alluvium. Deposits of clay, silt, sand, gravel, and other material in lake beds and in flood plains of modern streams. The term also includes the material in river terraces, which once formed part of the flood plain but are now above it.

Aquifer. A porous bed, lens, pocket, or deposit of material that transmits water in sufficient quantity to satisfy pumping wells and springs.

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.

Bentonite. and bentonitic clays have the property of swelling when water is added to them. They occur as white beds as much as 2 feet thick, but usually much thinner, and are probably formed by the weathering of volcanic ash.

Buried pre-Glacial Stream Channel. A channel eroded into the surface of 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.

Coal Seam. The same as a coal bed. It is 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 relatively steep slope separating level or gently slopping areas.

Flood Plain. A flat part of a river valley ordinarily above water, but submerged when the river is in flood. It is an area where silt and clay are being deposited.

Glacial Drift. A general term that includes all the loose, unconsolidated materials that were deposited by the ice-sheet, or by the waters associated with it. Clay containing boulders usually forms a large part of the glacial drift in an area, and is called glacial till or boulder clay, and is not to be confused with the more general term glacial drift, which occurs in the following several forms:

(1) Terminal Moraine or Moraine. A ridge or series of ridges formed by glacial drift that was laid down at the margin of a moving ice-sheet. The surface is characterized by irregular hills and undrained basins.

(2) Kame Moraine. Assorted deposits of sand and gravel laid down at or close to the ice margin. The topography is similar to that of a terminal moraine.

(3) Ground Moraine. Boulder clay (till) laid down at the base of an ice-sheet. The topography may vary from flat to gently rolling.

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

(5) Glacial-lake Deposits. Sand, silt, and clay deposited in glacial lakes during the retreat of the ice-sheet.

Shoreline. A discontinuous escarpment, with intervening gravel beaches and bars, which indicates the former margin of a glacial lake.

Ground Water. The water in the zone of saturation below the water-table.

Hydrostatic Pressure. The pressure that causes water in a well to rise above the point at which it was first encountered in the well, namely, at the level of the aquifer.

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

Pervious or Permeable. Beds are pervious or permeable when they permit the perceptible passage or movement of ground water, as in the case of sands and gravels.

Pre-Glacial Land Surface. The surface of the land as it existed before the ice-sheet covered it with drift.

Recent Deposits. Deposits that have been laid down by the agencies of water and wind since the disappearance of the continental ice-sheet; for example, alluvium in stream valleys.

Sand Point or Driven Well. A sand point is a piece of perforated and screened pipe 2 or 3 feet long, which ends in a sharp point. It is fastened to lengths of ordinary pipe and forced down into surface deposits of a sandy or gravelly nature. The depth of such a well rarely exceeds 30 feet.

Unconsolidated Deposits. The mantle or covering of alluvium, pre-glacial soils, and glacial drift consisting of loose, uncemented material that overlies the bedrock.

Variegated. Beds so described show different colours in alternating beds or lenses.

Water-table. The upper limit of the part of the ground saturated with water. This may be near the surface or many feet below it. A water-table is said to be perched when a zone of saturated material is separated from the main water-table below by a zone or zones of unsaturated material.

Water-worked Till. Glacial till or boulder clay that has been subjected to water action, usually near the margins of glacial lakes, so that the fine clay has been washed out and a deposit that may be composed mainly of sand and gravel is left behind.

Wells. The term refers to any hole sunk in the ground by any means for the purpose of obtaining water. If no water is obtained they are referred to as dry holes. Wells yielding water are divided into four classes:

(1) Flowing Artesian Wells. Wells in which the water is under sufficient hydrostatic pressure to flow above the surface of the ground at the well.

(2) Non-flowing Artesian (Sub-artesian) Wells. Wells in which the water is under sufficient hydrostatic pressure to raise it above the level of the aquifer, but not above the level of the ground at the well.

(3) Non-artesian Wells. Wells in which the water does not rise above the water-table or the aquifer.

(4) Intermittent Non-artesian Wells. Wells that are generally dry for a part of each year.

GENERAL DISCUSSION OF GROUND WATER

Almost all the water recovered from beneath the earth's surface for both domestic and industrial uses is meteoric water, that is, water derived from the atmosphere. Most of this water reaches the surface as rain or snow. Part of it is carried off by streams as run-off; part evaporates either directly from the surface and from the upper mantle of soil, or indirectly through transpiration of plants; and the remainder sinks into the ground to be added to the ground-water supplies.

The proportion of the total precipitation that sinks into the ground will depend largely upon the type of soil or surface rock, and on the topography; more water will sink into sand and gravel, for example, than into clay; if, on the other hand, the region is hilly and dissected by numerous streams, more water will be immediately drained from the surface than in a relatively flat area. Light, continued precipitation will furnish more water to the underground supply than brief torrential floods, during which the run-off may be nearly equal to the precipitation. Moisture falling on frozen ground will not usually find its way below the surface, and, therefore, will not materially replenish the ground-water supplies. Light rains falling during the growing season may be wholly absorbed by plants. The quantity of moisture lost through direct evaporation depends largely upon temperature, wind, and humidity. Locally these deposits may become very extensive. The water-bearing properties of alluvial deposits are variable, but, in general, such deposits form favourable aquifers. They are porous, and readily yield a part of their contained water, although in places their porosity may be greatly reduced by the presence of fine silt and clay. This type of deposit may be expected to yield moderate domestic supplies through shallow wells, and larger supplies if the deposits are extensive.

In some areas of relatively steep slopes, valleys have been partly filled with sand and gravel, which, in turn, have been covered with impervious clay and silt. These circumstances commonly give rise to artesian conditions in the lower part of the valley.

DISCUSSION OF WATER ANALYSES

Both the kind and quantity of mineral matter dissolved in a natural water depend upon the texture and chemical composition of the rocks with which the water has been in contact. Pollution is caused by contact with organic matter or its decomposition products. Analyses of well waters for mineral content are made by the Department of Health and Public Welfare, Winnipeg, and by the Bureau of Mines, Department of Mines and Resources, Ottawa.

As the ground-water survey of Manitoba progresses an effort is made to secure samples representative of each major aquifer encountered; the purpose of this is to compare the chemical characteristics of waters from the various geological horizons and, thereby, assist in making correlations of the strata in which the waters occur. The mineral content of natural waters is also of interest to the consumers, though the effects of the constituents are usually already apparent. The quantities of the various constituents for which tests are made are given as 'parts per million', which refers to the proportion by weight of each constituent in 1,000,000 parts of water. A salt when dissolved in water separates into two chemical units called 'radicals', and these are expressed as such in the chemical analyses. In one group are included the metallic elements of calcium (Ca), magnesium (Mg), sodium (Na), and iron (Fe), and in the other group are the sulphate (SO_4), chloride (Cl), bicarbonate (HCO_3), carbonate (CO_3), and nitrate (NO_3) radicals. The radicals listed in the analyses tabulated in the second part of this report can be combined to give the actual quantity of the particular salts present in the water, but this is not done here as the radicals alone give enough information to identify the water types. In fact, the sulphate, chloride, and carbonate radicals, plus the hardness, serve to identify a water, and crude field tests on the basis of these constituents were used in some areas to outline more completely zones of the various water types.

The following mineral constituents include all that are commonly found in natural waters in quantities sufficient to have any practical effect on the value of waters for ordinary uses:

Silica (SiO_2) is dissolved in small quantities from almost all rocks. It is not objectionable except in so far as it contributes to the formation of boiler scale.

Iron (Fe) in combination is dissolved from many rocks as well as from iron sulphide deposits with which the water comes in contact. It may also be dissolved from well casings, water pipes, and other fixtures in quantities large enough to be objectionable, but separates as the hydrated oxide upon exposure of the water to the atmosphere. Excessive iron in water causes straining on porcelain or enamelled ware, and renders the water unsuitable for laundry purposes. Water is usually considered not potable if the iron content is more than 0.5 part per million.

Calcium (Ca) in the water comes from mineral particles present in the surface deposits, the chief sources being limestone, gypsum, and dolomite. Fossil shells provide a source of calcium, as does also the decomposition of igneous rocks. The common compounds of calcium are calcium carbonate ($CaCO_3$) and calcium sulphate ($CaSO_4$), neither of which have injurious effects on the consumer, but both of which cause hardness.

Magnesium(Mg) is a common constituent of many igneous rocks and, therefore, very prevalent in ground water. Dolomite, a carbonate of calcium and magnesium, is also a source of the element. The sulphate of

magnesia (M_gSO_4) combines with water to form 'Epsom salts,' and renders the water unwholesome if present in large amounts.

Sodium(Na) is derived from a number of the important rock-forming minerals, so that sodium sulphate and carbonate are very common in ground waters. Sodium sulphate (Na_2SO_4) combines with water to form 'Glauber's salt' and excessive amounts make the water unsuitable for drinking purposes. Sodium carbonate (Na_2CO_3) or 'black alkali' waters are mostly soft, the degree of softness depending upon the ratio of sodium carbonate to the calcium and magnesium salts. Waters containing sodium carbonate in excess of 200 parts per million are unsuitable for irrigation purposes[1]. Sodium sulphate is less harmful.

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[1]"The extreme limit of salts for irrigation is taken to be 70 parts per 100,000, but plants will not tolerate more than 10 to 20 parts per 100,000 of black alkali (alkaline carbonates and bicarbonates)". Frank Dixey, in 'A Practical Handbook of Water Supply', Thos. Murby & Co., 1931, p. 254.

Sulphates (SO_4) referred to in this report are those of calcium, magnesium, and sodium, and have been mentioned above in referring to those radicals. They are also formed by oxidation of iron sulphides, and, hence, it is not uncommon to find iron in sulphate waters. Sulphates cause permanent hardness in water, and injurious boiler scale. Sodium and magnesium sulphates are laxative when present in quantities of more than 900 parts per million. The writers found that acclimatized people could drink water containing as much as 2,000 parts per million of all three of the principal sulphates, but that when all were present in quantities over 1,500 parts per million the water was commonly laxative to those not accustomed to it.

Chloride (Cl) is a constituent of all natural waters and is dissolved in small quantities from rocks. Waters from wells that penetrate brines or salt deposits contain large quantities of chloride, usually as sodium chloride (common salt) and less commonly as calcium chloride and magnesium chloride. Sodium chloride is a characteristic constituent of sewage, and any locally abnormal quantity suggests pollution from this source. However, such abnormal quantities should not, in themselves, be taken as positive proof of pollution in view of the many sources from which chloride may be derived. Chlorides impart a salty taste to water if present much in excess of 500 parts per million. In southwestern Manitoba waters with as much as 3,000 parts per million of chloride are used domestically, though more than 1,500 parts per million is generally considered undesirable. The following figures apply to chlorides: stock will require less salt if the water bears 2,000 parts per million; more than 5,000 parts per million is unfit for human consumption; more than 8,000 parts per million is unfit for horses; more than 9,500 parts per million is too much for cattle; and more than 15,500 parts per million is excessive for sheep. Magnesium chloride, less common than sodium chloride, is very corrosive to metal plumbing.

Nitrates(NO_3) found in ground water are decomposition products of organic materials; they are not harmful in themselves, but they do point to probable pollution. It is recommended that a bacterial test be made on water showing an appreciable nitrate content, if it is to be used for domestic purposes.

Carbonates (CO_3) in water are indicated in the table of analyses as 'alkalinity'. Calcium and magnesium carbonate cause hardness in water, which may be partly removed by boiling. Sodium carbonate causes softness in waters, and is referred to under 'Sodium' above.

Bicarbonates (HCO_3). Carbon dioxide dissolved in water renders the insoluble calcium and magnesium carbonates soluble as bicarbonates. The latter are decomposed by boiling the water, which changes them to insoluble carbonates.

Hardness is a condition imparted to waters chiefly by dissolved calcium and magnesium compounds. It here refers to the soap-destroying power of water, that is, to the amount of soap that must first be used to precipitate the above compounds before a lather is produced. The hardness of water in its original state is its total hardness, and is classified as 'permanent hardness' and 'temporary hardness'. Permanent hardness remains after the water has been boiled. It is caused by mineral salts that cannot be removed from solution by boiling, but it can be reduced by treating the water with natural softeners, such as ammonia or sodium carbonate, or with many manufactured softeners. Temporary hardness can be eliminated by boiling, and is due to the presence of bicarbonates of calcium and magnesium. Waters containing large quantities of sodium carbonate and small amounts of calcium and magnesium compounds are soft, but if the latter compounds are present in large quantities the water is hard. The following table[1] may

[1]Thresh, J.C., and Beale, J.F.: The Examination of Waters and Water Supplies; London, 1925, p. 21.

be used to indicate the degree of hardness of a water:

Total Hardness

Parts per million	Character
0-50	Very soft
50-100	Moderately soft
100-150	Slightly hard
150-200	Moderately hard
200-300	Hard
300 +	Very hard

The above table gives the generally accepted figures for hardness, but the people of southwestern Manitoba have become accustomed to harder waters, and the following table, based on about 800 field determinations of hardness, by the soap method, is more applicable:

Parts per million	Character
0-100	Very soft
100-150	Soft
150-250	Moderately hard
250-350	Hard
350-500	Very hard
500+	Excessively hard

Waters having a hardness of up to 300 parts per million are commonly used for laundry purposes. In southwestern Manitoba, hardness ranges from less than 50 parts per million to more than 2,500 parts per million.

PART II

TOWNSHIPS 1 to 6, RANGES 18 to 21, WEST PRINCIPAL MERIDIAN, MANITOBA. (Boissevain Area)

Introduction

An investigation of the glacial geology and the groundwater resources of the Boissevain area was conducted in the field season of 1946 by E. C. Halstead, and in the season of 1947 by J. A. Elson.

Physical Features

Turtle Mountain extends for about 40 miles along the International Boundary and for 8 to 10 miles north of the boundary. The east end of the mountain occupies the south part of the Boissevain area. Its summit is heavily forested, and is included in the Turtle Mountain Forest Reserve. Many small lakes occupy depressions between hills of various sizes and shapes. Intermittent creeks are found around the mountain and flow northwest to Whitewater Lake or northeast to Pembina River. A rolling, hummocky belt about 6 miles wide surrounds the mountain. The highest elevations on the summit are more than 2,250 feet above sea-level, and the plain beyond the base of the mountain is about 1,600 feet above sea-level.

Souris River follows a valley about a mile wide and 150 feet deep that enters the Boissevain area in sec. 36, tp. 6, rge. 20. The river follows this valley southeast to sec. 4, tp. 6, rge. 18, where it turns and flows northeast leaving the area in sec. 35, tp. 6, rge. 18. The continuation of the valley east of the turning point of the river is Langs Valley, which was an outlet for the former glacial Lake Souris. The northeast quarter of the area is gullied by short streams that empty into Souris River.

The central part is a gently rolling plain. Whitewater Lake, a saline lake that does not overflow, is located in tp. 3, rge. 20. It is bordered by swamp-land and a belt of hay flats about 2 to 3 miles wide.

Geology

Table of Formation

Age	Formation	Character	Thickness (Feet)
Recent	Alluvium	Stream-laid mud, silt, sand and gravel	
Pleistocene	Lake deposits	Silty clays, fine sands and silts, duned sands, assorted sands and gravel in beaches and deltas	0-50

Age	Formation	Character	Thickness (Feet)
	Glacial drift	Till, clay, sand gravel, boulders, assorted sand and gravel in outwash plains	0-400
Upper Cretaceous and Paleocene	Turtle Mountain Ravenscrag	Soft shale, lignite beds, fine-grained white to yellowish sand and sandstone	300-400
	Boissevain	Greenish grey sandstone and sand.	100
Upper Cretaceous	Riding Mountain	Upper beds of medium to light grey, hard, siliceous shales (Odanah shale), with some thin layers of fine, blue sand and bentonite beds; lower beds of slippery clay shale that tends to slump	1,000 +
	Vermilion River	Dark grey and black shale; comprising three members: Pembina (dark shale, numerous bentonite bands near base);	80 ±
		Boyne (grey, calcareous shale non-calcareous dark shale near base); and Morden (calcareous speckled shale, overlying dark grey, non-calcareous, blacky shale with thin partings of white sand)	190 ±
	Favel	Grey shale with white calcareous material; some bands of limestone; some bentonite	150 ±

Age	Formation	Character	Thickness (Feet)
Lower and Upper Cretaceous	Ashville	Dark grey to black shales with silt and sands	40 ±
Lower Cretaceous	Swan River	White to green sandstone, black shale and silt	50 +
Jurassic		Light grey to red shale, calcareous sandstone, grey to buff to brown shales, light grey limestone and sandstone	380 ±
Jurassic or earlier	Amaranth	Red beds and gypsum	220

The Boissevain area is underlain by Upper Cretaceous shales of the Riding Mountain formation, except in the south where Turtle Mountain is formed by an outlier of the late Cretaceous and early Tertiary formations, overlain by moraine of the continental glacier. Drilled wells into the Riding Mountain shale may reach one of three aquifers: (1) the fractured upper surface; (2) an aquifer at an elevation of about 1,450 feet, and (3) one yielding soft water at an elevation of about 1,250 feet above sea-level. The log of a representative well drilled 225 feet in depth in SE.$\frac{1}{4}$ section 24, tp. 4, rge. 20, is as follows:

Depth in feet	Character
0 - 40	Grey clay
40 - 133	Blue clay
133 - 137	Blue sand
137 - 138	Fractured upper surface of shale
138 - 222	Light grey, hard siliceous shale
222 - 225	Blue sand (water-bearing)

Overlying the shale is glacial till except on Turtle Mountain where

the Boissevain formation, of greenish grey sandstone that weathers a yellowish somewhat rusty colour, overlies the Riding Mountain beds. Only a few exposures of the Boissevain have been observed, and its boundaries are but little known. Turtle Mountain formation, a series of shale and sandstone and some lignite beds, rests on the Boissevain formation on Turtle Mountain.

The unconsolidated surface deposits range in thickness from 10 to more than 100 feet. Ground moraine occupies most of the area. The upper 20 feet or more is a greyish buff till, with lenses of stratified sand and gravel, underlain by a more impervious blue till. The areas of recessional moraine have a higher content of gravel and boulders. Glacial-lake clay surrounds Whitewater Lake and extends east of the lake. Water-worked till and shallow water-laid deposits of silt, sand, and gravel are present in a strip about 2 miles wide bordering the south side of Souris River.

Water Supply

A supply of potable water is pumped from aquifers reached by drilled wells drilled into the bedrock (Riding Mountain formation). The water may be salty, but can be used for domestic purposes. The deeper drilled wells reach aquifers of soft water in the same formation. Wells yielding a good supply are commonly dug or bored to an aquifer of sand overlying the shale. Dugouts are not common, and are used only in the central part of the area. Intermittent creeks flowing from the summit of Turtle Mountain in the south, and smaller creeks tributaries of Souris River in the north, are sources of water for stock during most of the grazing period.

Township 1, Range 18. The township is located on the east end of Turtle Mountain, from the summit of which intermittent streams flow east across the township. The chief water-bearing zone is in the unconsolidated surface deposits which are as much as 80 feet thick in some places. The surface is rolling, and the hills are commonly covered with a thin mantle of gravel. Most of the wells are bored 25 to 60 feet deep, and reach sands and coarse gravels below the till. An abundant supply of hard, clear, commonly iron-bearing water is available, and is useful for both domestic and stock use, each well supplying sufficient water for about seventy head of stock. Wells about 12 feet deep are dug into local pockets of gravel and sand within the glacial till. In NW.$\frac{1}{4}$ section 9, a bored well 80 feet deep, yields an insufficient supply, and four dry test holes have been dug.

A drilled well 203 feet deep, in NE.$\frac{1}{4}$ section 2, is on the side of a ravine. The water in the well rises within 8 feet of the surface, and a horizontal pipe laid 8 feet below the surface allows this well to discharge into the ravine as a flowing artesian well. The aquifer may be the Boissevain sandstone that underlies the Turtle Mountain formation.

Township 1, Range 19. Farming is carried on in the northeast corner of the township only, as the remainder of the land is included in the Turtle Mountain Forest Reserve. Bored wells about 50 feet deep reach sand and gravel below till, and yield hard, clear water sufficient for fifty head of stock. The thickness of the till is unknown, but dry holes bored to depths of 47, 70, and 90 feet all penetrated a yellow clay till. Dug wells 5 to 14 feet deep may yield abundant water from springs along the mountainside or from local pockets of gravel. In SW.$\frac{1}{4}$ section 21, a dry hole, bored 90 feet, reached fossilized spruce cones that were identified as black spruce cones by the Forestry Branch of the Manitoba Department of Lands and Forests.

Township 1, Range 20. This township is included in the Turtle Mountain Forest Reserve. Three wells are recorded. The surface is covered with many small lakes, and surface water is plentiful. A supply of water may be available from wells bored to sand or gravel below the surface deposits of yellow clay.

Township 1, Range 21. No wells are recorded. All the land is in the Turtle Mountain Forest Reserve.

Township 2, Range 18. The surface deposits of glacial till present a rolling, irregular surface across which flows two creeks with many intermittent tributaries.

The principal water-bearing zone is reached by bored wells ranging 25 to 80 feet in depth. An aquifer of sand or gravel below the surface till yields a supply of hard, clear, iron-bearing water, commonly sufficient for fifty head of stock.

In sections 1, 16, and 18, wells 120, 100, and 90 feet deep, respectively, are drilled into the Turtle Mountain formation of sand, sandstone, shale, and lignite. An abundant supply of hard, clear water is obtained. Boissevain sandstone underlies the northeast part of the township but no wells are drilled into it.

Township 2, Range 19. A supply of potable water is commonly pumped from the bored wells ranging 25 to 100 feet in depth and reaching aquifers of sand below the surface till. The surface is rolling, with gravel-covered hills and ravines cut by intermittent streams that flow north across the township from the summit of Turtle Mountain.

The surface till is underlain by sand, shale, and lignite of the Turtle Mountain formation. Wells are commonly dug into this formation, and yield an abundant supply of hard, clear water sufficient for forty head or more of stock. In NW.$\frac{1}{4}$ section 2, a bored well, 125 feet deep, reached a coal seam 2 feet thick at a depth of 100 feet and a small supply of water, but drilling was continued for another 25 feet and the well now yields sufficient water for one hundred head of stock. Another hole, bored 100 feet deep on the same farm, was dry, and penetrated blue clay only. In NW.$\frac{1}{4}$ section 29, a bored well 32 feet deep penetrated layers of shale and a 6-inch coal seam at a depth of 18 feet below the surface.

Boissevain sandstone outcrops in a ravine in section 35. Springs are present along the ravine. Only one well reaches this formation, and it is in SE.$\frac{1}{4}$ section 27, bored 80 feet in depth and yields abundant soft, clear water. An aquifer is commonly reached in the Turtle Mountain formation, and drilling operations are not carried deeper to aquifers in the underlying Boissevain formation.

Township 2, Range 20. The south part of the township is forested and is part of Turtle Mountain. The surface is rolling, and slopes to the north approximately 200 feet in 6 miles. Five intermittent creeks flow north across the township.

The principal water-bearing zone is reached by bored wells ranging in depth from 25 to 100 feet. An aquifer of sand and gravel is reached that underlies the yellow and blue clay of the surface till. In sections 12, 13, 21, and 30, bored wells 45, 25, 85, and 18 feet deep, respectively, are tapping aquifers in the Turtle Mountain formation. The bored wells commonly yield sufficient hard, clear, iron-bearing water for fifty to a hundred head of stock. Dug wells 10 feet deep in pockets of gravel and sand in the glacial till are found on some farms and are used only for domestic purposes.

In SE.$\frac{1}{4}$ section 3, a bored well, 100 feet deep, carries 40 feet of water from an aquifer of gravel below blue clay. Two other holes, 50 to 75 feet deep, dug into blue clay on the same section, were dry.

Township 2, Range 21. The township is located on the north side of Turtle Mountain. The surface slopes north, 400 feet in 6 miles, and is rolling and irregular. Five creeks flow north over the surface deposits of recessional and ground moraine. The south half is forested, and surface deposits of recessional moraine with local pockets of gravel are sites of wells dug 5 to 12 feet deep and yielding hard, clear water.

Bored wells ranging in depth from 20 to 118 feet are found in the north half of the township. These wells penetrate blue clay and commonly reach a zone of sand beneath that yields a supply of hard, commonly iron-bearing water. The supply may water fifty head of stock, but it is reported that wells reaching this aquifer yielded an abundant supply for 2 years and then went dry. The wells may be deepened by drilling to the underlying Turtle Mountain formation where good aquifers are commonly encountered.

In NW.$\frac{1}{4}$ section 3, a well bored 70 feet in till is not used, but commonly carries 20 feet of water. In NE.$\frac{1}{4}$ section 3, a bored well 85 feet deep reached gravel and boulders below blue clay and yields a limited supply for domestic use. Dry holes dug to depths of 30 to 50 feet encountered boulders but no water. In NW.$\frac{1}{4}$ section 9, a bored well, 118 feet deep, reached gravel below 100 feet of blue clay. Sufficient, very hard, clear water for a hundred head of stock rises 83 feet in the well.

Township 3, Range 18. Two water-bearing zones are present in this township. In the south, the surface deposits are recessional and ground moraine. Pembina River flows east across this part of the township. The hills and knolls are capped with sands and gravels, and pockets of these materials are found scattered all through the recessional moraine. The water-bearing zone is reached by bored wells 20 to 75 feet deep, and yields hard, clear water commonly sufficient for forty head of stock. In NE.$\frac{1}{4}$ section 18, a bored well 52 feet deep penetrated blue clay and reaches an aquifer of blue sand at 48 feet. A supply of water for domestic use is pumped from this well. A similar well, bored for stock water, yields enough for twenty head, but two dugouts are also excavated to assure a supply. Two wells 325 and 250 feet deep, are drilled in sections 5 and 11, respectively, and yield soft water similar to (those) wells drilled in the north part of the township.

In the north part of the township, the principal water-bearing zone lies in the Upper Cretaceous shales of the Riding Mountain formation that underlies the area. Wells dug in the unconsolidated surface deposits are not a satisfactory means of supply but commonly sufficient, soft, slightly salty water is pumped from wells, ranging from 200 to 400 feet in depth, drilled 100 feet or more into the bedrock.

Township 3, Range 19. Two principal water-bearing zones are present in the township. The upper one lies below the unconsolidated surface deposits of glacial till and is reached by bored wells ranging in depth from 20 to 100 feet. A supply of hard, clear water commonly sufficient for forty head of stock is recovered from this aquifer. In SE.$\frac{1}{4}$ section 12, a bored well 55 feet deep, penetrated blue clay and supplies sufficient water for sixty head. A dry hole drilled in till in the same section is 304 feet deep. Local pockets of gravel in the surface tills are also aquifers, and some dug wells 12 to 14 feet deep yield a limited supply from these sources.

The second principal water-bearing zone is reached by drilled wells, ranging in depth from 200 to 407 feet, that reach shale at an average depth

of 120 feet. The water is commonly soft, useful for both domestic and stock uses, and sufficient for thirty-five head of stock.

A third possible water-bearing zone is in the south part of the township underlain by Boissevain sandstone. Two wells reach aquifers in this formation: one, in SE.$\frac{1}{4}$ section 9, dug 20 feet, reached sandstone 10 feet below the surface, and yields hard, iron-bearing water sufficient for thirty head of stock; the other, in SE.$\frac{1}{4}$ section 11, is bored 70 feet deep through 60 feet of clay till and 10 feet of sandstone, and yields hard, iron-bearing water sufficient for sixty head.

Pembina River and small tributary creeks flow east across the south part of the township. Of the sixteen drilled wells recorded, ten yield soft, clear water.

Township 3, Range 20. The northwest quarter of the township is covered with glacial-lake clay and the remainder by recessional and ground moraine. Underlying the moraine in the south half is Boissevain sandstone, and here the till averages 70 feet in thickness. Cretaceous shales underlies the remainder of the township. Only in the north, in sections 31 and 35, wells reach aquifers in the bedrock. Six drilled wells, 180 to 275 feet deep, reach bedrock at an average depth of 150 feet, and are drilled 75 feet or more into the shale to aquifers that yield soft, salty water under sufficient hydrostatic pressure to rise within 20 feet of the surface. In NE.$\frac{1}{4}$ section 33, a well drilled 180 feet yields hard, clear water with some natural gas.

Throughout the remainder of the township, bored wells, averaging 40 feet in depth, reach sand aquifers below blue clay and yield hard, clear water sufficient for fifty head or more of stock. In NE.$\frac{1}{4}$ section 28, a well, bored 20 feet, carries about 5 feet of water and increases its supply noticeably after a rain. In the same section, several holes were bored up to 70 feet deep. Only one supplied water, and this went dry in the first year. A hole drilled to a depth of 500 feet was also dry. In NW.$\frac{1}{4}$ section 24, a well bored 32 feet, at the school, reached black sand with rounded pebbles at 30 feet. The well carries 12 feet of hard, clear water.

Wells may be dug or drilled in the south part of the township to the underlying Boissevain formation, and a good supply of water is commonly available. One well in NW.$\frac{1}{4}$ section 6, in a ravine, is 15 feet deep and reached the Boissevain sandstone at a depth of 12 feet. It yields abundant, hard clear water. In the northwest quarter dugouts are used for a supply of stock water.

Township 3, Range 21. Whitewater Lake lies in the northwest quarter of the township, and three intermittent creeks flowing northwest empty into it. The south part of the township is ground moraine, about 40 feet thick, overlying Boissevain sandstone. Wells are bored 20 to 80 feet deep to aquifers of sand below blue clay. These wells yield hard, clear water sufficient for forty head of stock. In sections 14, 15, 16, and 17 the presence of an aquifer of sand below about 12 feet of yellow clay, allows for abundant water just on the edge of the impervious clay area to the north. Dugouts are needed for a supply of stock water on many of the farms. One well in SE.$\frac{1}{4}$ section 9, bored 32 feet, reaches Boissevain sandstone and yields an abundant supply of hard, clear, iron-bearing water. A dry hole was drilled 117 feet deep in NE$\frac{1}{4}$ section 6.

Township 4, Range 18. The surface of the ground moraine is dotted with many sloughs that are useful as watering holes for stock in the summer months. Small springs are present along the ravines and dugouts are necessary

on many farms.

Two water-bearing zones are present. The upper zone lies at the base of the blue clay of the ground moraine where an aquifer of fine sand is commonly present. Bored wells 30 to 80 feet deep reach this zone and yield hard, iron-bearing water usually sufficient for thirty head of stock.

The second water-bearing zone is reached by wells 100 to 500 feet deep, drilled into the bedrock. These wells yield hard to soft water that can be used for both domestic and stock purposes. In NW.$\frac{1}{4}$ section 26, a bored well 125 feet deep penetrates blue clay and reaches the top of the shale. It carries 30 feet of water. In the same section a dry hole was drilled to a dépth of 410 feet, and another well drilled 360 feet yielded a supply of salty water. The well went dry in 6 years. A dugout is necessary to assure a supply of stock water.

Township 4, Range 19. The surface deposits of ground moraine composed of yellow and blue clay, are about 80 feet thick and underlain by shales of the Riding Mountain formation. The principal water-bearing zone is reached by wells drilled to depths of 150 to 540 feet. The water in these wells is under sufficient pressure to rise to within about 30 feet of the surface. It is moderately hard, iron-bearing, and at times appears cloudy, but the supply is sufficient for about thirty head.

Bored wells, ranging in depth from 30 to 96 feet, reach aquifers of sand and gravel below or within the blue clay of the ground moraine. The supply is commonly sufficient for twenty head of stock. A well 96 feet deep, in NW.$\frac{1}{4}$ section 14, is bored 93 feet through blue clay and reaches shale, into which it is dug an additional 3 feet. The water comes into this well from the upper fractured surface of the shale.

All wells of the township are relatively deep, the water-table being more than 35 feet below the surface. Shallow wells have failed and dugouts or drilled wells are necessary for an assurance of water.

Township 4, Range 20. The principal water-bearing zone in this township lies in the bedrock, which is about 100 feet below the surface of the ground in the south part and 70 feet below the surface in the north. Forty-four drilled wells are recorded; three are 90 to 150 feet deep; twenty-seven are 150 to 200 feet deep; fourteen are drilled to a depth of more than 200 feet. The deepest well is 372 feet deep and is located in SE.$\frac{1}{4}$ section 9. In all the wells the water rises in the casing to within about 30 feet from the surface. It is potable, used for domestic purposes, and commonly sufficient for fifty head of stock.

The surface deposits are yellow clay till which yields a gently rolling to flat topography. Dug wells in the till are not used as the water supplied by them is limited or negligible in amount. Dugouts are used in sections 1, 2, 7, 23, and 24.

Township 4, Range 21. The surface deposits are ground moraine except in the south part where glacial-lake silts and clays form the surface deposits. Whitewater Lake is surrounded by hay-flats.

Of the thirty-four wells recorded, twenty-seven are drilled. The drilled wells, 135 to 350 feet in depth, reach aquifers in the bedrock that commonly yield soft water sufficient for thirty head of stock. The hydrostatic pressure is variable, and the water rises in the well anywhere from 6 to 120 feet from the surface of the ground.

Three bored wells, in sections 16, 30, and 38, are 100, 60, and 66 feet deep, respectively; they are dug to sand below glacial till, and reach aquifers that yield hard, clear water. Wells about 15 feet deep are dug into

local pockets of sand and gravel. They yield an average supply of hard, clear water, but are not common in the township.

Township 5, Range 18. Short ravines with intermittent creeks that drain north to Langs Valley extend along the north part of the township. Thirty-six wells are recorded, of which eight are drilled. Two water-bearing zones are recognized in the bedrock. The upper zone is at an elevation 1,430 to 1,450 feet above sea-level and is reached by wells 180, 140, and 75 feet deep, in sections 6, 8, and 32, respectively. These wells yield hard, clear water sufficient for fifty head or more of stock. The second water-bearing zone of the bedrock is at an elevation of 1,210 to 1,288 feet above sea-level, and is reached by wells 300, 338, 300 and 290 feet in depth in sections 9, 16, 18, and 28, respectively. These yield soft, salty water sufficient for forty head, and the water can be used for domestic needs. A well 180 feet deep, drilled in NE.$\frac{1}{4}$ section 30, reaches an intermediate zone and yields hard, alkali water.

The remainder of the wells are dug or bored, and range in depth from 12 to 90 feet. The bored wells are 30 to 90 feet deep, reach aquifers of sand below till, and yield hard, clear water sufficent for thirty head of stock. Dugouts are seen throughout the township, and are an assurance for stock water. In NE.$\frac{1}{4}$ section 14, a drilled hole, 360 feet deep, and several bored holes were dry.

Township 5, Range 19. The surface is a rolling plain with gravel knolls, and two intermittent creeks flow northeast across the township. The surface deposits are ground moraine ranging from 40 to 90 feet in thickness. Dug wells, about 14 feet in depth, supply household needs from local pockets of gravel. Bored wells, ranging from 50 to 80 feet in depth, reach aquifers at the contact of the till and shale and yield a good supply of potable water. In SW.$\frac{1}{4}$ section 21, four bored wells reached a zone of boulders at a depth of 30 feet below the surface (of the ground). One reached boulders and sand, and the well filled with water that was extremely bitter and could not be used.

Of the thirty-nine wells recorded, twenty-seven are drilled. They range in depth from 90 to 345 feet, and are drilled into Upper Cretaceous shales of the Riding Mountain formation. The water is commonly hard and slightly salty, but is useful for domestic as well as stock use. The pressure is sufficient to cause the water to rise within 30 feet of the surface of the ground, and is sufficient for 40 head of stock.

Township 5, Range 20. The surface is a rolling plain of glacial till about 60 feet thick. Wells 13 to 30 feet are dug to aquifers in the till for a domestic supply. They are commonly situated in ravines and low areas. A bored well, 26 feet deep, in SE.$\frac{1}{4}$ section 32, supplies sufficient potable water for seven families in the village of Fairfax.

Fifty wells are recorded, of which forty-four are drilled; twenty-four range in depth from 120 to 180 feet; fourteen are 180 to 220 feet deep; six are more than 220 feet deep, and the deepest is drilled 325 feet. These wells reach aquifers in the shale. The aquifers below an elevation of about 1,400 feet above sea-level yield soft water and those above this zone yield hard water. All the water is salty or alkali, but can be used for household needs. In NE.$\frac{1}{4}$ section 12, a drilled well 170 feet deep yields only four barrels of water at a time, but can be pumped often during each day. Commonly the wells will water fifty head of stock. Drilled wells are an assurance of sufficient water in this township and have been drilled on nearly every farm.

Township 5, Range 21. Drilled wells in the township are 75 to 295 feet deep. Ten of the sixteen of these wells are between 100 and 160 feet in depth. The water encountered is under sufficient pressure to rise to within about 20 feet from the surface. It is hard and salty, commonly sufficient for thirty head or more of stock, but some wells cannot be used for domestic purposes because of the concentration of dissolved salts in the water. Bedrock is about 25 feet from the surface. Overlying the bedrock is glacial till, with local pockets and lenses of gravel. Wells ranging in depth from 14 to 30 feet are dug into the surface deposits and commonly reach aquifers in the zone of till immediately above the bedrock. The water may be alkali, and dugouts are needed on many farms. The dug wells may fail in periods of drought, or the salts in the drilled wells may be too concentrated, so a supply of good water is wanting in this township. Elgin Creek, an intermittent stream, flows northwest across the township.

Township 6, Range 18. Souris River enters the township in section 7 and flows southeast to section 4, where it turns and flows north leaving the township in section 35. The continuation of Souris Valley eastward is known as Langs Valley. Souris Valley is about a mile wide and 150 feet deep. Riding Mountain shale outcrops along it in sections 7, 8, and 9. The valley bottom is covered with alluvium, and recessional moraine forms the surface deposits north of the river and Langs Valley. Water-worked till mantles sections 4, 5, and 6. The surface of the township is rolling; highest elevations are more than 1,550 feet above sea-level and the lowest are less than 1,300 feet, a relief of 250 feet.

Dug wells 5 to 35 feet deep reach aquifers in the surface tills. Gravel pockets are commonly the sites of these wells, and a good supply of water is obtained. Springs along the river are also excellent sources of water. Bored wells 60 to 75 feet deep reach gravel or sand below till and commonly supply twenty head of stock. Many bored wells and dug wells have failed, and dugouts or the Souris River are sources of water for stock. In NW.$\frac{1}{4}$ section 13, a bored well 32 feet deep yields only 6 pails of water a day. A drilled well in NE.$\frac{1}{4}$ section 30, 175 feet deep, is in sand and gravel, and yields 1 barrel of water a day. Other wells drilled 108 and 152 feet deep, in sections 31 and 32, are in unconsolidated till. A drilled well in SW.$\frac{1}{4}$ section 6, is 155 feet deep and reaches shale at 55 feet that yields soft water.

Township 6, Range 19. Souris River crosses the township and follows a valley more than a mile wide and about 150 feet deep. The river enters in section 30 and leaves in section 12. The surface near the valley is hummocky and gullied by short streams. Along the valley bottom is alluvium. North of the river, the surface is an irregular rolling plain of recessional moraine; south of the river, water-washed till overlies bedrock that ranges in depth from 6 to 70 feet.

North of the river, dug wells 60 to 100 feet deep reach aquifers in the till, and yield a supply of hard water sufficient for forty head of stock. Local pockets of gravel are common. The supply on some farms is not reliable and dugouts are needed.

South of the river, drilled wells 86 to 300 feet in depth, reach aquifers in the shale. The supply is commonly sufficient for forty-five head of stock, and is hard, salty water except in the deeper wells where soft, salty water is obtained. Dug or bored wells to the bedrock surface yield a good supply. In sinking these wells, the upper, fractured surface is blasted and a reservoir is formed at the bottom of the well in the shale. Examples of these wells are found in sections 15 and 16, where wells 30 to 44 feet have been dug and blasted.

Township 6, Range 20. The surface is a gently rolling plain that slopes north; it is covered with water-worked till and shallow water-laid deposits of sand and gravel. Sections 29, 30, 31, and 32 are partly floored with glacial-lake sand. Two intermittent creeks cross the township; one flows north, the other northeast; both empty into Souris River beyond the township.

The bedrock surface is irregular; in NE.$\frac{1}{4}$ section 20, shale is 8 feet below the surface, and in section 34, 80 feet below, while in the south, where most of the drilled wells are located, the bedrock is on the average 40 feet below the surface. Fifteen drilled wells are recorded, ranging in depth from 90 to 280 feet. The aquifers yield hard, salty water that is used for both domestic and stock purposes and is under sufficient pressure to rise within 30 feet of the surface. In NW.$\frac{1}{4}$ section 36, a well drilled 200 feet reaches an aquifer deeper than the other wells and yields soft water sufficient for fifty head of stock.

Dug wells, 12 to 45 feet deep, in the till yield a limited supply for household uses only. These may reach the upper fractured surface of the bedrock, as do wells in sections 16 to 20, or reach an aquifer in the till. The most satisfactory wells are those dug in the local gravel and sand pockets, such as in SW.$\frac{1}{4}$ section 30, where a dug well, 13 feet deep is sand, yields an abundant supply of moderately hard water sufficient for sixty head of stock.

Township 6, Range 21. Glacial-lake sands and clay mantle the township. These wells ranging in depth from 10 to 16 feet are in surface deposits of sand or gravel and yield an abundant supply of hard, clear water. Other dug wells about 30 feet deep reach aquifers of sand or gravel below the surface till and overlying a more compact blue clay. These wells commonly yield hard, iron-bearing water that is sufficient for local needs. In SW.$\frac{1}{4}$ section 17, a sandpoint well 10 feet deep is used in the gravel and sand on this farm.

Drilled wells ranging in depth from 120 to 200 feet, are recorded in sections 9, 10, 14, 23, and 26. These wells reach aquifers in the shale, and yield salty water. Three of them yield hard water and two soft water. The supply is sufficient for twenty head or more of stock. Elgin Creek flows north across the township, and is a source of stock water; dugouts are also used, especially in the area of lake clay.

Fourteen wells were dug in section 16 in search of a water supply for Elgin Airport. All these wells penetrated about 8 feet of sand overlying blue clay. Three wells, dug 8, 15, and 12 feet deep yielded water and results of pumping tests were $\frac{1}{2}$, 2, and 1.8 Imperial gallons per minute, respectively. The 15-foot well, although yielding 2 Imperial gallons per minute, was dry in a short time. The 12-foot well had a static level of 5 feet of water after the 12-hour pumping test. An analysis is given of the water from this well.

Discussion of Water Analyses

The following table compares the analyses of samples taken from the aquifers in the Boissevain area with those of the water supplying the city of Brandon, which is taken from Assiniboine River and has a lower mineral content than that of underground water. According to the United States Public Health Service[1], a wholesome water should not contain more than 500 parts per million of total solids but a total solids content of 1,000 parts per million may be permitted; a total hardness of 150 parts per million is the maximum for soap economy; the magnesium content should not exceed 125 parts per million; the chloride, 250 parts per million, and the sulphate, 250 parts per million.

The analyses[2] entered in the table for any aquifer is the average of all the available analyses of water from that aquifer. The figures given in each column represent parts per million.

	Brandon water supply	Turtle Mountain formation	Boissevain sandstone	Riding Mountain shale	Gravel	Till
Total solids	550.0	1,042.6	1,719.0	2,637.5	1,442.4	2,305.6
Total hardness	331.5	647.5	905.0	285.3	750.4	981.6
Calcium	75.5	143.1	220.5	71.1	167.7	181.7
Magnesium	34.8	70.6	85.9	26.2	81.2	109.8
Sodium		63.5	208.0	834.3	169.8	224.3
Chloride	18.8	11.5	16.4	995.3	45.0	60.7
Sulphate	195.2	306.8	824.3	471.6	606.7	927.6
Alkalinity as $CaCo_3$	210.0	573.3	402.0	521.6	368.0	318.4
HCO_3	256.2	459.7	427.0	606.9	405.6	345.1

1. United States Public Health Service, Public Health Report No. 2,440.

2. Analyses from - Industrial Waters of Canada, 1934 to 1943, Bureau of Mines, No. 819, by H. A. Levren.

Of the analyses that follow, samples Nos. 1 to 30, inclusive, were analysed by the Bureau of Mines, Ottawa. Sample No. 31, was analysed by the National Testing Laboratories, Limited, Winnipeg.

ANALYSES OF WELL WATERS FROM Boissevain area, Townships 1 to 6, Ranges 18 to 21, West Princ. mer.

Sample Number	¼	Section	Township	Range	Meridian	Owner	Depth of well (feet)	* Aquifer	Total dissolved solids (parts per million)	Constituents as Analysed (parts per million) Calcium (Ca)	Magnesium (Mg)	Alkalis (as Na)	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Bicarbonate (HNO_3)	Alkalinity (as $CaCO_3$)	Hardness as ($CaCO_3$) (pts. per million) Ca hardness	Mg hardness	Total hardness
1	NE	15	1	18	1st	. T.Henderson	28	Gr.	2597.5	419.8	145.9	92.0	1403.0	25.6	1.5	388.8	344.0	1047.0	592.2	1639.2
2	NE	32	1	18	"	Morgan & Sons	42	Gr.	585.0	76.0	66.0	25.0	139.0	8.0	19.4	302.6	312.0	189.6	272.0	461.6
3	NW	1	2	18	"	W.S.Bell	120	TM.	1122.0	173.4	65.5	115.5	475.2	3.2	8.8	317.2	860.0	432.5	269.5	702.0
4	NW	18	2	18	"	C.Stephens	100	Sh.	1620.0	32.0	7.0	562.8	684.9	14.8	14.0	490.5	470.0	79.9	28.8	108.7
5	SW	31	2	18	"	H. Jones	33	Gr.	576.0	74.0	17.0	97.5	133.6	4.4	4.4	275.9	258.0	184.6	70.0	254.6
6	SW	19	3	18	"	Ninga Village	50	T.	2481.0	156.0	171.8	362.0	1314.0	85.4	13.8	371.0	360.0	892.2	706.0	1698.2
7	NW	20	3	18	"	J.W.Hicks	410	Sh.	2380.0	54.0	17.3	351.0	612.8	244.4	7.0	615.0	544.0	134.9	71.9	206.8
8	SE	36	3	18	"	W.B.Mitchell	300	Sh.	1474.0	77.0	21.0	511.2	331.1	41.1	3.4	639.0	544.0	192.1	86.3	278.4
9	SW	21	5	18	"	Margaret Village	55	T.	2666.6	277.0	168.0	42.0	1106.0	37.2	17.8	427.8	380.0	691.9	545.8	1237.7
10	NE	30	6	18	"	S.E.Miller	275	Sh.	4591.0	56.8	30.2	1728.0	12.4	2390.0	2.0	734.7	602.2	142.0	123.8	265.8
11	SE	25	1	19	"	C.Knowles	14	TM	850.0	154.0	56.4	50.0	242.9	nil.	7.0	634.9	520.0	384.0	231.9	615.9

* Symbols used for aquifers Sh.-Riding Mountain shale Ts.-contact of shale and till Gr.- Gravel
Ss.-Boissevain sandstone L.-Lignite TM- Turtle Mountain formation T.- Till

ANALYSES OF WELL WATERS FROM Boissevain area, Townships 1 to 6, Ranges 18 to 21, West Princ. mer.

Sample Number	¼	Section	Township	Range	Meridian	Owner	Depth of well (feet)	* Aquifer	Total dissolved solids (parts per million)	Constituents as Analysed (parts per million) Calcium (Ca)	Magnesium (Mg)	Alkalis (as Na)	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Bicarbonate (HNO_3)	Alkalinity (as $CaCO_3$)	Hardness as ($CaCO_3$) (pts. per million) Ca hardness	Mg hardness	Total hardness
12	NW	17	2	19	1st	W.B.Kempthorne	40	TM.	1156.0	102.0	90.0	25.0	202.5	31.5	49.6	427.0	350.0	254.5	371.0	625.5
13	NW	29	2	19	"	J.Harper	32	L.	2406.0	102.0	28.8	682.0	1067.0	17.9	12.4	710.0	618.0	254.5	118.5	373.0
14	NE	32	3	19	"	J.Dingwell	350	Sh.	4162.0	51.4	23.2	1510.0	9.9	2188.0	2.0	625.4	512.6	128.5	95.1	223.6
15	NE	19	5	19	"	C.N.R.Minto	170	Sh.	2898.0	36.0	13,1	917.5	1153.1	213.5	15.8	763.7	182.0	89.8	53.9	143.7
16	NE	12	2	20	"	Glover Bros.	45	L.	1996.0	296.0	115.0	162.0	836.0	29.5	21.2	458.0	558.8	739.0	474.0	1213.0
17	NW	6	3	20	"	G.Martin	15	Ss.	1234.0	159.0	87.0	131.0	515.2	19.4	1.5	429.5	448.0	399.5	358.0	757.5
18	NW	16	3	20	"	A.J.Venables	35	T.	441.0	84.6	42.8	42.0	36.2	9.6	4.0	501.2	410.8	211.5	175.5	387.0
19	SW	24	3	20	"	J.A.McRuer	28	T.	730.0	96.0	37.6	86.0	149.0	50.8	46.1	295.2	290.0	239.5	154.7	393.2
20	SE	31	3	20	"	H.Baskerville	180	Sh.	3055.0	181.4	62.1	756.0	1238.0	460.2	0.8	525.6	430.8	453.5	254.6	708.1
21	SE	23	4	20	"	G.Noton	220	Sh.	2001.0	129.6	43.7	490.0	524.3	439.0	0.8	495.3	406.0	324.0	179.2	503.2
22	SE	32	5	20	"	Fairfax School	26	Sh.	688.0	48.0	27.5	181.0	142.4	15.3	7.0	423.1	394.0	119.8	113.2	233.0

* Symbols used for aquifers Sh.-Riding Mountain shale Ts. -contact of shale and till Gr.- Gravel
Ss.-Boissevain sandstone L.-Lignite TM.- Turtle Mountain formation T.- Till

NO. 669

ANALYSES OF WELL WATERS FROM Boissevain area, Townships 1 to 6, Ranges 18 to 21, West Princ. Mer.

Sample Number	¼	Section	Township	Range	Meridian	Owner	Depth of well (feet)	* Aquifer	Total dissolved solids (parts per million)	Constituents as Analysed (parts per million) Calcium (Ca)	Magnesium (Mg)	Alkalis (as Na)	Sulphate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Bicarbonate (HNO_3)	Alkalinity (as $CaCO_3$)	Hardness as ($CaCO_3$) (pts. per million) Ca hardness	Mg hardness	Total hardness
23	NE	14	2	21	1st	H.F.Smith	55	Ts.	1680.0	290.0	107.5	354.0	759.1	6.5	8.8	424.1	346.0	724.0	442.5	1166.5
24	SE	33	2	21	"	A.Swanson	40	Ss.	2204.0	282.0	84.8	285.0	1133.4	13.5	14.0	424.6	356.0	703.6	349.0	1052.6
25	SE	17	3	21	"	Whitewater	15	Gr.	876.0	130.0	49.8	52.5	276.5	2.2	12.0	368.4	322.0	324.4	204.9	529.3
26	NE	24	3	21	"	C.Baskerville	32	T.	2872.0	255.0	123.4	452.0	1453.0	110.6	3.4	356.0	348.0	637.0	507.9	1244.9
27	NW	19	4	21	"	A. Gerdis	165	Sh.	3506.0	44.2	17.5	1436.0	7.4	1947.0	2.0	756.9	620.4	110.5	71.8	182.3
28	SE	36	4	21	"	C.P.R.Croll	66	Gr.	2586.0	202.0	83.0	598.0	1084.0	203.1	8.8	666.1	562.0	504.0	341.5	845.5
29	SE	5	6	21	"	E.Mealy	10	Gr.	1434.0	104.0	124.6	154.0	604.1	27.0	14.0	431.9	410.0	259.5	512.7	772.2
30	NE	24	2	22	"	Mountainside	33	T.	2644.0	222.0	115.4	362.0	1477.4	70.5	12.0	119.6	122.0	553.9	474.9	1028.8
31		17	6	21	"	Elgin Airport	12	Gr.	1010.0	107.0	62.0	139.0	226.0	161.0			380.0			521.0

* Symbols used for aquifers Sh.- Riding Mountain shale Ts. -Contact of till and shale Gr. - Gravel
Ss.- Boissevain sandstone L.-Lignite TM.- Turtle Mountain formation T.- Till.

Record of Wells

The well records of this area follow in tabulated form. A commentary on these has been made on page 1 of this report.

As a general rule, the depth to the 'Principal Water-bearing Bed' has been taken as the total depth of the well and its elevation is given as such. This commonly applies to wells drilled in the bedrock. Digging or drilling is commonly continued until a good supply of water is obtained and then operations are stopped. In shallow surface deposits, especially those that are sand, the wells are dug a short distance below the water-table in dry seasons. The level of the water-table changes about 2 feet each year in the near surface deposits of wide extent, but may rise or fall as much as 8 feet during a wet to dry 10-year cycle.

Most of the wells are drilled, and not all are recorded because information on most of the wells drilled more than 40 years ago was not available. Wells that are dug beside dugouts are not included in the records.

Carberry Area

WELL RECORDS—~~Rural Municipality of~~ Twps. 7 to 10 Rges. 14 to 17

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
3	NW	4	10	14	Prin	Sandpt	16	1210	-10	1200			Sand	Hard, clear		D, S	Sufficient for 50 head or more
4	SW	5	"	"	"	"	20	1251	-10	1241			"	" "		D, S	" " 30 " " "
5	NW	5	"	"	"	"	20?	1238					"	Hard, " iron		D	
6	NE	5	"	"	"	"	26	1209	-20?				"	Hard, " iron		D, S	Sufficient for 30 head or more
7	NE	6	"	"	"	"	20?	1243	-12-15				"	" "		D, S	" " 100 " " "
8	NW	7	"	"	"	"	35?	1234					"	Hard, " iron		D	" " 100 " " "
9	NE	7	"	"	"	"	20	1254					"	" "		D, S	" " 35 " " "
10	SE	8	"	"	"	"	10-15	1215	-12?				"	" "	43°	D, S #2228	" " 30 " " "
11	NW	8	"	"	"	"	20-25	1253					"	Mod. hard clear		D, S	" " 50 " " "
12	SE	9	"	"	"	"	?	1253					"			N	
13	SW	9	"	"	"	"	16	1237	-12	1215			"	Hard, clear		D, S	Sufficient for 100 head or more
14	SW	11	"	"	"	"	30	1257	-20-22				"with beds of clay	" "		D, S	" " 80 " " "
15	SE	12	"	"	"	"	47	1259	-32	1227			Sand with beds of clay	Very hard clear		D, S	" " 200 " " "
16	NE	12	"	"	"	"	40	1237	-35	1202			Sand	Hard, clear		D, S	" " 100 " " "
17	SE	13	"	"	"	"	40?	1237	-9	1228			"	" "		D, S	" " 100 " " "
18	SE	13	"	"	"	"	40	1239					"	" "		D	
19	SW	14	"	"	"	"	30-40	1264	-35				"	" "		D	
20	NW	14	"	"	"	"	60	1264	-20	1244			"	" "		D, S	Sufficient for 500 head or more. hard-pan at 60 ft.
21	SE	15	"	"	"	"	30-40	1269					Sand with beds of clay	" "		D, S	" " 100 " " more
22	NW	15	"	"	"	"	?	1253									
23	SE	16	"	"	"	"	?	1256								D	
24	NE	16	"	"	"	"	30	1263	-20?				Sand	Hard, clear		D	Sufficient for 100 head or more
25	NW	17	"	"	"	"	30-50	1254	-15-20				"	" "		D, S	" " 100 " " "
26	SW	18	"	"	"	"	?	1246					"	" "		D, S	" " 100 " " "
27	SE	19	"	"	"	"	15-20?	1263	-10-15?				"	" "		D, S	
28	SW	19	"	"	"	"	30	1259	-(-)23				Sand with a bed of clay	" "		D, S	
29	NE	19	"	"	"	"	26	1262	-(-20)				Sand	" "		D, S	Sufficient for 100 head or more
30	NW	20	"	"	"	"	35	1260	-15	1245			"	" "		D	Supplied Air station - about 100,000 gls. per day

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~~ Carberry Area Twps. 7 to 10 Rges. 14 to 17

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
31	NW	21	10	14	Prin	Sandpt.		1259									
32	NE	21	"	"	"	"	?	1255					Sand	Hard, clear		D, S	
33	SW	22	"	"	"	"	35	1254	-(-32)				"	" "		D, S	Sufficient for 70 head or more
34	NE	23	"	"	"	"	21+	1260	-21	1239			Silty clay	" "		D, S	" " 50 " " "
35	NE	24	"	"	"	"	85	1249	-33	1216			Sand	" "		D, S	" " 100 " or more
36	SE	25	"	"	"	"	40	1230					Sand with beds of silty clay	" "		D, S	" " 100 "
37	SW	25	"	"	"	"	56	1247	-30	1217			Clay with bands of sand	Soft "		D, S	
38	SE	28	"	"	"	"	20-30	1260					Sand	Hard, "		D, S	Sufficient for 50 head
39	SE	29	"	"	"	"	28	1258	-20	1238			"			D, S	" " 45 " or more
40	SW	29	"	"	"	"	40	1276	-19	1257			"	Slightly soft clear	42°	D, S	" " 35 " " "
41	NW	29	"	"	"	"	25	1264	-10	1254			"	Hard, clear		D, S	" " 100 " " "
42	NE	30	"	"	"	"	40	1262					"	" "		D #2229	
43	SE	31	"	"	"	"	-25	1268					"	" "		D, S	Sufficient for 100 head or more
44	NW	31	"	"	"	"	26	1215	-20	1195			"	" "		D, S	" " 100 " " "
45	SE	32	"	"	"	"	22	1274					"	Mod. hard clear		D, S	" " 100 " " "
46	NW	32	"	"	"	"	25±	1271	-20	1251			"	Hard, clear		D, S	" " 70 " " "
47	NW	33	"	"	"	"	22	1273	-17(±)				"	" "		D, S	" " 80 " " "
48	SE	34	"	"	"	"	36	1273	-30?				"	Slightly soft clear		D, S	" " 30 " or more
1	NW	3	10	15	Prin	Sandpt.	20?	1256					Sand	Hard, clear		D, S	Sufficient for 100 head or more
2	NE	12	"	"	"	"	35?	1247					"	" "		D, S	" " 100 " " "
3	NW	13	"	"	"	"	15-20	1245					"	" "		D, S	" " 100 " " "; slightly laxative
4	NE	14	"	"	"	"	25	1247					"	" "		D, S	" " 1500 " " "
5	NE	19	"	"	"	"	15	1259	-13	1246			"	" "		D	
6	SE	24	"	"	"	"		1259					"	" "			
7	NE	24	"	"	"	"	26±	1260	-(-20)				"	" "		D, S	Sufficient for 100 head or more
8	SE	25	"	"	"	"	18-21	1258					"	Mod. hard clear		D, S	" " 100 " " "
9	SE	26	"	"	"	"	30	1256	-(-25)				"	Hard, clear iron		D, S	" " 100 " " "

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.

Carberry Area

B 4-4
R. 7526

WELL RECORDS ~~Rural Municipality of~~ Twps. 7 to 10 Rges. 14 to 17, W. Princ. Mer., Man.

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	7	14	Prin	Dug	12	1233	-6	1227			Sand	Alkali, iron		N	25 ft. sandpoint ¼ mile SW used for domestic
2	SW	1	"	"	"	Sand-point	20?	1253					"	Very hard clear alkali iron		D, S	Sufficient for 15 head or more; laxative
3	SE	2	"	"	"	"		1231					"	Hard, clear iron		D, S	" " 100 " " "
4	SW	2	"	"	"	"	30?	1231					"	Slightly hard clear iron		D, S	" " 50 "
5	NW	2	"	"	"	"	30?	1227					"	Hard, clear iron		D, S	" " 100 " or more
6	NW	3	"	"	"	"	30	1230	-20	1210			"	Hard, "		D, S	" " 200 " " "
7	SE	4	"	"	"	"	20?	1231	-15?	1216			"	" " iron		D, S	" " 70 " " "
8	SW	4	"	"	"	"	25	1232	-15?	1217			"	Hard, "		D, S	" " 60 " " "
9	NW	4	"	"	"	"	20	1234	-15	1219			"	" " iron		D, S	" " 100 " " "
10	SE	5	"	"	"	"	18	1228	-14	1214			"	Hard, " iron		D, S	" " 100 " " "
11	NW	5	"	"	"	"	28	1235					"	Hard, "		D, S	" " 100 " " "
12	SW	6	"	"	"	"	20	1239					"	Mod. soft, clear iron		D, S	" " 40 " " "
13	NE	7	"	"	"	"	21	1222					"	Slightly hard clear iron		D, S	" " 100 " " "
14	SE	8	"	"	"	"	20?	1237					"	Hard, clear iron		D, S	" " 45 " " "
15	NE	8	"	"	"	"	36	1227	-20	1207			"	Mod. soft "		D, S	" " 100 " " "
16	SW	9	"	"	"	"	18	1229	-15	1214			"	" " " iron		D, S	" " 100 " " "
17	NE	9	"	"	"	"	25	1226					"				
18	NE	10	"	"	"	"	28	1230	-15	1215			" below hard-pan	Hard, clear iron		D #2238	Typical of village of Glenboro
19	NE	11	"	"	"	"	35?	1227	-20?	1207			"	clear		D, S	
20	SW	12	"	"	"	"	30-40	1231					"	Mod. soft "		D, S	Sufficient for 40 head
21	NW	12	"	"	"	"	8-15	1223	-5?	1218			"	" " " iron		D, S	" " 15 " or more
22	NW	13	"	"	"	"	12-15	1228	-10	1218			"	Hard, clear iron		D, S	" " 45 " " "
23	SW	14	"	"	"	"	35	1231	-18?	1213			"	Hard, " iron		D, S	" " 100 " " "
24	NW	14	"	"	"	"	20?	1223					"			D, S	
25	SE	15	"	"	"	"	30	1221					"	Mod. soft clear		D, S	Sufficient for 50 head
26	SW	15	"	"	"	"	30	1226	-25?	1201			"	Hard, clear iron		D, S	
27	SE	16	"	"	"	"	25	1224	-20	1204			"	Soft, "		D, S	Sufficient for 100 head or more
28	SW	16	"	"	"	"	30-35	1229	-20	1209			"	" " iron		D, S	" " 40 " " "

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~~ Carberry Area Twps. 7 to 10 Rges. 14 to 17

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
29	SE	17	7	14	Prin	Sand-point	25	1223	-19	1214			Sand	Slightly hard clear iron		D, S	Sufficient for 200 head
30	NE	17	"	"	"	"	14-20	1220	-14	1206			"	Hard, clear iron		D, S	" " 50 " or more
31	SE	18	"	"	"	"	35	1225	-15	1210			"	Mod. soft " iron		D, S	" " 55 " " "
32	SW	18	"	"	"	"	25?	1205					"	Mod. soft " iron		D, S	" " 40 " " "
33	NE	18	"	"	"	"	30	1223	-14	1209			"	Hard, clear iron		D, S	" " 100 " " "
34	SE	21	"	"	"	"	25	1219	-20	1199			"	Mod. soft"		D	
35	SE	22	"	"	"	"	28	1223	-18	1205			"	" " "		D, S	
36	NE	22	"	"	"	"	30	1227					"	"		D, S	Sufficient for 100 head or more
37	NE	23	"	"	"	"	16	1221	-12	1209			"	Slightly hard clear iron		D, S	" " 30 " " "
38	SW	24	"	"	"	"	35	1228	-15-20	1210			" clay at 40 ft.	Slightly hard clear		D, S	" " 100 " " "
39	NW	26	"	"	"	"	20?	1215					"			D, S	
40	NE	26	"	"	"	"	18	1210	-15	1195			"	Slightly hard clear		D, S	Sufficient for 100 head or more
41	NW	27	"	"	"	"	15	1208	-10	1198			"	Slightly " clear		D, S	" " 15 " " "
42	NW	29	"	"	"	"	32?	1185	-28?	1157			"	Slightly " clear		D, S	" " 20 " " "
43	SE	33	"	"	"	"	45-48	1206	-34	1174			"	Mod. soft clear iron		D, S	" " 100 " " "
44	SE	34	"	"	"	"	22	1196	-8	1188	18	1178	" below clay	Slightly hard clear		D, S	" " 100 " " "
45	NE	34	"	"	"	Dug & Sandpt.	36	1178	-29	1169			"	Slightly hard clear iron		D	
46	SE	36	"	"	"	Sand-point	16	1217	-12?	1205			"	Slightly hard clear iron		D, S	Sufficient for 30 head or more
47	SW	36	"	"	"	"	32	1208	-20?	1188			"	Hard, clear		D, S	" " 50 " " "
48	NW	36	"	"	"	"	24+	1195					"	Hard, " iron		D	
1	NW	2	7	15	Prin	Sand-point	20?	1227	-15	1212			Sand	Slightly hard clear iron		D, S	Sufficient for 30 head or more
2	NW	3	"	"	"	"	20?	1223					"	Hard, clear iron		D, S	" " 50 " " "
3	SE	4	"	"	"	"	20	1215	-15	1200			Sand	Mod. Soft clear iron		D, S	" " 50 " " "
4	SW	4	"	"	"	Dug	20	1250					Shale	Soft, clear		D	Barn deeper, water alkali, shale at 3 ft.
5	SW	5	"	"	"	Bored	70	1267	-8	1259			Shale	Hard, " iron, alkali		S	" " 35 "; Laxative; shale at 4 ft.
6	SE	6	"	"	"	"	75	1290	-15	1275			"	Very hard clear soda		S	" " 25 "; 160 ft. dry hole in shale Shale at 10 ft; 80 ft. well sufficient for 120 head

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~~ Carberry Area Twp. 7 to 10 Rge. 14 to 17.

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	NE	7	7	15	Prin	Sandpt.	33?	1223	-25?				Sand	Mod. soft clear		D	
8	NW	8	"	"	"	Dug Sandpt.	20-25	1219					"	Slightly hard clear iron		D, S	Sufficient for 100 head or more
9	SE	9	"	"	"	"	20?	1228					"	Hard, clear		D,S	
10	SW	10	"	"	"	"	20?	1222					"	Slightly hard clear iron		D, S	Sufficient for 20 head or more
11	NW	10	"	"	"	"	36	1213	-18?				"	Hard, clear		D, S	" " 100 " " "
12	SE	11	"	"	"	"	30?	1228					"	Slightly hard clear iron		D, S	" " 40 " " "
13	SE	12	"	"	"	"	20?	1229	-15?				"	Hard, clear		D, S	" " 45 " " "
14	SW	12	"	"	"	"	20?	1227					"	" "		D, S	
15	Ne	12	"	"	"	"	20?	1225					"	Mod. soft clear iron		D, S	Sufficient for 60 head or more
16	NE	12	"	"	"	"	30?	1230	-25	1205			"	Mod. soft " iron		D	School supply
17	SE	13	"	"	"	"	25?	1237					"	Mod. soft " iron		D, S	Sufficient for 25 head or more
18	SW	13	"	"	"	"	20?	1239	-18				"	Mod. soft " iron		D, S	" " 50 " " "
19	NE	14	"	"	"	"	18	1211	-10	1201			"	Slightly hard clear iron		D, S	" " 100 " " "
20	SE	15	"	"	"	"	28	1210	-18	1192			"	Slightly hard clear iron		D, S	" " 50 " " "
21	SE	16	"	"	"	"	20?	1213	-15?				"	Hard, clear iron		D	
22	NE	16	"	"	"	"	35	1214					"	Hard, clear iron		D, S	Sufficient for 100 head or more
23	SE	17	"	"	"	"	60	1244	-30	1214			"	Mod. soft clear iron		D, S	" " 100 " " "
24	NW	17	"	"	"	"	42	1217	-34	1183			"	Slightly hard clear		D, S	" " 20 " " "
25	NE	17	"	"	"	"	33	1217	-20	1197			"	Mod. soft clear iron		D, S	" " 100 " " "
26	SW	18	"	"	"	"	24-26	1228	-18	1210			"	Hard, clear iron		D, S	" " 100 " " "
27	NW	21	"	"	"	"	22	1187	-15	1172			"	Mod. soft clear	44	D, S #2235	
28	SE	22	"	"	"	"	15	1194	-9	1185			"	Mod. soft clear		D, S	Sufficient for 100 head or more
29	SW	25	"	"	"	"	30	1186	-25	1161			" below clay	Slightly hard clear iron		D, S	
30	NE	26	"	"	"	"	81	1159	-5	1154			"	Slightly hard clear		D, S	
31	SW	27	"	"	"	"	20?	1188	-11?				"	Slightly hard clear		D, S	Sufficient for 100 head or more
32	NW	27	"	"	"	"	28	1083	-24	1159			"	Hard, clear iron		D	
33	NE	30	"	"	"	"	33	1202	-30	1172			"	Mod. soft clear		D, S	Sufficient for 100 head or more
33	SE	31	"	"	"	Spring								Slightly hard clear			" " 60 " " "; Spring operates hydraulic ram

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 Carberry Area ~~Rural Municipality of~~ Twps. 7 to 10 Rges. 14-17

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
34	NW	31	7	15	Prin	Sandpt.	20	1173	-15?				Sand	Mod. soft clear		D, S	Sufficient for 50 head or more
35	NW	32	"	"	"	"	12	1113	-8	1105			"	Hard, clear		D, S	" " 100 " " "
36	SE	33	"	"	"	"	34	1108	-30	1078			"	" "		N	
37	SW	34	"	"	"			1119									
38	SE	35	"	"	"	Sandpt.	40	1164	-22	1142			Clay	Mod. soft clear		D	Barn sandpoint 35 ft. deep; also springs for stock
39	NE	35	"	"	"	"	12	1119	-8	1111			Sand	Slightly hard clear		D, S	Sufficient for 30 head or more
40	NE	36	"	"	"	"	27	1124	-18	1106			Gravel	Slightly hard clear		D, S	" " 100 " " "
1	NW	2	7	16	Prin	Dug	58	1206	-11	1195			Shale	Very hard clear iron		S	Sufficient for 50 head
2	SE	3	"	"	"	Dug & Bored	60	1348	-15	1333			"	Very hard clear		S	" " 60 " ; Bedrock at 20 ft.
3	NW	4	"	"	"	Bored	73	1336	-23	1313			"	Hard, clear alkali		S	" " 50 "; 16 ft. well in shale. Bedrock at 15 ft. For domestic use.
4	NE	4	"	"	"	Dug	20	1297	-6	1291			"	Hard, clear		D, S	Sufficient for 20 head only; Bedrock at 16 ft.
5	SE	5	"	"	"	Bored & drilled	73	1366	-70	1296			"	Very hard clear iron, salty		D, S	" " 50 "; Laxative
6	NW	6	"	"	"	Bored	94	1326	-55	1271			"	Very hard clear, alkali		S	" " 7 " only; Laxative
7	NE	6	"	"	"	Dug	36	1364	-10	1354			"	Very hard clear		S	
8	SE	8	"	"	"	Bored	55	1318	-13	1305			"	Very hard clear		D, S	Sufficient for 20 head or more; slightly Laxative
9	SW	9	"	"	"	"	40+	1324	-20	1320			"	Very hard clear salty alkali iron			" " 20 " only; Laxative to stock
10	NW	9	"	"	"	"	95	1294	-40	1254	65	1229	Clay	Very hard clear iron salty alkali		D, S	" " 50 "; Laxative; Bedrock at 60 ft.
11	SW	10	"	"	"	"	58	1323						Slightly hard clear		D, S	" " 50 "
12	SE	11	"	"	"	Dug	30	1273	-4	1269			Till or shale	Hard, clear salty, alkali			Sufficient for 6 head only; laxative
13	NE	12	"	"	"	"		1220						Slightly hard clear		D	
14	NE	12	"	"	"	Sandpt.	18	1215					Sand	Slightly hard clear		D	
15	NE	12	"	"	"	"	30	1215					"	Mod. soft clear		D, S	Sufficient for 100 head or more
16	NW	13	"	"	"	"		1217					"			N	
17	SE	14	"	"	"	"	51	1238	-(45+)					Mod. soft clear		D, S	Sufficient for 25 head or more
18	NW	14	"	"	"	"	36	1234	-30	1204			Sand & Gravel	Slightly hard clear		D, S	" " 40 " " "
19	NE	15	"	"	"	"	45	1242	-35	1207			Sand	Slightly hard clear		D, S	" " 30 "
20	SE	16	"	"	"	Dug & drilled	78	1262	-14	1248			Shale	Hard, clear		D, S	" " 45 "; Bedrock at 48 ft.

(?)

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

WELL RECORDS—~~Rural Municipality of~~ Carberry Area Twps. 7 to 10 Rges. 14 to 17

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	8	15	Prin	Sandpt.	40	1084	-(30-32)				Gravel	Slightly hard clear		D, S	Sufficient for 20 head or more
2	SE	5	"	"	"	"	15+	1148					Sand	Hard, clear		S	
3	SE	6	"	"	"	Dug	8	1231	-3	1228			"	" "		D, S	Sufficient for 60 head or more
4	NW	7	"	"	"									Mod. soft clear		D	
1	SW	1	8	16	Prin	Sandpt.	25	1171					Sand	Slightly soft clear		D	Spring for stock; well sufficient for 100 head or more
2	SE	2	"	"	"	"	30(?)	1168					"	Mod. hard, clear		D	Sandpoint usedat barn
3	SW	2	"	"	"	Dug	8	1158	-5	1153			Gravel	Hard, clear		D	Spring used for stock
4	NE	2	"	"	"	"	10	1144	-7	1137			Sand over blue clay	Hard, clear		D, S	Sufficient for 50 head or more
5	SW	3	"	"	"	"	30	1148	-29	1119			Sand	Soft, "		D	
6	NE	3	"	"	"	"	12	1156	-7	1149			"	Hard, "		D, S	Sufficient for 30 head or more
7	SW	4	"	"	"	Spring		1147						Slightly hard clear		D	Flows ½ gal. per minute Dug well 50 ft. deep yelded, bad water
8	SE	5	"	"	"	Dug	14	1147	-10	1137			Gravel	Hard, clear		D, S	Sufficient for 20 head only; 80 ft. well in blue clay was dry
9	NE	5	"	"	"	Sandpt.	(20(?)	1180	-15(?)				Sand	" "		D, S	Sufficient for 65 head; Spring for stock Elev. 1147
10	NE	5	"	"	"	"	18	1207					"				Used for steaming on C.P.R.
11	NE	6	"	"	"	"	23	1218	-19	1199			"	Very hard, clear		D, S	Sufficient for 65 head; springs for stock
12	SE	8	"	"	"	"		1201									
13	SE	9	"	"	"	Dug	32	1183	-30(?)				Sand & gravel	Slightly hard clear		D	Spring for stock
14	NW	9	"	"	"	"	20	1185	-16	1161			Gravel over clay	Mod. soft clear		D, S	Sufficient for 50 head
15	NE	9	"	"	"	Spring		1150						Slightly hard clear		D, S	" " 100 "; Flows 4 gals. per minute
16	SE	10	"	"	"	Sandpt.	13	1158					Sand				Spring for stock
17	SW	12	"	"	"	Dug	12	1111	-8	1103			Blue clay	Slightly hard clear	46°	D #2232	Attacks aluminum vessels; River for stock
18	NE	12	"	"	"	"	20-25	1186	-18	1168			Sand	Hard, clear		D, S	30 ft. sandpt. at barn; Supplies 50 head
19	SW	15	"	"	"	"	15	1128	-12	1116			Gravel	" "		D, S	Sufficient for 40 head; another well and sandpt. also used at 15 ft.
20	SE	17	"	"	"	"	25	1174	-22	1152	33	1141	Gravel	" " iron		D	18 ft. well at barn. water
21	NE	17	"	"	"	Sandpt.	25	1162	-22	1140			Gravel below clay	Hard, " iron		D, S	Sufficient for 10 head; Spring at elev. 1144 flows 2½ gals.

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(#) Sample taken for analysis.

Carberry Area

WELL RECORDS ~~Rural Municipality of~~ Twp. 7 to 10 Rges. 14 to 17

B 4-4
R. 7526

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	SW	19	8	16	Prin	Dug	14	1133	-6	1127			Sand	Slightly hard clear iron		D	Creek for stock
23	NW	19	"	"	"	"	8	1100	-3	1097			Gravel	Slightly hard clear		D	" " "
24	NW	20	"	"	"	Sandpt.	15	1156	-12	1144			Sand	Slightly hard clear		D, S	Barn sandpoint similar, supplies 30 head
25	SE	30	"	"	"	"	10	~~8~~	1132	11[illegible]			"	Slightly hard clear		D, S	Sufficient for 100 head or more; creek for stock
26	SW	30	"	"	"	"	18	1104	-15	1089			"	Hard, clear		D, S	" " 100 " " more
27	NW	32	"	"	"	"	21	1165	-18	1147			"	" "		D	
28	NE	32	"	"	"	"	40	1200	-(-30)				"	" " iron		D	Barn well dug in sand, Sufficient for 70 head
1	SE	1	8	17	Prin	Dug	55	1226	-52	1174			Gravel below till	Very hard clear iron		D, S	Sufficient for 30 head only
2	SW	1	"	"	"	Dug	38	1232	-16	1216				Hard, clear iron		D, S	" " 70 "
3	NE	2	"	"	"	"	27	1242	-15	1237			Till	Very hard clear		S	" " 30 "; Laxative to humans
4	NW	4	"	"	"	Drilled	100	1270						Hard, clear iron		S	" " 10 "
5	NW	5	"	"	"	Dug	9	1304	-0	1304			Till	Hard, clear		S	
6	SE	6	"	"	"	"	30	1326	-27	1299			Till with sand	" "		N	Haul household water
7	NW	6	"	"	"	Drilled	45	1328	-8	1320	45	1283	Sand	" " iron		D, S	Sufficient for 100 head or more
8	NW	7	"	"	"	Dug	45	1292	-9	1283			Sand	Very hard cloudy		S	Insufficient for 5 head in winter
9	NE	7	"	"	"	Dug & drilled	104	1286	-9	1277	102	1184	Gravel below till	Very hard, clear alkali	41.5	D, S #2231	Sufficient for 40 head or more; Laxative to humans
10	SW	8	"	"	"	Dug & Bored	90	1292	-24	1258			Black sand below till	Very hard, clear		D, S	" " 50 "
11	SE	9	"	"	"	Bored	42	1265	-21	1244						D	
12	NW	9	"	"	"	"	30	1264	-15	1249			Till	Hard, clear		D	Barely sufficient
13	NW	9	"	"	"	Drilled	145	1264	-25	1239			Sand below till	Potable, clear		N	Well plugged with sand and was abandoned
14	SW	10	"	"	"	Bored	52	1259	-7	1252				Black colour & sediment		S	
15	NE	10	"	"	"									Very hard, clear		D, S	
16	SW	12	"	"	"	Dug	51	1232	-20	1212			Gravel	Very hard clear alkali		D, S	Sufficient for 40 head
17	NW	12	"	"	"	"	27	1213	-21	1192				Hard		D, S	
18	SW	13	"	"	"	Dug & Sandpt.	25	1208	-23	1185			Sand	Mod. hard, clear iron		D, S	Sufficient for 50 head or more
19	SW	14	"	"	"	Dug	21	1237	-5	1232			Clay below sand	Very hard clear alkali		S	" " 40 "; " Laxative to humans

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WELL RECORDS — ~~Rural Municipality of~~ Carberry Area Twp. 7 to 10 Rges. 14 to 17.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
20	NW	14	8	17	Prin	Dug	28	1198	-16	1182				Very hard clear iron		D, S	Sufficient for 40 head
21	SW	17	"	"	"	"	36	1294	-15	1279				Very hard clear iron		D	Used in winter only; Laxative in summer
22	SW	18	"	"	"	"	55	1295	-23	1272			Till (?)	Very hard clear		S	
23	NE	18	"	"	"	"	56	1292	-24	1268				Hard, clear		N	
24	SE	19	"	"	"	"	47	1261	-6	1255				Very hard clear alkali		D, S	
25	SW	19	"	"	"	"	38	1279	-13	1266				Very hard cloudy		S	
26	NE	21	"	"	"	"	40	1236	-30	1206			Till(?)	Hard, clear alkali iron		D, S	Sufficient for 50 head; Slightly laxative to humans
27	SE	22	"	"	"	Dug & bored	70	1196	-7	1189	8	1188	Sand	Hard, clear Yellow colour		S	" " 25 "
28	SW	22	"	"	"	Dug	51	1195	-13	1182			Till	Very hard clear iron		D	Slightly laxative
29	SE	25	"	"	"	"	20±	1135					Sand	Mod. hard clear		D, S	Sufficient for 15 head or more
30	NW	25	"	"	"	"	28	1121	-25	1096	28	1093	Sand below clay	Hard, clear		D	Spring used for stock
31	SE	28	"	"	"	Sandpt.	20-25	1182	-(15-20)				Sand	Mod. hard clear		D	
32	NE	28	"	"	"	Dug & Sandpt.	30	1192	-(±20)				"	Hard, clear		D, S	Sufficient for 25 head or more
33	NW	28	"	"	"	Dug	27	1202	-9	1193			Gravel(?)	Very hard cloudy iron		D, S	" " 12 " " "; slightly laxative
34	SW	30	"	"	"	Dug & Sandpt.	16+	1272	-(16+)				Till	Hard, clear iron alkali		D, S	" " 20 " only; Very laxative
35	NW	31	"	"	"	Bored	56	1265	-26	1239			"	Hard, clear iron		D, S	" " 100 "; slightly laxative
36	NE	31	"	"	"	Dug	33	1243	-27	1221	33	1215	Sand below till	Hard, clear		D, S #2230	" " 65 "
37	SW	32	"	"	"	Dug & Bored	20+	1234						" " iron		D, S	" " 50 " or more
38	SE	33	"	"	"	Dug	26	1173	-19	1154			Sand	Mod. hard clear		D, S	" " 25 "
39	NE	33	"	"	"	"	36	1256	-24	1232			Till	Hard, clear		S	
40	SE	34	"	"	"	Dug & Sandpt.	11	1171	-4	1167			Sand	Mod. hard, clear		D, S	Sufficient for 50 head or more
41	SW	34	"	"	"	Sandpt.	10	1172					"	Slightly soft clear		D, S	
1	SE	17	9	14	Prin	Sandpt.	18-20	1197	-10(±)				Sand	Hard, clear iron		D, S	Sufficient for 200 head or more
2	SE	20	"	"	"	"	24	1203	-9	1194			"	Hard cloudy		S	Unsatisfactory for drinking-Brown precipitate forms
3	SW	22	"	"	"	"	26	1202					"	Soft clear iron		D, S	Sufficient for 100 head or more
4	SE	31	"	"	"	"	20?	1235	-16(?)				"	Hard, clear iron		D	

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Carberry Area

WELL RECORDS ~~Rural Municipality of~~ Twps. 7 to 10 Rges. 14 to 17

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
21	NW	16	7	16	Prin	Dug	17	1222	-13	1209				Very hard clear salty odour		S	Sufficient for 40 head
22	SE	17	"	"	"	drilled		1273					Shale (?)	Very hard clear alkali salty		S	
23	SE	18	"	"	"	Bored & drilled	72	1284	-21	1263			Shale	Very hard clear iron salty alkali		S	Sufficient for 50 head or more Bedrock at 47'(?) Domestic well 28' water in gravel24'
24	NW	18	"	"	"	Dug	20-30	1262					Clay	Hard, clear		S	Sufficient for 20 head only; Laxative to man
25	NE	19	"	"	"	"	31	1231	-26	1205						N	
26	NW	20	"	"	"	Bored	27	1219	-15	1204			Gravel below till	Very hard, clear		D, S	Sufficient for 30 head only
27	NW	21	"	"	"	Dug	8	1206	-4	1202			Sand	Slightly hard clear		S	" " 50 "; Sandpoint for domestic supply
28	SE	22	"	"	"	Dug & Sandpt.	38	1242	-36	1206			"	Slightly hard clear iron		D, S	" " 30 " or more
29	SW	22	"	"	"	Sandpt.	35(?)	1233					Sand	Hard		D	
30	SW	22	"	"	"	Dug	40+	1232	-35	1197			"	Slightly hard clear		D	
31	SE	23	"	"	"	Spring		1184					"	Slightly hard clear		D	
32	SW	24	"	"	"	Sandpt.		1212					"	Slightly hard clear iron		D	
33	SE	30	"	"	"	Dug	24	1232	-20	1212	20	1212	Sand below till	Very hard clear		D, S	Sufficient for 50 head or more
34	NW	30	"	"	"			1188									
35	NW	31	"	"	"	Dug	15	1182	-12(±)				Clay	Very hard clear iron		D, S	Sufficient for 30 head corrodes aluminum
36	SW	32	"	"	"	"	40	1230	-15	1215			Gravel & clay	Hard, clear		D, S	" " 20 "; Barn well 39' deep Sandpoints not successful
37	NW	32	"	"	"	"	45	1227	-28	1199			Sand	Hard, " iron			
38	NE	32	"	"	"	"		1229						Slightly hard clear		D,S	
39	NE	35	"	"	"	"	25	1194	-22	1172			Fine sand	Slightly hard clear	45°	D, S	Sufficient for 30 head
1	SW	1	7	17	Prin	Drilled	80	1294	-15		60	1234	Shale gravel below till	Soft salty clear		D, S	Sufficient for 15 head; Shale at 40 ft.
2	NW	2	"	"	"	Bored	42	1316	-27				Till	Very hard salty alkali		S	" " 30 " or more; Laxative
3	SE	3	"	"	"	"	68	1390	-18	1372			Shale	Slightly hard soda cloudy		S	" " 50 "; Dug well 24' supplies household shale at 60 ft.
4	SW	3	"	"	"	drilled	101	1443	1-27	1416	101	1443	Shale	Mod. soft clear		D, S	Sufficient for 10 head; shale at 50 ft.
5	SW	4	"	"	"	Dug	12	1425	-4				Sand & gravel	Hard, clear iron		D, S	" " 40 "
6	NW	5	"	"	"	drilled	103	1334	-21	1313	103	1231	Shale	Hard, " alkali salty		S	" " 25 "; Laxative
7	SW	6	"	"	"	Dug	24	1313	-9				"	Hard, clear salty		S	
8	SW	6	"	"	"	Bored	31	1368	-12	1356	-20 ~~-29~~	1348 ~~1339~~	Till	Very hard clear		D	

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(#) Sample taken for analysis.

Carberry Area

WELL RECORDS—~~Rural Municipality of~~ Twps. 7 to 10 Rges. 14 to 17.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
9	SE	8	7	17	Prin	Dug	39	1326	-21	1305				Black sediment		N	
10	NE	9	"	"	"	"	10	1257	-3	1254			Shale	Very hard clear salty alkali		S	Sufficient for 8 head only; Shale at 8 ft.
11	SE	10	"	"	"	Bored	66	1345	-13	1342			"	Very hard clear salty alkali		S	" " 35 "
12	SW	10	"	"	"	Dug	38	1345	-11	1334				Very hard clear		S	
13	SW	11	"	"	"	"	40?	1320					Shale	Hard, clear alkali, iron			Sufficient for 110 head
14	SE	12	"	"	"	"	16	1294	-4	1290			"	Hard, clear alkali		D, S	" " 50 "; slightly laxative shale at 4 ft.
15	NE	12	"	"	"	"	19	1269	-3	1266			Shale	Hard cloudy alkali		N	" " 12 "; Laxative; shale at 8 ft.
16	NW	13	"	"	"	"	36	1279	-20	1259						S	
17	NE	14	"	"	"	"	44	1280	-30	1250			Shale	Mod. soft clear salty, alkali		S	Sufficient for 30 head; Slightly laxative; shale at about 39'
18	NW	14	"	"	"	Dug & Drilled	90	1285	-41	1244			"	Very hard salty alkali clear		S	" " 40" "; Shale at about 48'
19	NW	18	"	"	"	Dug	38	1314	-2	1310			Sand in till	Very hard clear alkali		D, S	" " 75 "; slightly laxative
20	NE	18	"	"	"	"	15	1257	-3	1254				Very hard clear			
21	NE	19	"	"	"	Bored	24	1311	-17	1294				Very hard clear		S	
22	SE	20	"	"	"	Dug	42	1281	-24	1257				Soft clear yellow colour			
23	NW	20	"	"	"	Bored	40	1309	-14	1295			Sand in till	Very hard clear iron		S	Sufficient for 25 head; Laxative; Dry hole dug 65' in clay
24	NW	21	"	"	"	Dug	17	1278	-4	1274				Very hard clear iron alkali		D, S	" " 35 "; Laxative
25	SW	23	"	"	"	"	12	1288	0				Sand, gravel (Alluvium)	Hard, clear		S	Main supply pumped from Souris River
26	NW	23	"	"	"	"	23	1196	-11	1185	21	1175	Gravel	Very hard clear		D, S	Sufficient for 15 head
27	SE	25	"	"	"	Dug & Bored	63	1255	-25	1230	63	1192	Gravel below till	Very hard clear alkali		S	" " 15 "; Laxative
28	SW	26	"	"	"	Dug	21	1167	-17	1150						D	
29	SW	26	"	"	"	"	21+	1210						Very hard clear		D	
30	NE	26	"	"	"	"	20	1165	-13	1152			Gravel below till	Hard, clear		D, S	Sufficient for 30 head; Domestic well 27' Elevation 1220 ft.
31	SE	27	"	"	"	"	28	1159	-10	1149			Shale	" " iron		D, S #2233	" " 30 " or more; shale at 4 ft.
32	SE	27	"	"	"	Bored	50	1281	-34	1247	48	1233	Sand below till	Very hard clear iron alkali		D, S	" " 12 " only; Laxative. Dry hole 103 ft. deep drilled into soft shale
33	NE	27	"	"	"	"	40	1268	-33	1235			Till or shale	Very hard clear iron alkali		D, S	Sufficient for 20 head only; slightly Laxative
34	NW	28	"	"	"	Dug	45	1307						Hard, clear iron alkali		D, S	" " 30 " "; Laxative

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 Carberry Area ~~Rural Municipality of~~ Twps. 7 to 10 Rges 14 to 17

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
35	NE	28	7	17	Prin	Dug	12	1282	-6	1276			Alluvium	Hard, clear alkali		D, S	Sufficient for 20 head
36	NE	29	"	"	"	"		1299						Very hard clear alkali		D, S	" " 35 " only; Laxative
37	SW	30	"	"	"	"	17	1326	-8	1318			Gravel below till	Very hard clear alkali, iron		D, S	" " 10 "; Laxative
38	NE	30	"	"	"	"	45	1325	-40(?)				Clay	Very hard clear alkali, iron		S	" " 10 " only
39	NW	31	"	"	"	"	38	1336	-33	1303				Very hard clear alkali, iron		D, S	" " 15 "; Laxative
40	SE	32	"	"	"	"	36	1305	-31	1274			Clay	Very hard clear Alkali, iron		D, S	" " 35 "; "
41	NE	32	"	"	"	Bored	50	1285	-8	1277				Very hard clear		D, S	Sufficient for 15 head; Domestic supply for several families
42	SW	33	"	"	"	"	48	1298	-33	1265			Clay	Very hard clear iron salty		D, S	" " 40 "; Laxative
43	NW	33	"	"	"	Drilled	50	1293	-15(?)		46	1247	Sand	Very hard alkali sediment		D, S	" " 30 "
44	SW	34	"	"	"	Dug	16	1253	-11	1242			Alluvium	Hard, clear iron		D, S	" " 40 "; slightly laxative
45	NW	35	"	"	"	"	30-32	1231	-24	1207	25	1206	Gravel below till	Very hard clear alkali, iron		D, S	" " 30 "; " "; Many dry holes dug
46	NE	35	"	"	"	"	30	1233	-18	1215				Very hard clear		D, S	
47	SE	36	"	"	"	"	21	1200	-18	1182			Gravel	Hard, clear		D, S	Sufficient for 100 head
48	NE	36	"	"	"	"	15-20	1175	-8	1167			"	Slightly hard clear		D, S	" " 25 "
1	SE	1	8	14	Prin	Sandpt.	20	1214	-16	1198			Sand	Hard, clear		D	
2	SE	1	"	"	"	"	70	1225	-55	1170			Black sand	" "		D, S	Sufficient for 100 head or more
3	NE	10	"	"	"	"	14	1085					Sand	Mod. soft clear		D, S	" " 100 " " "
4	SW	11	"	"	"	"	26	1082					"	Hard, clear		D, S	" " 100 " " "
5	NW	12	"	"	"	"	24	1068	-20	1048			"	" " iron		D, S	" " 40 " " "
6	NE	13	"	"	"	"		1270									
7	NE	23	"	"	"	"	20(?)						Sand	Hard, clear		D	
8	SW	24	"	"	"	Dug	15	1102	-14	1088			"	Slightly hard clear		D	
9	NE	24	"	"	"	"		1152									
10	NE	25	"	"	"	Sandpt.	20(±)	1042	-15(±)				Sand below clay	Hard, clear iron		D, S	Sufficient for 60 head or more
11	NW	36	"	"	"	"	27	1060	-12	1048			Sand & Gravel	Hard, clear		D, S	" " 45 "

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

Carberry Area

WELL RECORDS ~~Rural Municipality of~~ Twps. 7 to 10 Rges. 14 to 17

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	27	10	15	Prin	Sandpt		1266					Sand	Hard, clear		, S	
11	SE	36	"	"	"	"	46	1262	-15	1247			"	" "		D, S	Sufficient for 12 head or more
12	SW	36	"	"	"	"	28	1267	-(15-18)				"	" "		D, S	" " 20 " " "
13	NW	36	"	"	"	"	15-25	1268	-(15-20)				"	" "		D, S	" " 100 " " " Sandpt. at house at ± 12 ft. or more
14	NE	36	"	"	"	"	28	1267	-(20-25)				"	" "		D, S	" " 100 "
1	NE	31	10	16	Prin	Sandpt	20?	1248	-9	1239			Sand	Soft, clear		D, S	
2	NW	35	"	"	"	"	16±	1246	-(12-15)				"	Mod. hard clear iron		D	
1	NW	2	10	17	Prin	Driven	85	1244	-25?				Sand	Mod. hard, clear		D	Supplies Military Camp-over 50,000 gals. per day
2	NW	14	"	"	"	Sandpt.	48	1248					"	Mod. hard, clear		D, S	Sufficient for 35 head or more
3	SE	20	"	"	"	"	37-40	1231	-27	1204			"	Mod. hard, clear		D, S	" " 40 " " "
4	NW	20	"	"	"	"	30	1233	-(15+)				" and gravel	Mod. hard, clear		D, S	" " 65 " " "
5	SW	22	"	"	"	"	21+	1237					"			S	
6	NW	24	"	"	"	"	10	1215	-6	1209			"	Mod. hard, clear		D, S	Sufficient for 100 head or more
7	NE	24	"	"	"	Dug	9	1218	-5	1213			"	Hard, clear iron		D, S	
8	SW	27	"	"	"	Sandpt.	25	1226	-20(±)				"	Mod. hard, clear		D, S	Sufficient for 100 head or more
9	NE	28	"	"	"	"	20?	1215					"	Mod. hard, clear		D, S	" " 100 " " "
10	SE	30	"	"	"	"	6	1214	-3	1211			Gravel	Slightly soft clear		D, S	
11	NE	31	"	"	"	Dug	12	1240					Till				Not yet finished
12	SE	32	"	"	"	"	12	1221	-4	1217			Sand	Hard, clear		D, S	Sufficient for 60 head or more
13	SW	33	"	"	"	"	8	1204	-6	1198			"	" "		D, S	
14	SE	34	"	"	"	Sandpt.	13-14	1209	-10	1199			"	Mod. hard, clear		D, S	Sufficient for 50 head
15	SW	34	"	"	"	"	19	1229	-12	1217			Gravel & sand	Mod. hard, clear		D, S	" " 100 " or more

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

WELL RECORDS — ~~Rural Municipality of~~ Carberry Area Twps. 7 to 10 Rges. 14 to 17.

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	SW	2	9	17	Prin	Sandpt.	16+	1149	-15	1134			Sand	Mod. hard clear		D	
2	NE	3	"	"	"	"	10-12	1165	-9	1156			"	Mod. hard clear		D, S	Sufficient for 80 head
3	NW	4	"	"	"	"	12?	1219	-8?				Gravel	Mod. hard clear		D, S	" " 15 " or more
4	SE	5	"	"	"												
5	NE	6	"	"	"	dug	47	1230	-38	1192			Till	Very hard clear		N	
6	SW	7	"	"	"	"	18	1185	0	1185			"	Hard, cloudy		S	
7	NW	7	"	"	"	"	15	1195	-11	1184			Sand	" clear		D	
8	SW	9	"	"	"	"	9	1188	-4	1184			"			N	Freezes in winter
9	SW	10	"	"	"	Sandpt.	12	1160	-8	1152			"	Hard, clear		D, S	Sufficient for 100 head or more
10	NW	10	"	"	"	Dug	14	1168	-8	1160			Sand & Gravel	" "		D, S	" " 100 " " "
11	NE	15	"	"	"	Sandpt.	15	1249	-10	1239			"	Soft "		D, S	
12	SE	16	"	"	"	Dug	10	1166	-7	1159			"	" "		D, S	Sufficient for 30 head
13	NW	16	"	"	"	"	22	1181	-18	1163			Gravel	Hard, "		S	" " 100 " or more
14	NW	17	"	"	"	"	25	1177	-15	1162			"	" "		D	
15	SE	19	"	"	"	"	30	1162	-8	1154	27	1135	" in till	Quite hard clear		D	Barn well similar. Sufficient for 50 head
16	NW	19	"	"	"	"	27	1182	-17	1165			Till	Hard, clear iron		S	Sufficient for 40 head; Laxative to man.
17	SW	20	"	"	"	Spring										D	
18	SW	21	"	"	"	Dug	25	1170	-23	1147			Gravel	Hard, clear iron		D, S	Sufficient for 80 head or more
19	SE	22	"	"	"	"	10	1167	-4	1163			Fine sand	Mod. hard clear		D, S	" " 40 "
20	SE	28	"	"	"	"	27	1123	-20	1103				Hard, clear		D	
21	SW	29	"	"	"	"	12	1158	-6	1152			Sand & Gravel	Soft, "		S	Sufficient for 30 head
22	NE	30	"	"	"	"	8	1165	0	1165			" " "	Mod. hard clear		D	
23	NW	30	"	"	"	"	12	1168					Till				Well not finished
24	NE	31	"	"	"	"	8		-4				Gravel	Mod. hard clear		D, S	Sufficient for 90 head
1	NW	3	10	14	Prin	Sandpt.		1256					Sand	Hard, clear		D, S	
2	SE	4	"	"	"	"	10-20	1231					"	Slightly soft clear		D, S	Sufficient for 100 head or more

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(#) Sample taken for analysis.