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WATER SUPPLY PAPER No. 130

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF SWIFT CURRENT NO. 137 SASKATCHEWAN

By

B. R. MacKay, H. H. Beach and D. P. Goodall

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GEOLOGICAL SURVEY

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF SWIFT CURRENT, NO. 137, SASKATCHEWAN

INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Swift Current, No. 137, comprises an area of 432 square miles situated in the southwestern part of southern Saskatchewan. It consists of twelve townships described as tps. 13, 14, 15, and 16, ranges 13, 14, and 15, W. 3rd mer.

Swift Current, a city with a population of approximately 5,300, is situated on the main line of the Canadian Pacific railway about 7 miles south and 6 miles west of the northern and eastern boundaries of the municipality.

Several branch lines of the Canadian Pacific railway extend from Swift Current and neighbouring points. The Lemsford Section, on which is situated the village of Cantuar, runs from the siding of Java on the main line west of Swift Current in a northwesterly direction to cross the northern boundary of the municipality in sec. 33, tp. 16, range 15. The Meyronne line extends nearly due south to cross the southern boundary in sec. 3, tp. 13, range 13. Two subsidiary branches extend from this latter line, one, southwest from the village of Dunelm through Duncairn to the southwest corner of the municipality, and the other in a due east direction from Hak, as the Coderre branch.

A lowland area, including most of townships 15 and 16, range 15, and the northwestern part of township 16, range 14, occupies the northwestern corner of the municipality at an average elevation of about 2,400 feet above sea-level. From the lowland the land surface rises abruptly toward the southeast to an elevation of approximately 2,700 feet at the top of a steep escarpment extending across the municipality from the northwest corner of township 14, range 15, to the

southeast corner of township 16, range 15. This escarpment forms the northern boundary of the Swift Current uplands. A similar elevation is attained in the uplands north of Swiftcurrent creek in the northeast corner of the municipality. From the escarpment southward the rise is more gradual to the southern border of the municipality where a maximum elevation of about 2,950 feet is attained. The uplands are dissected by the deep valley of Swiftcurrent creek which crosses diagonally from the southwestern corner and extends through the city of Swift Current, to the northeastern corner of the municipality. The banks of the valley throughout most of its length rise abruptly to the general level of the uplands at elevations of 100 to 150 feet above the valley floor. The banks are deeply indented by many, short, tributary coulées, creating in their vicinity a rough, irregular topography. The valley floor, in its upper reaches, does not exceed half a mile in width and is much less in places. Down stream from the city of Swift Current to the eastern border of the municipality the valleys has a width of nearly 2 miles; the valley floor is fairly level to undulating and the banks, particularly on the north side, are gently sloping. The stream occupying this deep valley is small. Its average width is about 25 feet and depth about 2 to 3 feet. It provides an ample water supply for the city of Swift Current. This water is hard, but the mineral salt content is relatively low, rendering it quite suitable for drinking after organic impurities have been removed by the city's filtration plant. An analysis of this water is included in the list of water analyses accompanying this report.

Two dry stream channels extend through the uplands north of Swiftcurrent creek, in the vicinity of Swift Current, and at one time drained the lowland area in the northwestern corner of the

municipality. Another, narrow deep valley, approximately 6 miles southwest of Swift Current, passes through the upland and opens into the lowland in the vicinity of Beverley.

Throughout the upland areas of the municipality little difficulty has been experienced in obtaining adequate supplies of drinkable water, provided wells are sunk sufficiently deep to penetrate the productive aquifers of the bedrock. In the lowlands the bedrock is only sparingly productive and residents are obliged to confine their search for ground water to the unconsolidated Recent and glacial deposits. Water from these sources in the lowlands is, as a rule, more highly mineralized and hence of inferior quality to that derived from the bedrock sources on the uplands.

Water-bearing Horizons in the Unconsolidated Deposits

The unconsolidated deposits are of two distinct types, namely, Recent deposits formed along the stream valleys by the accumulation of sediments eroded from the adjoining uplands, and glacial deposits covering the entire area remote from the stream valleys. Although ground water supplies in the unconsolidated deposits of this municipality are obtained largely from the glacial drift, abundant supplies may occur in the Recent flood-plain deposits of Swiftcurrent creek and some of its tributaries. The stream deposits are probably thin in the small stream channels and can be expected to yield adequate supplies in only a few isolated localities. In the valley of Swiftcurrent creek these deposits consist mostly of clays and silts interbedded with a few scattered pockets of sand or gravel. The depth of these deposits can be expected to vary considerably in different parts of the stream channel. They are probably quite thin in the upper reaches of the stream channel where the valley is narrow,

but are known to extend to a depth of slightly more than 100 feet in the vicinity of the Experimental Farm at Swift Current. Wells at this point encountered water in sands and gravels at depths between 90 and 132 feet. Several shallow wells in the same vicinity obtain large yields of slightly "alkaline" water from pockets of sand and gravel at depths of less than 30 feet. Most of the valley deposits are only slightly pervious, and the ground water circulation through them is slow. The small seepages of water to be expected from such fine-grained sediments will probably be more highly mineralized than from the more porous beds of gravels.

Just how much of the stream deposits can be assigned to Recent origin is problematical. It is quite possible, however, that most of these fine silts and clays are late glacial flood-plain deposits, and the Recent deposits occur only in the immediate vicinity of the stream.

With the exception of areas where the bedrock outcrops or is overlain by Recent stream deposits, a mantle of glacial drift covers the bedrock throughout the municipality, to depths ranging irregularly from a few feet to 80 feet or more. The drift is composed mostly of glacial till, consisting of compact, yellow and light grey to blue-grey clay, through which are irregularly interspersed small lens-shaped pockets of sand and gravel. This till was deposited many thousands of years ago by a great continental ice-sheet that spread southward over the province of Saskatchewan.

During the retreat of the ice front additional material carried by the ice was distributed unevenly over the surface. In places the forward movement of the ice was balanced by the rate of melting, thus the ice front remained stationary for a long period

of time in one locality, resulting in a more irregular accumulation of glacial drift. This irregular, and usually greater, accumulation of drift is called "moraine", and is characterized by low hills and ridges, and intervening undrained depressions. It is, for the most part, more porous than the glacial till due to the sorting action of the water from the melting ice. The moraines in this municipality are confined to two small areas on the western border, in townships 14 and 16, range 15, and a small area on the eastern border north-east of Swift Current.

The lowland area in the northwestern corner of the municipality formed part of a glacial lake basin during the period immediately following the retreat of the ice. During this time a thin deposit of lake clay and sand was laid down in this area. Glacial lake clay also overlies the bottoms of the dry valleys, extending eastward to join Swiftcurrent valley.

In the central part of the lake basin the clay is compact and impervious and cannot be regarded as a source of ground water. Toward the margins, however, the clay becomes more sandy and along the edges of the area it is almost entirely replaced by lake sands. Within the clay-covered area it is necessary to sink wells to the contact of the lake clay and the underlying boulder clay. Thin sands, or more occasionally gravel beds, occur at this horizon and are usually water-bearing. Wells tapping these beds range in depth between 20 and 30 feet and yield supplies of hard, drinkable water that are adequate for domestic use and 20 to 25 head of stock. These productive beds may not be present at all points and should prospecting at shallow depths fail to produce an adequate water supply for stock requirements, it will be necessary to extend wells down into the sand beds occurring in the upper part of the underlying glacial till where water has been

found within 45 feet of the surface. In the lake sand area wells commonly encounter moderately large supplies of hard, drinkable water within 20 feet of the surface, and it is not usually necessary to extend wells to greater depths into the underlying till. At a few places in the northwestern part of township 16, range 15, wells sunk in undrained depressions have encountered a highly mineralized, undrinkable water at shallow depths.

Within the small areas of moraine, water is readily found by sinking shallow wells near gravel ridges or in the depressions intervening between the low, rolling hills. The water obtained is generally of good quality.

The glacial till that covers the bedrock over the remainder of the area varies irregularly in thickness. It is only a few feet thick along the steeper slopes of the hills and it is even absent at isolated points where the bedrock is exposed at the surface along the valley of Swiftcurrent creek. Over the uplands it probably nowhere greatly exceeds 50 feet in thickness.

Here ground water supplies are obtained from the glacial drift in only a few isolated localities. The boulder clay itself yields only small seepages of hard water that are generally insufficient for more than the household use. Wells encountering pockets of water-bearing sand or gravel yield water of good quality, although the supply from individual wells is usually not large. There is a notable occurrence of flowing springs throughout this area. Many of these issue from the drift on the sides of coulées, but most of them no doubt have their origin in bedrock aquifers. These waters are drinkable and some are reported to be soft.

Water-bearing Horizons in the Bedrock

Three bedrock formations are known to occur beneath the glacial drift in different parts of this municipality. These are, in descending order, the Cypress Hills formation, the Swift Current formation, and the Bearpaw formation. Of these the Bearpaw formation is the most uniform and extensive and as it is the oldest it underlies the other formations wherever they occur and at other places is found immediately beneath the glacial drift. The Swift Current formation has been noted in rock exposures only in the NE.$\frac{1}{4}$, sec. 34, tp. 15, range 13. These beds are overlain by the Cypress Hills formation which they closely resemble. Where found they have been differentiated more by the difference in age of the fossils they contain than by any striking differences in the character of the component sediments. As, however, their ground water possibilities appear to be similar to those existing in the Cypress Hills formation these two formations are mapped and discussed as a unit under the name of the Cypress Hills formation. It consists essentially of thick beds of unconsolidated sands interbedded with layers of cemented gravels (conglomerates), sandstones, and grey shales. The formation extends throughout the entire uplands area of the municipality lying south of the main line of the Canadian Pacific railway, with the exception of the bottoms of the stream valleys and possibly the small, flat-topped plateau occurring over the southern half of township 15, range 14. As these beds were deposited as stream silts and gravels upon the eroded surface of the Bearpaw formation their base occurs at different elevations in different parts of the area and their thickness varies greatly from place to place. They may be only a few feet thick along the margins of the areas of their occurrence,

as indicated on Figure 1 of the accompanying map, but on the higher uplands they may extend to depths of 150 to 200 feet from the surface.

Wells sunk in these deposits encounter large ground water supplies at various horizons ranging in depth from 20 to 200 feet from the surface. The most extensive water-bearing beds occur at or near the base of the formation. They usually consist of fine-grained, grey sands overlain by less pervious sandstones and conglomerates. Waters from some of these beds are under hydrostatic pressure and rise in the wells 10 to 20 feet above the aquifer; others show no indication of pressure, but from most of the wells the yield is adequate for the household and stock requirements of the average farm. Many of the wells in this area obtain their water supplies from shallower horizons that occur interspersed at irregular intervals throughout the formation. These aquifers can seldom be traced for more than a mile or two in any one locality but many of them yield large water supplies. Where only small yields have been encountered the well is usually deepened to encounter other aquifers until a satisfactory supply is obtained. Springs also issue from the banks of many of the coulées and on the steep slopes at points where the aquifers are exposed at the surface. These waters are soft to moderately hard. The dissolved mineral salt content is relatively low and the waters are reported to be quite suitable for the household drinking supplies. Within the upland area lying to the east of Swiftcurrent creek only one well is known to have penetrated the base of the Cypress Hills formation without encountering water. On the western side of the creek several wells situated on the uplands near the western border of the municipality failed to obtain water from the Cypress Hills formation and were carried down to sandy beds

that occur in the upper part of the underlying Bearpaw formation before an adequate water supply was obtained. The Cypress Hills formation thins perceptibly toward the west, hence the underlying Bearpaw was encountered at moderate depths of 65 to 140 feet.

The Bearpaw formation is thought to immediately underlie the Cypress Hills formation throughout the uplands and the glacial drift throughout the rest of the municipality. The formation is probably not less than 700 feet thick in some of the areas of higher elevation. It consists essentially of dark grey clays and shales interbedded with thin beds of fine sand and sandy shale and occasional bands of hard sandstone. The shales may be distinguished from the boulder clay of the overlying drift by their darker colour, more soapy feel, the almost entire absence of stones or pebbles, the occasional occurrence of fossils, and by the small, roughly cubical, iron-stained fragments into which the shale tends to crumble upon weathering. Most of the sand as encountered in wells in this municipality occurs in the upper 200 feet of the formation at elevations between 2,450 to 2,650 feet above sea-level. Many large springs yielding moderately hard, drinkable water flow from outcrops of the sandy horizons along the northern edge of the uplands in townships 14 and 15, range 15. These springs water an extensive area of hay meadows on the lowlands in the vicinity of Seward station in the southwestern corner of township 15, range 15, and supplied water for the Canadian Pacific Railway locomotives at this point for several years. This horizon apparently continues to be water-bearing in a southerly direction to the southern border of the municipality, as it has been tapped by several wells situated in the western sections of township 13, range 15. The eastern limits of the area in which these sandy beds occur or contain water is not well defined, however, as wells on the eastern side of Swiftcurrent

creek have found production in the overlying Cypress Hills deposits. From the vicinity of Seward northeastward to the northeast corner of the municipality wells sunk to this horizon usually encounter an abundance of water, although the mineral salt content tends to be high, rendering some of these supplies unsuitable for domestic use. A second horizon is encountered at an elevation of about 2,100 feet in the northwestern corner of the municipality and is described in greater detail in a later section dealing with the ground water conditions of township 16, range 15. The areal extent of this horizon is not known, but it is not expected to be continuous much beyond the confines of this township. Several dry holes have been sunk below this elevation on the creek flats east and northeast of Swift Current and only two wells have struck water at elevations below 2,150 feet. The elevations at which the water-bearing horizons occur in these wells are uncertain and the water may be derived in part as seepage from the overlying drift.

The possibility of obtaining water from the Bearpaw formation at still greater depths cannot be considered as favourable, as the shales composing the middle and lower parts of this formation are known to be quite compact and contain very few porous beds suitable for large accumulations of ground water.

A well located on the SE.$\frac{1}{4}$, sec. 2, tp. 16, range 15, was drilled to a depth of 375 feet, of which probably the lower 300 feet were in the Bearpaw. This well yields a large supply of soft water that is used for watering stock. The content of sodium sulphate in solution in the water, however, renders it unsuitable for domestic use. Water of similar quality is to be expected at such depths in other parts of the lowlands. It is very questionable if deep drilling will encounter water sufficiently low in sodium sulphate and common salt to be used as drinking water supplies.

Water-bearing sands are known to occur near the base of the Bearpaw in several localities in the municipalities to the north and northeast, but these supplies are scattered and their occurrence in this municipality is uncertain. The base of the Bearpaw formation probably occurs at an elevation of about 1,850 feet in the northern part of the township, or at a depth of about 600 feet in Swiftcurrent valley and in the northwestern lowlands area.

Drilling to greater depths necessary to reach the base of the Bearpaw formation is costly and of questionable worth, as no definite assurance can be given that the supplies obtained will be satisfactory either in quality or quantity. It is to be noted that only in a very few, isolated localities have wells failed to obtain at least moderately large supplies of water at much shallower depths. Information was obtained on 369 wells in this municipality and of these only 14 were reported to be dry. It is probable that had some of these wells been extended to slightly greater depths, water would have been found.

GROUND-WATER CONDITIONS BY TOWNSHIPS

Township 13, Range 13

This township is composed of fairly level to slightly undulating prairie land. The land surface rises gradually from an average elevation of about 2,900 feet above sea-level along the northern border to approximately 2,950 feet in the southern part of the township. The drainage is poor, although a wide valley tract extending northward from the vicinity of the town of Wymark may carry part of the spring run-off in this area.

The glacial drift overlying bedrock is judged to be thin; probably not over 20 feet thick in any one locality. It is composed mostly of yellowish to grey clay with very few sand or gravel pockets interspersed through it. Although most of the wells in the township have been sunk through the drift, few are reported to yield sufficient water for the farm requirements from these deposits.

The Cypress Hills formation immediately underlies the drift throughout the township. It is composed mostly of silt and clay shales interbedded with porous beds of sand and gravel, and an occasional band of hard, cemented sandstone or conglomerate. Individual beds of sand and gravel are apparently not extensive over great distances. Many of them are water-bearing, however, and, owing to their common occurrence at various elevations in the formation, wells sunk to depths less than 125 feet usually encounter one of these productive beds.

A group of wells on sections 18, 19, and 20 on the western side of the township are producing large yields from depths of 70 to 125 feet or from elevations ranging from 2,810 to 2,785 feet above sea-level. Farther east and south the water-bearing beds are usually encountered at higher elevations of 2,890 to 2,860 feet,

or at depths of 35 to 120 feet depending upon the surface elevation at the well location. A few wells are also producing from aquifers that lie below or above this zone.

Most of the wells in the township yield adequate supplies for the farm requirements, although a few small yields are reported. The waters are of good quality and some are reported to be moderately soft.

There is no apparent shortage of ground water supplies in this township where wells have been sunk to suitable depths, but wells over 100 feet in depth are required in many places. One well, situated on the SE.¼, section 12, was drilled to a depth of 248 feet. Soft water was encountered in sandy clay at the base of the well at an elevation of about 2,720 feet. The water is "alkaline", but has been used for drinking. The geological horizon of this aquifer is not definitely known, although it is probably below the base of the Cypress Hills formation and in the upper part of the Bearpaw formation. It is possible that this water-bearing horizon underlies other parts of the township, although to date wells of this depth have not been required.

Township 13, Range 14

The western border of this township lies within the area drained by Pelletier and Swiftcurrent creeks. The land surface rises rather abruptly from an elevation of about 2,600 feet above sea-level in the valley bottom in the northwest corner, and from an average elevation of about 2,800 feet along the western border to approximately 2,950 feet in the centre of the township. The eastern half of the township is comparatively level with only slight undulations of the surface. A mantle of glacial till covers the bedrock to variable

depths in different parts of the township. It is apparently quite thin on the steeper slopes of the western half of the township, but reaches a thickness of 30 to 35 feet in some sections in the southeastern part.

Only three wells are reported to yield water from the glacial drift. These wells, situated in sections 10, 14, and 15, encountered pockets of water-bearing sands at depths of 10 to 12 feet. The waters vary in character; that from the well on section 14 is reported to be soft and forms the household drinking supply for several of the residents in this vicinity, and the well on section 15 produces hard, slightly "alkaline", but drinkable, water.

Elsewhere in the township wells have been sunk through the drift and the water supplies are obtained from aquifers in the underlying Cypress Hills formation.

These wells vary in depth from 14 to 208 feet. The individual water-bearing beds are apparently confined to small areas and occur at various elevations through the formation. Some of the largest yields of water are obtained from wells over 100 feet in depth. These deep wells have been sunk in various parts of the township, including sections 1, 9, 10, 21, 23, 27, and 30. These waters are reported to be soft to moderately hard and quite suitable for the domestic drinking supply.

Water of a similar character is also obtained from the shallow wells at depths of less than 100 feet. The yield from some of these, however, is inadequate for the stock requirements.

No wells in the township are known to have been sunk through the Cypress Hills formation. Its base probably lies at an elevation of about 2,600 feet as indicated by outcrops of the underlying Bearpaw formation in the valley of Swiftcurrent creek in section 31.

The Bearpaw formation is known to be water bearing west of Swiftcurrent creek and it is quite probable that it may also be water bearing in this township. Waters from this formation where encountered in the western side of the municipality are usually hard and drinkable.

Two dry holes are known to occur in this township in sections 12 and 14. These wells do not exceed 60 feet in depth and it is probable that had they been sunk to greater depth in the Cypress Hills or Bearpaw formation, adequate water supplies would have been obtained.

Township 13, Range 15

This township is divided into three areas of upland by the stream channels of Swiftcurrent and Pelletier creeks. Swiftcurrent creek flows in a northerly direction along the western border of the township to section 19, then northeast to cross the northern border in the northeast corner. Pelletier creek flows north from section 2 to section 34, thus dissecting the area that lies east of Swiftcurrent creek. The narrow belt of farm land between Pelletier valley and the eastern border of the township is slightly undulating and slopes gently toward the north from a maximum elevation of about 2,960 feet in section 1 to about 2,700 feet in the southern part of section 36. The land surface of the south-central area lying between the two stream channels is more irregular. It is characterized by steep slopes and numerous low hills. The maximum elevation of 2,900 feet is attained in section 4. From this point the land slopes to an elevation of about 2,800 feet along the edges of Pelletier valley on the eastern side of the area, and to about 2,700 feet on the banks of Swiftcurrent creek on the west.

On the western side of the valley the land surface rises from approximately 2,600 feet in the creek bottom toward the northwest to a maximum elevation of about 2,850 feet in sections 31 and 32.

Groundwater supplies of this township are obtained from the unconsolidated deposits and from the Cypress Hills and Bearpaw formations.

The unconsolidated material consists of stream-deposited silts, sands, and gravels that occur in the bottoms of Swiftcurrent and Pelletier valleys, and of the mantle of glacial drift that overlies the bedrock in the upland areas.

Wells sunk to shallow depths in the stream deposits may encounter large supplies of drinkable water. These supplies are little used as the creek and flowing springs in the valley bottom supply ample water for the few residents in these localities.

On the uplands remote from the valleys water supplies have been located in the drift deposits in only a few isolated localities. Where found the water occurs in sand pockets or sandy clay interspersed through the less pervious boulder clay. These waters are reported to be quite suitable for domestic use and the supply from most of these wells is sufficient for the farm requirements.

In many sections of the township the residents have failed to locate water in the unconsolidated deposits and have sunk their wells to the underlying bedrock formations, where large supplies are generally assured. Cypress Hills formation immediately underlies the drift on the upland areas and extends down to elevations between 2,700 and 2,650 feet above sea-level. The Bearpaw formation underlies the Cypress Hills formation except in the valleys where stream erosion has removed the latter and the Bearpaw is directly overlain by the unconsolidated deposits.

Wells sunk in the Cypress Hills formation usually encounter water, although in many places it is found necessary to sink the well to the lower or basal beds of the formation before a suitable supply is obtained. These water-bearing beds occur at depths of 50 to 180 feet, or at elevations ranging from 2,720 to 2,675 feet above sea-level. The aquifer is usually a bed of sand or sandstone. Quicksand was encountered in several of these wells, although only one, situated in section 5, is reported to have lost its supply because of sand entering the well.

Shallower aquifers have been encountered in only a few sections in the township. Most waters from this formation are hard and all are reported to be suitable for the domestic drinking supply.

Three wells situated on the western side of the township in sections 19, 30, and 31 struck water in a sand aquifer at an elevation of about 2,690 feet. The Cypress Hills formation is known to thin perceptibly toward the west and it is probable that these wells struck an eastern extension of a water-bearing horizon in the upper part of the underlying Bearpaw formation. This horizon has been tapped by numerous wells in the eastern half of the township to the west, and is the chief source of ground water supply for that area.

Other water-bearing horizons are expected to occur in the upper part of the Bearpaw formation in other parts of this township.

Township 14, Range 13

The land surface of this township rises gradually toward the south from an average elevation of about 2,700 feet on the northern border to an elevation slightly exceeding 2,900 feet in the south-central part of the township.

The till comprising the glacial drift is thought to form only a thin mantle over the bedrock in this township. A few wells situated in the southern sections are reported to yield water from porous sandy clay or pockets of sand occurring irregularly interspersed through the drift at depths of less than 20 feet. Elsewhere it was found necessary to sink wells to the underlying Cypress Hills formation before a satisfactory water supply was obtained.

Water is obtained from this formation at depths varying from 18 to 190 feet, and over a wider range of elevations from 2,875 to 2,760 feet above sea-level. The lowest horizon occurs at elevations of 2,700 to 2,675 feet above sea-level. It lies at or near the base of the formation and is tapped by wells in the northern third of the township at depths of 18 to 50 feet. Owing to a rise in the land surface toward the south the wells tapping this horizon are deeper in the central part of the township. A group of drilled wells, about fourteen in number, situated on section 13, are yielding large supplies of soft water from this horizon at depths ranging from 140 to 190 feet. In section 16 in the central part, and in sections 18 and 19 on the western side of the township, wells drilled to depths of 135, 125, and 32 feet are also producing from this horizon.

At several points in the central sections and throughout the southern third of the township, aquifers have been located higher in the formation. These aquifers do not occur at any definite elevation and have been encountered by wells sunk to variable depths ranging from 10 to 79 feet.

The yield from individual wells that tap any of these aquifers is usually sufficient for the farm requirements of 20 to 40 head of stock. Only two wells, situated on sections 16 and 17,

are reported to yield inadequate supplies from the shallow aquifers and one 205-foot well in section 17 failed to encounter a suitable water supply in the lower horizon. These waters are all reported to be quite suitable for the household drinking supply, although the deeper wells, in general, yield softer water than is obtained from wells sunk to the shallow aquifers.

Ground water conditions existing in the Bearpaw formation have not been definitely proved as no wells in this immediate vicinity are known to have penetrated this formation. It is quite probable, however, that beds of fine sand or sandy shales may occur in the upper part of the Bearpaw and can be expected to yield water in this township. These waters, however, will probably be more highly mineralized than waters from the Cypress Hills formation.

Township 14, Range 14

Swiftcurrent creek flows in a northwesterly direction diagonally across this township from section 6 to section 34. The land surface rises rapidly from elevations between 2,550 and 2,500 feet along the creek bottom to form the steep slopes of the valley. The slope flattens off over the rolling hilly uplands and attains a maximum elevation of about 2,850 feet in the southeastern corner of the township. The surface rises even more gently over the northwestern uplands to slightly more than 2,700 feet above sea-level in the northwest corner.

Ground water supplies of this township are obtained from springs and from wells sunk in the stream deposits of Swiftcurrent creek into pockets of sand or gravel in the glacial till that mantles the uplands, and into porous beds of sands, sandstones, and gravels in the Cypress Hills formation.

The stream deposits of Swiftcurrent creek consist mostly of clays and silts interbedded with a few beds or pockets of sand and gravel and may reach a thickness of 20 feet or more in some localities. These porous deposits no doubt contain moderately large supplies of drinkable water that is readily available by sinking shallow wells, but at the present time the creek and flowing springs on the valley sides supply most of the water required for range stock in this vicinity.

On the uplands, ground water is obtained from the glacial till in only a few isolated localities. Where encountered the water occurs in sand or gravel interspersed through the boulder clay at depths of 10 to 25 feet from the surface. The yield from individual wells is adequate for the farm requirements of 10 to 30 head of stock, and the water is reported to be suitable for the household drinking supply. Throughout most of the township the residents have failed to locate water-bearing deposits in the glacial drift and have sunk wells into the underlying Cypress Hills formation.

Ground water occurs at various elevations in this formation, although the largest supplies are obtained from sand and gravel beds that occur near its base. These supplies are tapped by wells in the northern third of the township at depths of 20 to 60 feet from the surface. Owing to a rise in the surface elevation toward the south, and a corresponding thickening of the formation in that direction, it was found necessary to sink wells to depths of 102 and 120 feet in sections 9 and 12 before tapping this horizon. Flowing springs that issue from the creek banks and from tributary coulées at an elevation of about 2,670 feet in sections 5, 8, 11, 21, 25, and 26 are probably caused by seepage from this bedrock horizon.

Waters obtained from this formation vary considerably as to their mineral salt content. Several wells in the township yield water that is reported to be slightly "alkaline", but drinkable, others yield water of better quality and of variable hardness ranging from moderately soft to hard.

No wells in the township are known to have encountered the Bearpaw formation immediately underlying the Cypress Hills beds. Swiftcurrent creek has cut its bed down to this formation and where not covered by the stream deposits outcrops of these shales may be seen on the lower banks and in the valley bottom. The upper part of this formation is water-bearing in the townships to the north and northwest and it is reasonable to suppose these water supplies also occur in this formation in this township. Depths to these aquifers will vary according to the surface elevation at the well location. Wells situated in the valley may encounter water at depths of 100 feet or less, whereas depths of 200 feet or possibly more may be required for wells situated on the uplands. Where encountered in other parts of the municipality these waters commonly contain some iron in solution, but the mineralization is rarely so great as to prohibit the use of the water in the households.

Township 14, Range 15

This township lies on the Swiftcurrent uplands. The land surface is characterized by numerous low hills, ridges, and undrained depressions. Ground water supplies of the township are obtained from wells sunk to sand and gravel pockets in the glacial drift and from wells penetrating both the Cypress Hills and Bearpaw (bedrock) formations, and from springs that flow from the Bearpaw sands in the northwestern corner of the area. These supplies are supplemented by surface water from Swiftcurrent creek, in the south-eastern corner, and by surface water collected in small lakes and artificially constructed reservoirs at several places on the uplands.

Recent stream deposits are known to occur only in the valley of Swiftcurrent creek in section 1. The ground water conditions of these deposits have not been tested to date owing to the small extent of the deposits and to their inconvenient location.

On the uplands several wells sunk to depths of 35 feet or less encountered water in sand pockets in the glacial drift. These wells are probably not indicative of the ground water possibilities of the drift, as only a comparatively few wells have been sunk to date in this township. Fairly large supplies of drinkable water are expected to occur at depths less than 40 feet in pockets of sand and gravel in the moraine-covered areas on the western side of the township, although it may be necessary to sink several test holes before a satisfactory yield is obtained. The thickness of the drift varies in different parts of the township. On the western side it may extend to a depth of 40 to 50 feet in some localities, although it is probably much thinner on the steeper hillsides. The drift forming the till plain over the central and eastern parts of the area is thin and probably does not exceed 25 feet in thickness throughout most of this area.

No prediction can be made as to the quantity of water obtainable in any one locality, due to the irregular extent and thicknesses of the water-bearing pockets. Ground waters obtained from the drift deposits, in this area, however, usually are of good quality.

The Cypress Hills formation underlies the drift throughout most of the township. It is judged to be thin in the north-eastern half of the area and is absent in the valley of Swiftcurrent creek and on the escarpment in sections 31 and 32 where surface elevations range lower than about 2,660 feet.

A 61-foot well situated on section 14 and a 70-foot well on section 18 are apparently the only wells in the township yielding water from this formation. In the latter well only a small yield of slightly "alkaline" water is obtained from a bed of sand at an elevation of about 2,730 feet. The well on section 14 yields an adequate supply of hard water from a bed of gravel at an elevation of about 2,661 feet. Other aquifers no doubt occur at moderate depths of 100 feet or less in other parts of the township.

The Bearpaw formation underlying the Cypress Hills formation is known to be water-bearing in its upper part. Fine sands and sandy shales outcrop at an elevation of about 2,600 to 2,650 feet in the northwestern corner of the township. Numerous springs of moderately soft to hard, drinkable water issue from the porous beds in this locality.

This horizon is also tapped by a 160-foot and a 90-foot well situated on the upland on the N.½, section 32. The deeper of these wells produces, from an elevation of about 2,622 feet, a brownish coloured water that is reported to be "alkaline". The shallower well yields clear, hard, drinkable water from a porous bed occurring at an elevation of about 2,662 feet. This horizon is also tapped by two wells in the central part of the township at an elevation of about 2,634 feet. These wells yield large supplies of drinkable water. The areal extent of these water-bearing beds is not well known, but it probably underlies most of this township at approximately the same elevation and hence at moderate depths from the surface.

Township 15, Range 13

The northwestern part of this township lies at an average elevation of about 2,450 feet above sea-level and comprises a wide valley tract traversed by Swiftcurrent creek. From the edge of the

valley in sections 19, 29, and 33, the land surface rises abruptly to the Swiftcurrent uplands at an average elevation of 2,650 to 2,700 feet.

Water supply for the city of Swift Current, part of which lies within this area, in sections 19 and 30, is obtained from Swiftcurrent creek. Elsewhere in the township water supplies are obtained from flowing springs that occur along the edge of the valley escarpment and from wells sunk in the unconsolidated deposits and the bedrock.

The unconsolidated deposits in Swiftcurrent valley may be fairly thick in places. They are composed mostly of clays and silts interbedded with an occasional layer of sand and gravel. Several wells sunk to depths of less than 20 feet on the flats encountered large supplies of slightly "alkaline" water in these deposits. At other locations in the valley wells have been sunk to the underlying Bearpaw formation before a suitable water supply was obtained. Persons in search of water supplies in these flats are advised to prospect with an auger for the scattered pockets of water-bearing gravels and sands before undergoing the expense of drilling a well to horizons in the Bearpaw formation, from which adequate supplies of water sufficiently low in mineral salts to be drinkable cannot be assured. Two deep wells in this lowland area are probably yielding water from sand beds in the Bearpaw formation.

One of these wells, drilled to a depth of 132 feet, on the NW.$\frac{1}{4}$, section 20, encountered a water-bearing sand at the base, or at an elevation of about 2,322 feet. When tapped by the drill, the water rose to within 40 feet of the surface. The second well, situated on the SE.$\frac{1}{4}$, section 29, was drilled to a depth of 340 feet or an elevation of about 2,147 feet. The position of the water-bearing horizon is uncertain but thought to be at the base of the well. This water is also under hydrostatic pressure and rises to within 90 feet of the surface. Both of these waters are hard and

contain iron in solution, but are reported to be drinkable. The analysis of water from the later well is included in the list of water analyses in a later section of this report.

A dry hole was drilled to a depth of 456 feet on the SE.$\frac{1}{4}$, section 29, indicating a very irregular distribution of these aquifers. It is quite possible, however, that these or other aquifers may occur at moderate depths in other parts of this lowland area.

In the upland area, including slightly more than the southeastern half of the township, the Bearpaw formation is overlain by 30 to 50 feet of Cypress Hills formation and it in turn is overlain by a mantle of glacial drift varying in thickness from a few feet to 35 feet or possibly more in some localities.

Wells sunk to depths of 35 and 23 feet in sections 6 and 22 encountered moderately large supplies of slightly "alkaline" water in beds of sand and gravel. These aquifers are thought to be in glacial drift. Other wells sunk to depths of 13 to 35 feet in this upland area are undoubtedly yielding water from the sandstones, conglomerates, and unconsolidated sands and gravels of the Cypress Hills formation. This horizon is encountered at elevations ranging from 2,640 to 2,680 feet above sea-level and probably extends to the base of the formation at an elevation of about 2,600 feet. Several springs that occur in a coulée in sections 4, 5, and 8, although issuing from the drift no doubt have their origin in this horizon.

Where encountered these waters are hard and reported to be quite suitable for drinking. The yield from individual wells is usually adequate for 20 to 50 head of stock.

One well, situated in the SE.$\frac{1}{4}$, section 3, encountered water in the underlying Bearpaw formation at a depth of about 165 feet or at an elevation of about 2,581 feet above sea-level. The character of this aquifer was not determined. The water, however, is reported to be soft, slightly "alkaline", and sufficient in quantity for the farm requirements.

The areal extent of this aquifer is not known, as no other wells in the upland area have been sunk to this depth. It is quite probable, however, that similar water supplies may occur at approximately the same elevation in other localities.

Township 15, Range 14

Swiftcurrent creek occupies a wide valley that cuts across the southeastern corner and thence extends northward along the eastern edge of this township. A dry valley occupied by the main line of the Canadian Pacific railway extends from section 30 eastward across the township to join Swiftcurrent valley on the south side of the city of Swift Current. A narrower valley with more steeply eroded sides extends from section 7 to the point where it joins Swiftcurrent valley in section 3. The upland area intervening between these valleys in the central part of the township and narrow belts of uplands along the north and south borders rise from 150 to 200 feet above the valley bottoms, which in the vicinity of Swift Current in section 25 have an approximate elevation of 2,430 feet.

The bedrock surface is covered by a mantle of unconsolidated deposits consisting of Recent stream deposits, glacial lake clay in the valley bottoms, and glacial till or boulder clay over the uplands.

Ground water supplies are obtained mostly from wells dug to shallow depths in the unconsolidated deposits or from deep wells bored or drilled to the underlying bedrock. The city of Swift Current pumps its water supply from Swiftcurrent creek. A reservoir is used for storage on the creek with an estimated capacity of 100,000,000 gallons, and three other reservoirs at approximately 150 feet higher elevation holding 700,000, 500,000, and 300,000 gallons, respectively. A stand pipe holding 100,000 gallons is also used to balance the pressure throughout the business section of the city.

Recent stream deposits, consisting largely of clay and silt interbedded with a few beds of sand and gravel, occur along the bottom of Swiftcurrent valley. Wells sunk to porous beds in these deposits may yield large supplies of water, although some of these may be slightly "alkaline" and for this reason alone may not be satisfactory for drinking. Such shallow sources are particularly liable to pollution and water derived from wells located in these deposits in or near the city should be examined regularly for bacteria by the Provincial Analyst.

The wide valley that extends westward from the city of Swift Current is underlain by lake clay. The clay in most places is not productive of ground water, but in this locality a few beds of water-bearing sand and gravel can be expected to occur along the edges of the valley or possibly at the contact of the lake clay and the underlying boulder clay. A 14-foot well situated in the SE.$\frac{1}{4}$, section 28, is reported to yield a supply of soft water from this latter type of deposit.

Throughout the rest of the township the unconsolidated deposits consist mostly of yellowish to dark grey boulder clay. A few isolated pockets of sands and gravels occur interspersed through

the clay, and where encountered in wells yield small supplies of drinkable water. Residents in search of water in the drift deposits are advised to prospect the upper 25 feet with a small auger, preferably on the lower slopes or in the bottoms of draws, before undergoing the expense of sinking a well. The drift varies in thickness in different localities, but it probably does not extend to depths greater than 50 feet throughout most of the township and is known to be very thin on some of the hill-sides.

Wells sunk through the drift to the underlying bedrock usually encounter water. The supplies occur in beds of sandstones and sandy shales in the upper part of the Bearpaw formation. Wells situated in sections 8, 9, 10, 15, and 33 encountered these water supplies at depths ranging from 125 to 180 feet, or at elevations between 2,600 to 2,500 feet above sea-level. These waters vary in character. The well on section 15 is reported to yield soft water, but hard, drinkable water is obtained from wells on sections 9, 10, and 33, and hard, "alkaline" water that is not suitable for drinking is obtained from a well on the NW.$\frac{1}{4}$, section 8. A 16-foot well situated in a coulée in the NE.$\frac{1}{4}$, section 8, encountered soft water in sandstone at an elevation of about 2,634 feet. This is the highest aquifer encountered in the bedrock of this township. The deepest well in the township, situated in section 21, encountered a small supply of water in quicksand at a depth of 325 feet or at an elevation of about 2,240 feet. This is the only well within this township known to have been sunk to an elevation lower than 2,500 feet. It is probable, however, that other aquifers may occur at elevations below 2,500 feet in other parts of the township and may be encountered at depths of less than 200 feet in the lowland areas. No prediction can be made,

however, as to the character of these waters. Where encountered in the townships to the north and west they range from soft, drinkable waters to salty and highly "alkaline" types that are only used for stock watering.

Since several wells situated in the south-central part of the township have encountered water in sand at elevations between 2,634 and 2,560 feet above sea-level, or at depths ranging between 100 and 165 feet, it is possible that a more or less continuous aquifer extends, within these limits of elevation, under the southern uplands area.

The city of Swift Current lies at an approximate elevation of 2,430 feet and hence at a much lower level than this upland horizon. No large supplies of water are to be expected from the glacial deposits in the vicinity of the city, and such water as may occur will be confined to irregular sand or gravel pockets of limited individual areal extent. It is probable that the part of the Bearpaw formation that occurs under the drift in this lowland part of the township is composed more largely of shales and hence is less porous than the upper part of the formation occurring beneath the drift in places or Cypress Hills formation at other places on the uplands. Sands are known to occur in the lower part of the Bearpaw formation and in the underlying Belly River formation and may be water-bearing. It may be necessary to sink wells to depths of 300 to 450 feet in order to reach these beds and, as evidenced by the 456-foot dry hole on section 29 of the township to the east, water cannot be assured at all points. Such water as will be found will be greatly inferior in quality to that derived from the creek.

It may not be drinkable due to the presence of iron and other mineral salts, and may contain too much soda to be used in boilers. The use of such water would be largely confined to cooling operations and to fire protection.

Township 15, Range 15

A lowland area covered for the most part by glacial lake sands occupies slightly more than the northwestern half of this township. From an elevation of about 2,400 feet above sea-level in the northwestern corner of the township the land surface rises gradually toward the southeast to an elevation of about 2,550 feet in the central part of the township. The main line of the Canadian Pacific railway follows a slight valley tract across the southeastern edge of the lowlands from section 25 to section 6 at elevations between 2,475 and 2,500 feet. From the vicinity of the railway southeastward the land surface rises abruptly to a small area of uplands that occupy the southeastern corner of the township and have an average elevation of about 2,775 feet. The uplands and the lower slopes extending for a short distance north of the railway are underlain by boulder clay or glacial till. In the valley bottoms immediately northwest and west of Java a thin layer of lake clay covers the till. The glacial drift covering the uplands is only sparingly productive and the ground water supplies are obtained almost entirely from wells sunk to bedrock and from springs that issue from bedrock aquifers where they occur at or near the surface.

The Cypress Hills formation may immediately underlie the drift throughout part of this upland area, but it has not been positively identified in any of these wells. Water is encountered in sandstone and sandy shales of the Bearpaw formation at depths of 75 to 140 feet from the surface or at elevations ranging from about 2,680 to 2,600 feet above sea-level. These waters are reported to be moderately soft to hard and suitable for drinking. The yield from individual wells is usually adequate for the farm requirements. Many of the springs flow throughout the year and provide additional stock water supplies. Wells sunk to depths of 118 and 600 feet in the N.E.$\frac{1}{4}$, section 1, failed to encounter more than small yields of water. This condition is unusual. The close proximity of the well locations to the edge of the valley in this vicinity may account for the scarcity of water in the upper 100 to 150 feet. Water-bearing horizons are expected to occur, however, at greater depths, although these are known to be more erratic in their distribution.

In the lowland area ground water supplies are obtained from wells sunk to depths of 20 feet or less in the glacial lake deposits and from deep wells drilled into the underlying Bearpaw formation.

The glacial lake deposits consist mostly of clay in the eastern side of the area, but become more sandy toward the west. Beds and small pockets of sand and gravel occur interbedded with the clay and form excellent reservoirs for the accumulation of ground water. These water-bearing beds are usually located in the depressions and are encountered at depths of 10 to 20 feet after penetrating a few feet of top soil and yellow clay. The yield from individual wells is usually adequate for 15 to 20 head of

stock, but the quality of the water varies in different localities. Some of the shallow wells, situated in section 10, 16, and 17, yield highly mineralized water that is used only for stock. Other shallow wells are reported to yield moderately soft to hard, drinkable, waters. An 80-foot well, situated in the N.W.$\frac{1}{4}$, section 33, when first dug produced highly mineralized water from an undetermined horizon. This well has since been abandoned.

Two wells in this lowland area are believed to have been drilled to the underlying Bearpaw formation. One of these, situated on the N.W.$\frac{1}{4}$, section 20, encountered a large yield of "alkaline" water at a depth of 180 feet. This water is only used for watering stock. The second well, situated on the N.W.$\frac{1}{4}$, section 24, was drilled to a depth of 350 feet. Water was encountered in quicksand, but owing to difficulty experienced by the sand flowing into the well it was abandoned. Residents of the lowland area are advised to prospect thoroughly for shallow water-bearing beds in the unconsolidated deposits before undergoing the expense of sinking a deep test hole into the bedrock where the water obtainable is of a much inferior quality.

Township 16, Range 13

Swiftcurrent creek occupies a wide valley tract that trends in a northeasterly direction across the southern half of this township. The valley is floored with flood-plain deposits of clay and silt interbedded with localized beds of sand and gravel. North of the valley the land surface is steeply rolling in places and rises in a northwesterly direction from an average elevation

of about 2,400 feet above sea-level in the valley bottom to slightly over 2,600 feet in a narrow upland area that extends along the western side and across the northwestern corner of the township. South of the valley the surface rises abruptly to a small upland area that occupies the southeastern corner of the township at an elevation of about 2,700 feet above sea-level. This area is covered with moraine; elsewhere north and south of the valley the bedrock is overlain with boulder clay forming a till plain.

In the valley bottom, ground water supplies are obtained largely from wells sunk to sand and gravel beds in the unconsolidated deposits. These deposits vary greatly in thickness throughout the valley floor. On the northern side they are apparently thin, as bedrock is exposed in several places along the stream channel. South of the creek, in section 4, gravels were encountered in a drilled well at a depth of 115 feet. It has not been definitely determined whether these gravels represent an ancient stream deposit or are in the glacial drift. In other parts of the valley, water-bearing beds of sand and gravel have been encountered at various depths ranging from 18 to 50 feet from the surface. Most of the water obtained is reported to be hard and only one well, situated in section 11, yields water that is considered to be too highly mineralized for the household drinking supply.

Northward from the edge of the valley the bedrock is overlain by boulder clay ranging in depth from only a few feet to 60 feet or possibly more. None of the wells investigated in this area was producing water from the drift, although

it is probable that small supplies of water are obtainable at shallow depths in some of the coulée bottoms. No wells are known to have been sunk in the small area of upland south of the valley, but in the township to the east where the glacial deposits are apparently similar most of the wells have been sunk into the bedrock before a suitable water supply was obtained.

Cypress Hills formation is thought to immediately underlie the drift in section 1 and possibly parts of sections 2, 11, and 12, where surface elevations range higher than 2,600 feet above sea-level. Wells sunk into this formation should encounter water of good quality in sand or gravel beds at depths of 25 to 100 feet.

The Bearpaw formation immediately underlies the unconsolidated deposits throughout the rest of the township and is known to be water bearing in the valley bottom and on the highlands to the north.

The water occurs in fine sands and sandy shales at various elevations ranging from about 2,300 to 2,550 feet above sea-level. Depths of producing wells range from 32 to 200 feet. A well situated on the SE.$\frac{1}{4}$, section 4, encountered a gravel bed at a depth of 85 to 115 feet and below it Bearpaw shales to the base of the well at a depth of 302 feet. The water-bearing horizon is uncertain, but it is probable that most of the supply is obtained from the gravels, as the water-level remains at the level of the gravels. There is apparently considerable lateral variation in the water-bearing sands of the Bearpaw, as few wells encounter water at the same elevation and several dry holes have been drilled to greater depths in close proximity to producing wells.

Where encountered those water supplies are usually adequate for the average farm requirements of 20 to 30 head of stock. The waters are hard and some contain noticeable amounts of dissolved mineral salts. Iron also forms an objectionable impurity, although its concentration is not sufficient to render the water undrinkable.

Township 16, Range 14

A lowland area covered by glacial lake clay and sand occupies several sections in the northwestern corner of this township. The average surface elevation of this lowland is about 2,400 feet above sea-level. From this area the land surface rises towards the east to an elevation of about 2,650 feet in the vicinity of section 13 and to the south to an elevation of slightly more than 2,700 feet in section 5. These uplands are dissected by a dry valley that extends southeastward from the lowlands to the valley of Swiftcurrent creek in the southeastern corner of the township. This valley is underlain by glacial lake clay and the adjoining uplands are covered by a mantle of glacial till.

Ground water supplies in the lowland area are obtained almost entirely from shallow wells 10 to 20 feet in depth. The few wells investigated in this area are situated in the part underlain by lake sands. Wells on sections 18 and 33 yield large supplies of "alkali" water that is reported to be drinkable. A third well on section 20 produces water of better quality, but the yield is inadequate for the farm requirements. It may be necessary to sink wells to a depth of 30 to 50 feet in the clay-covered area in sections 29, 30, 31, and 32 before a suitable water supply is obtained.

Water-bearing sands have been encountered at an average depth of 45 feet in the lake clay-covered area lying to the west of this township, and it is probable that similar ground water conditions may extend through this area.

Little is known regarding the ground water conditions in the deep valley that extends to the southeastern corner of the township, but water-bearing sands and gravels are expected to underlie the clays in this area as well.

Groundwater supplies in the upland areas are obtained from wells and springs. Most of the springs occur in the lower slopes at elevations ranging from 2,400 to 2,500 feet. They flow from the glacial deposits, but some of them no doubt have their origin in the underlying bedrock. These waters are of good quality and are used for watering stock and for household use where conveniently located to farm buildings.

Many of the wells in this area have encountered pockets of water-bearing sands or gravels in the glacial drift at depths of 60 feet or less. Others failing to strike water in the drift, have been sunk deeper into the underlying Bearpaw formation where good supplies are usually obtained.

Wells yielding water from the drift deposits have been located for the most part in draws or on the lower hill slopes where gravel and sand beds are more widely distributed. Their distribution, however, is irregular, and in many cases it is necessary to sink a number of test holes before a suitable water supply is located. No prediction can be made as to the quality of the waters obtainable from these deposits as they vary widely throughout the township. In section 7 soft water

is obtained from a 12-foot well, and hard, iron-bearing water is obtained from a depth of 55 feet in another well nearby.

Wells sunk into the Bearpaw formation encounter water at several different horizons. In the east-central part of the township a well-defined horizon is reached in wells sunk to depths of 34 to 140 feet or to elevations ranging from 2,536 to 2,470 feet above sea-level. The shallowest of these wells, situated on section 16, yields only sufficient water for a few head of stock. Other wells on sections 13, 14, and 22 have larger yields. This water is highly mineralized and is unfit for drinking. It is used, however, for watering stock. The areal extent of the horizon is fairly well defined, as the lower surface elevations do not permit of its occurrence west of this upland area. This highly mineralized type of water is not present everywhere, however, as a well sunk to a depth of 116 feet on section 23 encountered a large supply of soft water at an elevation of about 2,504 feet. The exact geological horizon at which this aquifer occurs is not known. The character of the water suggests a different origin from that of other waters in this vicinity, but the aquifer has not been found elsewhere in the township.

On the southern area of uplands the water-bearing beds in the Bearpaw formation occur over a wider vertical range. These waters also vary in character, although the highly mineralized types predominate. It is possible that other water-bearing horizons may occur at greater depths in the Bearpaw, as large supplies of water are obtained from aquifers at elevations as low as 2,100 feet in the southeastern part of the township to the west.

Township 16, Range 15

The greater part of this township lies in a lowland with an average surface elevation of about 2,400 feet above sea-level. In the southeastern corner of the township, including sections 1, 2, 11, and 12, the land surface rises rapidly toward the Swiftcurrent uplands and obtains a maximum elevation of about 2,650 feet in section 1. The lowland area is overlain by glacial lake clay and sands with the exception of a narrow belt of moraine and till-covered area that extends along the western border and across the northwestern corner of the township. The highland in the southeastern part is also overlain by a mantle of boulder clay.

Water supplies in the township are obtained almost entirely from wells, as there are few sloughs and dugouts and no permanent streams in this area.

Two water-bearing horizons are known to occur in the unconsolidated deposits. The upper horizon is encountered by wells dug to shallow depths, usually not greater than 20 feet. The water occurs in isolated pockets of sand, and more occasionally gravel, interspersed through the light-grey to yellowish grey lake clay. The yield from individual wells varies, and most of the wells are affected by extended periods of drought. The waters also vary in character and most of them contain appreciable amounts of mineral salts in solution, but they are being used for the household drinking supply.

The second water-bearing horizon occurs at depths ranging from 30 to 55 feet, or at an average depth of about 45 feet. The water is confined to a bed of sand or quicksand. This horizon has been located in various parts of the lowlands and is fairly continuous throughout this area. Most of these

wells yield sufficient water for 15 to 30 head of stock and several larger yields are reported. The waters are mostly hard and used for the domestic drinking supply, although noticeable amounts of salts are present in the water from wells located in sections 7 and 20, and one well situated on section 3 produces highly "alkaline" water that is used only for watering stock.

Three of the wells investigated in this township are yielding water from the Bearpaw formation. Two of these, situated on section 2, were drilled to depths of 375 and 380 feet. Water was struck in blue sand at the base of the wells at an elevation of about 2,100 feet. The water is under hydrostatic pressure and rises in the well 110 feet above the water-bearing bed. This water is soft, but contains a high concentration of mineral salts in solution, mostly "Glauber's salt", rendering it unsuitable for domestic use. It is used, however, for watering stock with no apparent ill effects.

The third well, situated on section 20, is apparently obtaining water from the same horizon at a depth of 250 feet or an elevation of 2,160 feet. This water is under less pressure and rises only about 25 feet above the aquifer. Although the yield is large the water is too highly mineralized even for stock use. No analysis was made of this water, but it is reported to be salty. The areal extent of this horizon is not known outside of the areas indicated by these three wells. The horizon may, however, underlie most of the southern half of the township. Owing to the high concentration of mineral salts in these waters it is

doubtful if these supplies are worth the expense that would be incurred in drilling to this depth. Careful prospecting of the unconsolidated glacial deposits should locate adequate supplies of drinkable water for all farm requirements in nearly all parts of the township.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF SWIFT CURRENT, No. 137, SASKATCHEWAN

West of 3rd meridian	Township / Range	13 / 13	13 / 14	13 / 15	14 / 13	14 / 14	14 / 15	15 / 13	15 / 14	15 / 15	16 / 13	16 / 14	16 / 15	Total No. in municipality
Total No. of Wells in Township		67	26	25	50	31	11	29	19	30	26	27	28	369
No. of wells in bedrock		64	24	18	42	17	7	24	13	10	20	9	3	251
No. of wells in glacial drift		3	2	7	8	14	4	4	4	20	6	17	25	114
No. of wells in alluvium		0	0	0	0	0	0	1	2	0	0	1	0	4
Permanency of Water Supply														
No. with permanent supply		63	20	25	50	31	11	28	18	27	18	27	28	346
No. with intermittent supply		0	3	0	0	0	0	0	1	3	2	0	0	9
No. dry holes		4	3	0	0	0	0	1	0	0	6	0	0	14
Types of Wells														
No. of flowing artesian wells		0	0	0	0	0	0	1	0	0	0	0	0	1
No. of non-flowing artesian wells		10	4	4	9	0	3	6	3	9	3	4	6	61
No. of non-artesian wells		53	19	21	41	31	8	21	16	21	17	23	22	293
Quality of Water														
No. with hard water		39	20	21	35	25	10	27	14	24	17	23	25	280
No. with soft water		24	3	4	15	6	1	1	5	6	3	4	3	75
No. with salty water		0	0	0	0	0	0	0	0	0	0	0	2	2
No. with "alkaline" water		4	2	2	0	4	2	7	2	7	10	10	8	58
Depths of Wells														
No. from 0 to 50 feet deep		47	14	15	26	21	4	25	10	21	6	17	23	229
No. from 51 to 100 feet deep		16	4	5	5	7	5	0	1	2	3	3	2	53
No. from 101 to 150 feet deep		3	1	3	3	3	1	1	4	4	8	3	0	34
No. from 151 to 200 feet deep		0	6	2	15	0	1	1	3	1	3	4	0	36
No. from 201 to 500 feet deep		1	1	0	1	0	0	2	1	2	5	0	3	16
No. from 501 to 1,000 feet deep		0	0	0	0	0	0	0	0	0	1	0	0	1
No. over 1,000 feet deep		0	0	0	0	0	0	0	0	0	0	0	0	0
How the Water is used														
No. usable for domestic purposes		61	23	24	50	31	10	28	18	24	19	19	22	329
No. not usable for domestic purposes		2	0	1	0	0	1	0	1	6	1	8	6	26
No. usable for stock		63	23	25	50	31	11	28	19	30	20	27	27	354
No. not usable for stock		0	0	0	0	0	0	0	0	0	0	0	1	1
Sufficiency of Water Supply														
No. sufficient for domestic needs		63	20	25	50	31	11	28	18	27	18	27	27	345
No. insufficient for domestic needs		0	3	0	0	0	0	0	1	3	2	0	1	10
No. sufficient for stock needs		48	18	20	47	25	8	28	10	21	17	18	18	278
No. insufficient for stock needs		15	5	5	3	6	3	0	9	9	3	9	10	77

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

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

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

Analyses of Water Samples from the Municipality of Swift Current, No. 137, Saskatchewan

LOCATION						Depth of well, Ft	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS									Source of water
No	Qtr	Sec	Tp	Rge	Mer			Total	Perm	Temp	Cl	Alkalinity	CaO	MgO	SO_4	Na_2O	solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1	SW	23	13	13	3	28	420	500	380	120	7	300	60	76	33	29	331	107		159		4	49	12		* 2
2	SE	13	14	13	3	170	460	450	280	170	9	295	60	40	70	107	403	107		84		93	104	15		* 2
3	NE	7	14	14	3	20	700	650	600	50	15	290	150	86	344	117	777	269		17	232		234	25		* 1
4	SE	16	14	15	3	94	1,140	800	700	100	10	345	50	112	480	304	1,026	90		214	27		678	17		* 3
5	SE	18	14	15	3	20	420	340	300	40	30	220	30	86	123	76	415	54		140	57		114	50		* 1
6	NW	11	15	13	3	28	500	550	360	190	20	240	80	83	148	46	452	143		81	131		64	33		* 2
7	SE	29	15	13	3	340+	1,197											(2)	(1)?	(3)			(1)?	(4)		* 3
8		25	15	14	3		551	(Swift Current City Supply)										(4)	(1)		(3)		(2)		(5)	Swift current creek
9	NE	2	15	15	3	130	2,580	2,200	1900	300	10	340	330	338	1,533	322	2,427	340	340		1,009		722	16		*3
10	NW	32	16	13	3	160	2,920	450	260	190	17	600	90	54	1,492	1,168	2,832	161		113		322	2,208	28		* 3
11	NE	7	16	14	3	200	4,920	2,200	2200	Nil	60	250	260	490	2620	852	3,944	250	292		1,460		1,843	93		* 1
12	SW	23	16	14	3	116	320	160	100	60	7	230	40	29	33	80	285	72		61		91	49	12		* 3
13	NW	25	16	14	3	28	1,460	800	700	100	48	375	140	137	730	379	1,468	251		105	259		774	79		* 1
14	SE	2	16	15	3	375	4,260	100	Nil	100	99	330	50	18	2,419	1,763	4,075	89		38		208	3,577	163		* 3
15	SW	20	16	15	3	55	1,860	1,200	800	400	86	625	40	230	783	569	1,834	72		465	21		1,134	142		* 1
16	NW	22	16	15	3	16	1,120	500	360	140	51	440	60	119	467	368	1,170	107		249		39	691	84		* 1
17	NE	23	16	15	3	23	3,560	1,800	1500	300	50	505	170	386	2079	909	3,465	304		169	918		1,991	83		* 1

Water samples indicated thus, *1, are from glacial drift or other unconsolidated deposits.
Water samples indicated thus, *2, are from bedrock, Cypress Hills formation.
Water samples indicated thus, * 3, are from bedrock, Bearpaw formation.
Analyses are reported in parts per million; where numbers (1), (2), (3), (4), and (5) are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$)
Analysis No. 8, by Provincial Analyst, Regina; Analysis No. 7, by Department of Agriculture, Ottawa.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Seven water samples were taken for analysis from the unconsolidated deposits in this municipality by the Geological Survey in 1935. Of these, one is from Recent stream gravels, three are from Recent and glacial lake sands, and three are from sand and gravel pockets in the glacial drift.

The Recent stream deposits of this area are confined mostly to the floor of Swiftcurrent creek. These sediments consist largely of clay and silt derived from the erosion of the glacial drift and the Bearpaw shale on the valley sides. The movement of ground water is slow through these fine sediments and ample opportunity is afforded for the taking into solution of such dissolvable mineral salts as may be present in the sediments. Evaporation of surface waters collecting in undrained depressions on the valley floor tends to concentrate the mineral salts present and these waters slowly seep into the valley silts. Waters percolate more rapidly through the more porous sand and gravel beds that occur interspersed through the clay and in the bottoms of the smaller stream channels. Wells tapping these pockets yield a water that, if not polluted by surface water containing sewage, is quite satisfactory for domestic use. The third analysis given on the accompanying table is of water obtained from stream gravel in Swiftcurrent valley, in the southwestern part of the municipality. This water contains a relatively small amount of mineral salts in solution as compared with waters from the more compact silt. The bulk of the 700 parts per million of total solids present in the water is made up of nearly equal parts of sodium sulphate (Na_2SO_4), magnesium sulphate ($MgSO_4$), and calcium carbonate ($CaCO_3$). None of

these compounds is present in harmful amounts, but the calcium carbonate and magnesium sulphate cause the water to be very hard. Greater concentrations of mineral salts are present in many of the waters from the silts in the lower parts of the valleys than in the upper parts. Hence in the vicinity of Swiftcurrent water obtained from shallow wells sunk on the creek flats usually contains sufficient quantities of sodium sulphate and magnesium sulphate in solution to impart a bitter taste to the water and render it unsatisfactory for domestic use.

Water derived directly from Swiftcurrent creek is not highly mineralized, as much of it is derived from spring waters on the uplands to the south. The run-off from these highlands is also rapid and the waters have little opportunity to take up mineral salts before entering the main stream channel. This water after passing through the purification plant at Swiftcurrent contains only about 551 parts per million of total dissolved solids. The constituent salts and their relative abundance are indicated by analysis No. 8, on the accompanying table of analyses.

Marked variations are noted in the quality of waters from the glacial drift, many within limited areas. The compact boulder clay contains large amounts of readily soluble mineral salts. Hence, even shallow wells sunk entirely in boulder clay or tapping only very thin sand pockets yield water that contains large amounts of salts in solution and may be unfit for both humans and stock. Waters derived from porous pockets of sand and gravel occurring at shallow depths and hence not covered by any appreciable thickness of boulder clay, are soft or only moderately hard and can be used for drinking.

In general, waters from small pockets under greater thicknesses of the clay have correspondingly increased amounts of sulphate salts. Other important factors determining the quality of waters from the drift in this area are the character and porosity of the underlying bedrock. Where the drift overlies the compact shale of the Bearpaw formation, the downward percolating waters collect immediately above the bedrock. In areas where the underlying beds are more porous less opportunity is afforded for the mineral salts to become concentrated.

In the southern uplands, where the drift is underlain by the Cypress Hills formation, waters in the drift rarely contain noticeable amounts of soluble salts. Analysis No. 5 is of water from a 20-foot well tapping a sand pocket in the drift on the western border of the upland area. The total dissolved solids of 420 parts per million are exceptionally low for water from the drift. The compounds of calcium and magnesium contribute to the hardness of the water, but none of the salts is present in sufficient abundance to affect the use of the water for any farm use.

In the northern half of the municipality the waters from the drift show such a wide variation that no representative analysis can be given. Supplies obtained from the lake sands, or from the more extensive sand and gravel pockets occurring at shallow depths in the moraine and till-covered areas, are hard and mostly "alkaline", but are satisfactory for domestic use. Larger concentrations of salts are present in water from the boulder clay and even from sand beds if they occur beneath more than 20 or 30 feet of boulder clay.

In general, sodium sulphate (Glauber's salt) is the most abundant of the salts forming the total solid content. In waters from other than the very shallow sand beds, this salt is usually present in amounts ranging from 700 to 2,000 parts per million. The upper limit of concentration for this salt in waters used domestically is usually considered as 1,000 to 1,200 parts per million, although waters containing greater concentrations are commonly used by humans without any apparent ill effects. Waters containing concentrations as great as 4,000 parts per million of this salt are used for stock, but their use is not recommended if waters of better quality are obtainable.

Magnesium sulphate (Epsom salts) is usually second in order of abundance. This salt has about twice the laxative effect of an equal amount of sodium sulphate, but its concentration in these waters is usually much less than that of the sodium sulphate. The rest of the dissolved solids consist mostly of the carbonates of magnesium and calcium. These salts contribute to the hardness of the water, but are not considered detrimental to the health of persons using the water. Analysis No. 17 given on the table is of water obtained from a thin sand bed occurring under the lake clay at a depth of 23 feet on sec. 23, tp. 16, range 15. This analysis is typical of the waters of poorer quality from the glacial deposits. Analysis No. 16 is of water from a well only 16 feet deep on section 22, in the same township, and is characteristic of the waters found in the more extensive sand beds at shallow depths. Both of these waters and the water from the 55-foot well on section 20, of this same township, contain larger amounts of common salt (NaCl) than are usually found in waters

from the glacial drift. It is possible that all of these supplies are in contact with the shales of the Bearpaw formation, from which the salt may be in a large part derived. These wells are situated in a lowland area and surface evaporation may tend to concentrate the salts carried in solution in the water that flows from the uplands into the undrained depressions from which it eventually finds its way into the underlying sediments. Water with such a high common salt content does not generally occur in places where the drift overlies areas of high elevation.

Water from the Bedrock

Eight water samples from the bedrock formations were taken for analysis. Three of these are from the Cypress Hills formation and the rest from the Bearpaw formation.

Waters from the Cypress Hills formation have a comparatively low dissolved mineral salt content and are usually of excellent quality for domestic use. The total dissolved solids rarely range higher than 500 parts per million and no individual salt attains a sufficiently high concentration to be harmful. The carbonates of magnesium and calcium are usually present in sufficient abundance to impart hardness to the water. A few waters, however, contain an excess of sodium carbonate and are termed soft. Waters containing more than 100 to 200 parts per million of sodium carbonate (black alkali) are not recommended for irrigation. The soda is more prevalent in water from greater depths than from the shallower aquifers in the formation. Analyses Nos. 1, 2, and 6 are of waters from scattered localities and at different depths in the formation, but the general character of the water is similar in each case.

The quality of water from the Bearpaw formation depends upon several factors. The compact, dark shales are of marine origin and contain inherently large amounts of readily dissolvable mineral salts. Waters from these shales are highly charged with sodium and calcium sulphate and common salt, and are mostly unfit for drinking. Many of these waters have concentrations of total solids exceeding 3,000 or even 5,000 parts per million and tend to create scour in stock. Fortunately the compact shales are in many places interspersed with more porous sand beds in the upper part of the formation in the uplands regions. Waters from the sands are much less highly mineralized. The character of the overlying sediments is also an important factor in determining the quality of water from the sands. In the uplands the boulder clay mantle is thin and the Cypress Hills formation is sufficiently porous to allow water to percolate from the surface to the aquifers in the upper part of the Bearpaw. The waters are not highly mineralized on reaching the formation and if they do not come in contact with thick beds of shale will not become more highly mineralized. Analysis No. 12 given on the table is of water from a well on the SW.¼, sec. 23, tp. 16, range 14, believed to be tapping a sand bed in this formation at a depth of 116 feet. This water is soft and low in sulphate and other mineral salts and is of much better quality than is usually found in this formation. Analyses Nos. 9 and 10 are much more typical and show total solid contents of 2,580 and 2,920 parts per million, respectively. Such waters would undoubtedly have laxative effects upon persons unaccustomed to "alkaline" waters, but are being used for drinking without reported ill effects.

Sand beds are fewer in the Bearpaw formation underlying the lowlands and the waters obtained from them are of much poorer quality than those found on the uplands. Analysis No. 14 is of water from a well tapping a sand bed under a considerable thickness of shale, and as would be expected the water is highly mineralized, having a total solid content of 4,260 parts per million. This water would prove to be strongly laxative and is being used only for stock. Even for this use it cannot be considered satisfactory. Water of poor quality is to be expected at greater depths in the shales, and for that reason deep drilling is not recommended in the lowlands or drilling below the upper sandy beds of the formation in the uplands.

WELL RECORDS—Rural Municipality of SWIFT CURRENT NO. 137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SE.	1	13	13	3	Bored	70	2,942	- 15	2,927	70	2,872	Cypress Hills sand	Hard, clear		D, S	Oversufficient for local nees; other wells filled in, unfit for use.
2	SW.	1	"	"	"	Drilled	110	2,942	- 6	2,936	103	2,839	Cypress Hills sand	Hard, clear, "alkaline"		D, S	Sufficient for 100 head stock.
3	SE.	2	"	"	"	Dug	20	2,944	- 17	2,927	17	2,927	Cypress Hills sand	Hard, clear		D, S	Insufficient for local needs.
4	SE.	4	"	"	"	Dug	45	2,950									Dry hole base in Cypress Hills formation; also another 45-foot dry hole.
5	SW.	5	"	"	"	Dug	98	2,941	- 96	2,845	96	2,845	Cypress Hills sand	Hard, clear		D, S	Insufficient for local needs.
6	NW.	5	"	"	"	Drilled	90	2,940								N	
7	NW.	6	"	"	"	Drilled	128	2,978	-114	2,864	128	2,850	Cypress Hills sand	Hard, clear		D, S	Oversufficient for local needs.
8	NW.	8	"	"	"	Drilled	83	2,946	- 75	2,871	75	2,871	Cypress Hills sand	Soft, clear		D, S	Sufficient for local needs.
9	SW.	12	"	"	"	Dug	25	2,970	- 20	2,950	20	2,950	Cypress Hills formation	Soft, clear		D, S	Oversufficient for local needs.
10	SE.	12	"	"	"	Dug	27	2,968	- 10	2,958	27	2,941	Cypress Hills formation	Hard, clear		S	Sufficient for 30 head stock.
11	SE.	12	"	"	"	Drilled	248	2,968	- 15	2,953	248	2,720	Bearpaw sand	Soft, clear, "alkaline"		D, S	Sufficient for local needs; also a 33-foot well with small supply.
12	SE.	13	"	"	"	Dug	27	2,940	- 24	2,916	24	2,916	Cypress Hills sand	Hard, clear		D, S	Sufficient for 10 head stock.
13	SE.	15	"	"	"	Drilled	86	2,948	- 66	2,882	86	2,862	Cypress Hills sand	Soft, clear		D, S	Sufficient for 150 head stock.
14	NE.	15	"	"	"	Dug	32	2,928	- 30	2,898	30	2,898	Cypress Hills sand	Soft, clear		D, S	Sufficient for local needs.
15	NE.	15	"	"	"	Dug	32	2,926	- 26	2,900	26	2,900	Cypress Hills sand	Soft, clear		D, S	Sufficient for 50 head stock.
16	NW.	15	"	"	"	Dug	25	2,926	- 23	2,903	23	2,903	Cypress Hills sand	Hard, clear		D, S	Sufficient for local needs.
17	NW.	15	"	"	"	Dug	28	2,926	- 24	2,902	24	2,902	Cypress Hills sand	Hard, clear		D, S	Sufficient for 10 head stock.
18	NW.	15	"	"	"	Dug	38	2,928	- 36	2,892	36	2,892	Cypress Hills sand	Soft, clear		D, S	Sufficient for local needs.
19	NW.	15	"	"	"	Dug	29	2,926	- 27	2,899	27	2,899	Cypress Hills gravel	Hard, clear		D, S	Sufficient for local needs.
20	NW.	15	"	"	"	Dug	25	2,924	- 23	2,901	23	2,901	Cypress Hills conglomerate	Soft, clear		D, S	Insufficient for local needs.
21	NW.	15	"	"	"	Dug	30	2,926	- 25	2,901	25	2,901	Cypress Hills sand	Soft, clear		D, S	
22	NW.	15	"	"	"	Dug	32	2,926	- 29	2,897	29	2,897	Cypress Hills sand	Soft, clear		D, S	Sufficient for local needs.
23	NE.	18	"	"	"	Drilled	140	2,911	-125	2,786	125	2,786	Cypress Hills sand	Hard, clear		D, S	Oversufficient for local needs; also a 50-foot well not used.
24	SE.	19	"	"	"	Drilled	85	2,885	- 66	2,819	75	2,810	Cypress Hills sand	Soft, clear		D, S	Oversufficient for local needs.
25	SE.	19	"	"	"	Drilled	87	2,886	- 66	2,820	81	2,805	Cypress Hills sand	Soft, clear		D, S	Oversufficient for local needs.
26	SE.	19	"	"	"	Drilled	90	2,888	- 76	2,812	80	2,808	Cypress Hills sand	Hard, clear		D, S	Oversufficient for local needs.

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

WELL RECORDS—Rural Municipality of SWIFT CURRENT NO.137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
27	NE.	19	13	13	3	Dug	20	2,886									Dry hole, base in Cypress Hills conglomerate also a 43-foot well with very little water.
28	NE.	19	"	"	"	Dug	33	2,890	- 30	2,860	30	2,860	Cypress Hills sand	Hard, clear		D, S	Sufficient for 20 head stock.
29	NE.	19	"	"	"	Drilled	95	2,886	- 77	2,809	95	2,791	Cypress Hills sand	Soft, clear		D, S	Oversufficient for local needs; also an 18-foot well.
30	NW.	20	"	"	"	Dug	30	2,884	- 20	2,864	20	2,864	Cypress Hills clay	Hard, clear		D, S	Sufficient for 5 head stock.
31	NW.	20	"	"	"	Drilled	70	2,878	- 59	2,819	59	2,819	Cypress Hills conglomerate	Soft, clear		D, S	Sufficient for local needs.
32	NW.	20	"	"	"	Drilled	77	2,884			75	2,809	Cypress Hills sand	Soft, clear		D, S	Sufficient for local needs.
33	NW.	20	"	"	"	Drilled	85	2,884	- 65	2,819	85	2,799	Cypress Hills sand	Soft, clear		D, S	Oversufficient for local needs.
34	SW.	23	"	"	"	Dug	28	2,930	- 25	2,905	25	2,905	Cypress Hills sand	Soft, clear		D, S	Sufficient for 50 head stock;# also another well not used much.
35	NE.	25	"	"	"	Dug	20	2,926	- 12	2,914	20	2,906	Cypress Hills formation	Hard, clear		D, S	Sufficient for local needs.
36	NE.	26	"	"	"	Dug	24	2,915	- 22	2,893	22	2,893	Cypress Hills gravel	Soft, clear		D	Sufficient for local needs; also a spring; flows continuously.
37		28	"	"	"		46	2,900	- 17	2,883	37	2,863	Cypress Hills gravel				C.P.R. well.
38	E.½	29	"	"	"	Dug	44	2,894	- 40	2,854	40	2,854	Cypress Hills sand	Hard, clear		D, S	Sufficient for local needs.
39	SE.	29	"	"	"	Dug	40	2,875	- 31	2,844	31	2,844	Cypress Hills sand	Hard, clear, "alkaline"		D	Sufficient for local needs.
40	SE.	29	"	"	"	Dug	45	2,881	- 40	2,841	40	2,841	Cypress Hills sand	Soft, clear		D	Sufficient for local needs.
41	SE.	29	"	"	"	Dug	38	2,896	- 35	2,861	35	2,861	Cypress Hills gravel	Hard, clear		D, S	Oversufficient for local needs.
42	NE.	29	"	"	"	Dug	40	2,896	- 36	2,860	36	2,860	Cypress Hills sand	Soft, clear		S	Sufficient for 75 head stock.
43	NE.	32	"	"	"	Dug	24	2,847	- 21	2,826	21	2,826	Cypress Hills gravel	Soft, clear		D, S	Sufficient for 15 head stock; also a spring and a 7-foot well.
44	NE.	33	"	"	"	Dug	24	2,906	- 22	2,884	22	2,884	Cypress Hills gravel	Hard, clear		D, S	Sufficient for 12 head stock; also a similar well same depth.
45	SW.	34	"	"	"	Dug	50	2,920	- 45	2,875	45	2,875	Cypress Hills gravel	Soft, clear		D, S	Sufficient for 20 head stock.
46	SE.	34	"	"	"	Dug	50	2,932	- 45	2,887	45	2,887	Cypress Hills sand	Soft, clear		D, S, I	Sufficient for 40 head stock.
47	SE.	34	"	"	"	Dug	50	2,920			49	2,871	Cypress Hills sand	Hard, clear		D, S	Insufficient for 5 head stock.
48	SW.	35	"	"	"	Dug	50	2,928	- 40	2,888	50	2,878	Cypress Hills gravel	Hard, clear		D, S	Sufficient for 12 head stock.
49	SW.	35	"	"	"	Dug	70	2,920					Cypress Hills sand	Soft, clear		D, S	Sufficient for 20 head stock.
50	SE.	35	"	"	"	Dug	38	2,918	- 18	2,900			Cypress Hills sand	Hard, clear "alkaline"		D, S	Insufficient for 18 head stock; also a spring.
51	SW.	36	"	"	"	Dug	35	2,924	- 33	2,891	33	2,891	Cypress Hills sand	Hard, clear		D, S	Insufficient for 4 head stock.
1	SW.	1	13	14	3	Drilled	158	2,963	-130	2,833	130	2,833	Cypress Hills sand	Soft, clear		D, S	Sufficient for 10 head stock.
2	SE.	2	"	"	"	Dug	36	2,965	- 31	2,934	31	2,934	Cypress Hills gravel	Hard, clear		D, S	Sufficient for local needs.

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WELL RECORDS—Rural Municipality of SWIFT CURRENT NO. 137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
3	SW.	2	13	14	3		33	2,970					Cypress Hills gravel			N	Good supply.
4	SW.	6	"	"	"	Drilled	198	2,800					Cypress Hills formation	Hard			Oversufficient for local needs.
5	NW.	9	"	"	"	Drilled	180	2,915	-163	2,752	163	2,752	Cypress Hills sand	Hard, clear		D, S	Sufficient for 10 head stock.
6	NW.	10	"	"	"	Drilled	200	2,937	-193	2,744	193	2,744	Cypress Hills sand	Hard, clear		D, S	Oversufficient for local needs.
7	NE.	10	"	"	"	Dug	12	2,963	- 10	2,953	10	2,953	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
8	NE.	12	"	"	"	Dug	58	2,956									Dry hole base in Cypress Hills sand.
9	SE.	14	"	"	"	Dug	60	2,948									Dry hole base in Cypress Hills formation.
10	SW.	14	"	"	"	Dug	11	2,962	- 7	2,955	7	2,955	Glacial sandy clay	Soft, clear		D, S	Oversufficient for local needs.
11	SW.	15	"	"	"	Dug	12	2,977	- 8	2,969	8	2,969	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
12	SE.	16	"	"	"	Dug	36	2,907	- 34	2,873	34	2,873	Cypress Hills sand	Hard, clear		D, S	Insufficient for local needs.
13	SW.	16	"	"	"	Dug	36	2,900					Cypress Hills sand	Hard, clear, "alkaline"		D, S	Intermittent supply.
14	NE.	18	"	"	"	Dug	42	2,768	- 34	2,734	34	2,734	Cypress Hills gravel	Hard, clear		D, S	Sufficient for local needs.
15	NE.	21	"	"	"	Drilled	160	2,900	- 60	2,840	160	2,740	Cypress Hills gravel	Hard, clear		D, S	Oversufficient for local needs.
16	SE.	23	"	"	"	Drilled	180	2,936	-174	2,762	174	2,762	Cypress Hills formation	Hard, clear		D, S	Sufficient for local needs.
17	SE.	26	"	"	"	Drilled	82	2,922	- 79	2,843	79	2,843	Cypress Hills clay	Clear		N	Intermittent supply; several other wells.
18	NE.	26	"	"	"	Dug	14	2,900	- 12	2,888	12	2,888	Cypress Hills sand	Hard, clear		D, S	Sufficient for 10 head stock.
19	NE.	27	"	"	"	Drilled	153	2,900	-124	2,776	153	2,747	Cypress Hills gravel	Soft, clear		D, S	Sufficient for local needs.
20	NE.	30	"	"	"	Drilled	118	2,778	- 13	2,765	118	2,660	Cypress Hills formation	Hard, clear		D	Oversufficient for local needs.
21	SW.	31	"	"	"	Dug	18	2,735	- 16	2,719	16	2,719	Cypress Hills sand	Hard, clear		D, S	Sufficient for local needs; also a spring that flows continuously.
1	NE.	1	13	15	3	Drilled	189	2,906	-182	2,724	182	2,724	Cypress Hills sand	Soft, clear		D, S, I	Oversufficient for local needs.
2	SW.	3	"	"	"	Dug	24	2,863	- 14	2,849	20	2,843	Cypress Hills sand	Hard, clear		D, S	Sufficient for 25 head stock.
3	NW.	4	"	"	"	Drilled	180	2,889	-160	2,729	180	2,709	Cypress Hills sand	Hard, clear, iron		D, S	Sufficient for local needs.
4	SE.	5	"	"	"	Dug	122	2,889	-119	2,770	119	2,770	Cypress Hills sand	Hard, clear		D, S	Insufficient for local needs.
5	SE.	6	"	"	"	Dug	100	2,807	- 96	2,711	96	2,711	Cypress Hills sandstone	Hard, clear		D, S	Sufficient for local needs.
6	SW.	6	"	"	"	Spring		2,696					Cypress Hills formation				
7	NE.	12	"	"	"	Dug	7	2,850	- 3	2,847	3	2,847	Glacial sand	Soft, clear		S	Sufficient for 14 head stock; also a 22-foo well, soft water.
8	SW.	15	"	"	"	Dug	14	2,862	- 10	2,852	10	2,852	Cypress Hills sandstone.	Hard, clear		D, S	Sufficient for local needs.

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WELL RECORDS—Rural Municipality of SWIFT CURRENT NO. 137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
9	SE.	17	13	15	3	Dug	45	2,788	- 41	2,747	41	2,747	Cypress Hills sand	Hard, clear		D, S	Sufficient for local needs; also a 16-foot well.
10	NE.	19	"	"	"	Bored	65	2,754	- 61	2,693	61	2,693	Bearpaw sand	Hard, clear		D, S	Sufficient for 24 head stock.
11	SW.	21	"	"	"	Dug	24	2,738	- 8	2,730			Glacial drift	Hard, clear		D, S	Insufficient for local needs.
12	NE.	21	"	"	"	Dug	30	2,701	- 15	2,686	30	2,671	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
13	NW.	21	"	"	"	Spring		2,671					Cypress Hills formation				
14	SW.	22	"	"	"	Dug	90	2,782	- 86	2,696	86	2,696	Cypress Hills sandstone	Hard, clear		D, S	Insufficient for local needs.
15	SE.	22	"	"	"	Dug	14	2,640	- 10	2,630	10	2,630	Glacial clay	Hard, clear		D, S	Sufficient for local needs.
16	NW.	23	"	"	"	Spring		2,632					Glacial drift				Several springs here.
17	NE.	24	"	"	"	Dug & Bored	60	2,800	- 56	2,744	56	2,744	Cypress Hills sand	Hard		D, S	Sufficient for 35 head stock.
18	NE.	24	"	"	"	Drilled	140	2,815	-120	2,695	140	2,675	Cypress Hills gravel	Hard, clear		D, S, I	Sufficient for local needs.
19	SE.	30	"	"	"	Bored	75	2,763	- 70	2,693	70	2,693	Bearpaw sand	Hard, clear		D, S	Sufficient for 19 head stock.
20	NE.	31	"	"	"	Drilled	140	2,822					Bearpaw silt	Hard		D, S	Sufficient for 20 head stock.
21	SE.	32	"	"	"	Dug	7	2,745	- 4	2,741	4	2,741	Glacial sand	Hard, clear		D, S	Sufficient for 8 head stock.
22	SW.	33	"	"	"	Dug	16	2,712	- 14	2,698	14	2,698	Cypress Hills conglomerate	Hard, clear, "alkaline"		D	Insufficient for local needs; also a 14-foot well supplies 8 head stock.
23	SE.	33	"	"	"	Dug	50	2,728	- 40	2,688	50	2,678	Cypress Hills gravel	Hard, clear		D, S	Sufficient for local needs.
1	NE.	2	14	13	3	Dug	10	2,885	- 3	2,882	10	2,875	Cypress Hills gravel	Hard, clear, "alkaline"		D, S	Sufficient for 60 head stock.
2	SE.	2	"	"	"	Spring		2,879					Glacial drift				
3	NW.	3	"	"	"	Dug	65	2,924	- 63	2,861	63	2,861	Cypress Hills sand	Hard, clear		D, S, I	Sufficient for 80 head stock.
4	SW.	4	"	"	"	Dug	15	2,865	- 10	2,855	10	2,855	Glacial sand	Hard, clear		D, S	Sufficient for 3 head stock.
5	SW.	4	"	"	"	Dug	20	2,867	- 18	2,849	18	2,849	Glacial sand	Soft, clear		D, S, I	Sufficient for 10 head stock.
6	NW.	4	"	"	"	Dug	48	2,871	- 44	2,827	44	2,827	Cypress Hills gravel	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
7	SE.	5	"	"	"	Drilled	79	2,857	- 54	2,803	79	2,778	Cypress Hills formation	Hard, clear		D, S	Sufficient for 18 head stock.
8	SE.	5	"	"	"	Dug	12	2,856	- 9	2,847	9	2,847	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
9	NE.	5	"	"	"	Dug	22	2,853	- 19	2,834	19	2,834	Cypress Hills sand	Soft, clear		D, S	Sufficient for 15 head stock.
10	NE.	5	"	"	"	Dug	12	2,850	- 9	2,841	9	2,841	Cypress Hills sand	Soft, clear		D, S	Sufficient for 10 head stock.
11	NE.	5	"	"	"	Dug	52	2,860	- 48	2,812	48	2,812	Cypress Hills sandy clay	Hard, clear		D, S, I	Sufficient for 20 head stock.
12	SE.	5	"	"	"	Spring		2,800					Cypress Hills formation				

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of SWIFT CURRENT NO. 137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
13	NE.	6	14	13	3	Spring		2,839					Cypress Hills formation				Continuous flow.
14	NE.	10	"	"	"	Dug	40	2,910	- 36	2,874	36	2,874	Cypress Hills conglomerate	Hard, clear		D, S	Sufficient for 75 head stock.
15	SE.	13	"	"	"	Drilled	170	2,892	-150	2,742	170	2,722	Cypress Hills formation	Soft, clear		D, S, I	Oversufficient for local needs.
16	SE.	13	"	"	"	Drilled	170	2,896	-155	2,741	170	2,726	Cypress Hills sand	Soft, clear		D, S	Oversufficient for local needs. #
17	SE.	13	"	"	"	Drilled	180	2,880			180	2,700	Cypress Hills formation	Soft, clear		D, S	Oversufficient for local needs.
18	NE.	13	"	"	"	Drilled	185	2,871	-135	2,736	185	2,686	Cypress Hills formation	Soft, clear		D, S	Sufficient for local needs.
19	NE.	13	"	"	"	Drilled	140	2,874			140	2,734	Cypress Hills gravel	Soft, clear		D, S	Oversufficient for local needs; many other drilled wells 140 to 170 feet deep.
20	NW.	13	"	"	"	Drilled	190	2,860	- 65	2,795	190	2,670	Cypress Hills sand	Soft, clear		D, S, I	Sufficient for local needs.
21	NW.	15	"	"	"	Dug	26	2,829	- 19	2,810	19	2,810	Cypress Hills sand	Soft, clear		D, S	Sufficient for 6 head stock.
22	NE.	16	"	"	"	Dug	23	2,832	- 20	2,812	20	2,812	Cypress Hills clay	Hard, clear		D	Sufficient for domestic needs only.
23	NE.	16	"	"	"	Drilled	135	2,822	-123	2,699	123	2,699	Cypress Hills sand	Soft, clear		D, S	Sufficient for 10 head stock.
24	SE.	17	"	"	"	Dug	75	2,860	- 73	2,787	73	2,787	Cypress Hills sand	Hard, clear		D, S	Sufficient for only 8 head stock; also a 205 foot well, very poor supply.
25	SE.	18	"	"	"	Drilled	125	2,820					Cypress Hills formation	Hard, clear, iron		D, S, I	Oversufficient for 10 head stock.
26	NW.	19	"	"	"	Dug	32	2,720	- 24	2,696	32	2,688	Cypress Hills formation	Hard, clear		D, S	Sufficient for 20 head stock.
27	SE.	21	"	"	"	Dug	5	2,780	- 3	2,777	3	2,777	Glacial drift	Soft, clear		D, S	Oversufficient for 10 head stock.
28	NW.	22	"	"	"	Dug	50	2,770	- 46	2,724	46	2,724	Cypress Hills conglomerate	Hard, clear		D, S, I	Sufficient for 28 head stock.
29	NE.	22	"	"	"	Spring		2,800					Glacial drift				
30	SW.	25	"	"	"		35	2,750					Cypress Hills formation			D, S	Sufficient for 4 head stock.
31	NE.	28	"	"	"	Dug	18	2,710	- 14	2,696	14	2,696	Cypress Hills sand	Hard, clear		D, S	Sufficient for 30 head stock; also a spring dry in dry years.
32	SE.	30	"	"	"	Dug	30	2,740	- 27	2,713	27	2,713	Cypress Hills sand	Soft, clear		D, S	Sufficient for 10 head stock.
33	NE.	32	"	"	"	Dug	29	2,702	- 27	2,675	27	2,675	Cypress Hills gravel	Hard, cloudy, "alkaline"		D, S	Sufficient for 10 head stock; also a spring
34	NW.	34	"	"	"	Drilled	70	2,744	- 50	2,694	50	2,694	Cypress Hills sand	Hard, clear, iron		D, S, I	Oversufficient for 30 head stock.
35	NE.	34	"	"	"	Dug	50	2,740	- 46	2,694	46	2,694	Cypress Hills conglomerate	Soft, clear		D, S	Sufficient for 13 head stock.
1	SW.	3	14	14	3	Drilled	83	2,780	- 75	2,705	75	2,705	Cypress Hills sand	Soft, clear		D, S, I	Sufficient for 25 head stock.
2	SE.	4	"	"	"	Dug	18	2,790	- 15	2,775	15	2,775	Glacial sand	Hard, clear		D, S, I	Sufficient for 17 head stock.
3	NE.	4	"	"	"	Dug	12	2,746	- 10	2,736	10	2,736	Glacial gravel	Soft, clear		D, S	Insufficient for local needs; also a similar well.
4	SW.	4	"	"	"		16	2,750					Glacial sand	Hard		S	Sufficient for local needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of SWIFT CURRENT NO. 137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
5	SW.	5	14	14	3	Spring		2,670					Glacial drift				
6	NE.	7	"	"	"	Dug	20	2,535	- 11	2,524	11	2,524	Recent stream gravel	Hard, clear		D	Oversufficient for local needs. #
7	NE.	8	"	"	"	Spring		2,670					Cypress Hills formation				Gives abundant supply.
8	NE.	9	"	"	"	Drilled	102	2,748	- 88	2,660	88	2,660	Cypress Hills formation	Soft, clear		D, S, I	Oversufficient for local needs.
9	NE.	10	"	"	"	Drilled	35	2,772	- 30	2,742	30	2,748	Cypress Hills formation	Hard, clear, "alkaline"		D, S	Sufficient for 8 head stock.
10	NE.	10	"	"	"	Drilled	85	2,770	- 83	2,687	83	2,687	Cypress Hills formation	Hard, clear		D, S	Insufficient for local needs.
11	NE.	11	"	"	"	Spring		2,692					Glacial drift				
12	NE.	12	"	"	"	Drilled	120	2,824	-107	2,717	107	2,717	Cypress Hills gravel	Hard, clear		D, S	Oversufficient for local needs.
13	SE.	12	"	"	"	Drilled	120	2,775					Cypress Hills formation				Sufficient for local needs.
14	NE.	14	"	"	"	Drilled	65	2,742	- 59	2,683	59	2,683	Cypress Hills gravel	Hard, clear, "alkaline"		D, S, I	Sufficient for 12 head stock.
15	SW.	15	"	"	"	Drilled	86	2,722	- 72	2,650	72	2,650	Bearpaw sand	Hard, clear		D, S	Oversufficient for local needs.
16	NW.	17	"	"	"	Dug	26	2,680	- 19	2,661	19	2,661	Glacial sand	Hard, clear		D	Sufficient for domestic needs.
17	SW.	18	"	"	"	Dug	30	2,671	- 23	2,648	23	2,648	Cypress Hills conglomerate	Hard, clear		D, S	Sufficient for 16 head stock.
18	SE.	21	"	"	"	Spring		2,670					Glacial drift				
19	SE.	23	"	"	"	Dug	30	2,675	- 28	2,647	28	2,647	Cypress Hills gravel	Soft, clear		D	Sufficient for local needs.
20	SE.	24	"	"	"	Drilled	72	2,746	- 59	2,687	59	2,687	Cypress Hills gravel	Soft, clear		D, S	Sufficient for 35 head stock.
21	NE.	25	"	"	"	Dug	26	2,726	- 23	2,703	23	2,703	Cypress Hills gravel	Hard, clear		D, S	Sufficient for 15 head stock.
22	SW.	25	"	"	"	Spring		2,662					Glacial drift				
23	NE.	25	"	"	"	Spring		2,716					Glacial drift				
24	NE.	26	"	"	"	Dug	22	2,710	- 14	2,696	14	2,696	Cypress Hills gravel	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
25	SW.	26	"	"	"	Spring		2,610					Glacial drift.				
26	SE.	26	"	"	"	Spring		2,650					Glacial drift				
27	NE.	30	"	"	"	Dug	52	2,674	- 49	2,625	49	2,625	Cypress Hills gravel	Hard, clear, "alkaline"		D, S	Insufficient for 10 head stock.
28	NW.	32	"	"	"	Dug	60	2,710					Cypress Hills sand	Hard, clear		D, S	Oversufficient for local needs.
29	SE.	36	"	"	"	Dug	36	2,710	- 23	2,687	23	2,687	Cypress Hills sandstone	Hard, clear		D, S	Insufficient for 16 head stock.
1	SE.	6	14	15	3	Dug	38	2,815	- 36	2,779	36	2,779	Glacial sand	Hard, clear		D, S	Sufficient for 70 head stock.
2	SE.	14	"	"	"	Dug	61	2,720	- 59	2,661	59	2,661	Cypress Hills gravel	Hard, clear		D, S	Sufficient for local needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of SWIFT CURRENT NO. 137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
3	NE.	16	14	15	3	Dug	60	2,736	- 50	2,686	50	2,686	Glacial drift	Hard, clear		D, S	Sufficient for 15 head stock.
4	SE.	16	"	"	"	Drilled	94	2,738	- 74	2,664	94	2,644	Bearpaw sandy shale	Hard, clear		D, S	Oversufficient for 100 head stock. #
5	SE.	18	"	"	"	Dug	20	2,796	- 13	2,783	13	2,783	Glacial sand	Hard, clear		D	Sufficient for domestic needs. #
6	NE.	18	"	"	"	Bored	70	2,800	- 40	2,760	70	2,730	Cypress Hills sand	Hard, clear, "alkaline"		D	Sufficient for domestic needs; also a 14-foot well, good supply.
7	NW.	21	"	"	"	Drilled	150	2,784					Bearpaw formation	Hard, clear, iron		D	Sufficient for local needs.
8	NW.	32	"	"	"	Drilled	160	2,782					Bearpaw shale	Hard, brown, "alkaline"		S	Oversufficient for local needs; also springs on quarter.
9	NE.	32	"	"	"	Bored	96	2,762	- 85	2,677			Bearpaw shale	Hard, clear		D, S	Sufficient for local needs.
10	SE.	36	"	"	"	Dug	36	2,720	- 26	2,694			Glacial sandy clay	Soft, clear		D, S	Sufficient for local needs.
1	SE.	3	15	13	3	Drilled	165	2,746					Bearpaw formation	Soft, clear, "alkaline"		D, S	Oversufficient for local needs.
2	NE.	4	"	"	"	Dug	26	2,671	- 23	2,648	23	2,648	Cypress Hills gravel	Hard, clear		D, S, I	Sufficient for 22 head stock.
3	SE.	4	"	"	"	Spring		2,642					Cypress Hills gravel				
4	NE.	5	"	"	"	Spring	3	2,617	+ 2	2,619	3	2,614	Cypress Hills gravel	Hard, clear		D, S	Sufficient for local needs.
5	SW.	6	"	"	"	Dug	35	2,670	- 23	2,647	23	2,647	Glacial clay	Hard, clear, iron, "alkaline"		D, S	Sufficient for local needs.
6	SE.	8	"	"	"	Spring		2,630					Cypress Hills gravel				
7	NE.	10	"	"	"	Dug	24	2,686	- 17	2,669	17	2,669	Cypress Hills gravel	Hard, clear, "alkaline"		D, S	Sufficient for 75 head stock.
8	NW.	11	"	"	"	Dug	28	2,704	- 23	2,681	23	2,681	Cypress Hills gravel	Hard, clear		D, S	Sufficient for 26 head stock. #
9	SW.	13	"	"	"	Dug	13	2,690	- 10	2,680	10	2,680	Cypress Hills sand	Hard, clear		D, S, I	Sufficient for 100 head stock; also a 12-foot well with a large supply.
10	SE.	13	"	"	"	Dug	11	2,690					Cypress Hills formation				Oversufficient for local needs.
11	SW.	14	"	"	"	Dug	35	2,700	- 30	2,670	30	2,670	Cypress Hills sand	Hard, clear		D, S	Oversufficient for 20 head stock.
12	NW.	20	"	"	"	Drilled	132	2,450	- 40	2,410	128	2,322	Bearpaw sand	Hard, clear, iron	45	D, S	Sufficient for local needs.
13	NW.	22	"	"	"	Dug	23	2,660	- 11	2,649	21	2,639	Glacial sand	Hard, "alkaline"		D, S	Sufficient for 8 head stock; also a 16-foot well with good supply.
14	SE.	22	"	"	"		23	2,660	- 12	2,648			Glacial drift				Sufficient for 52 head stock.
15	SW.	22	"	"	"		42	2,660					Cypress Hills formation				Large yield.
16	NW.	23	"	"	"	Dug	28	2,698	- 22	2,676	22	2,676	Cypress Hills conglomerate	Hard, clear		D, S	Sufficient for 75 head stock.
17	SE.	26	"	"	"	Dug	20	2,668	- 12	2,656	12	2,656	Cypress Hills gravel	Hard, clear		D, S	Sufficient for 200 head stock; also a 20-foot well with a good supply.
18	SE.	29	"	"	"	Drilled	340	2,487	- 90	2,397	340	2,147	Bearpaw formation	Hard, clear, "alkaline" iron		D, S	Sufficient for local needs; also a 30-foot well and a 456-foot dry hole. #

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WELL RECORDS—Rural Municipality of SWIFT CURRENT NO.137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
19	NW.	33	15	13	3	Dug	12	2,435	- 8	2,427	8	2,427	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
20	NE.	34	"	"	"	Dug	9	2,457	- 5	2,452	5	2,452	Alluvial sand	Hard, clear "alkaline"	45	D, S	Sufficient for local needs; also a similar well.
1	NW.	8	15	14	3	Drilled	150	2,736	-120	2,616	150	2,586	Bearpaw sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
2	NE.	8	"	"	"	Dug	16	2,638	- 3	2,635	3	2,635	Bearpaw sand	Soft, clear		D, S	Sufficient for local needs.
3	NE.	9	"	"	"	Bored	125	2,720	-120	2,600	120	2,600	Bearpaw sand	Hard, clear		D, S	Sufficient for local needs; also a 100-foot well.
4	NW.	10	"	"	"	Bored	125	2,682	-120	2,562	120	2,562	Bearpaw sand	Soft, clear		D, S	Insufficient for local needs; several holes give small supply.
5	SE.	15	"	"	"	Drilled	165	2,732	-160	2,572	160	2,572	Bearpaw sand	Soft, clear		D, S	Sufficien for local needs.
6	NE.	20	"	"	"	Bored	50	2,500	- 49	2,451	49	2,451	Glacial sand	Hard		D, S	
7	SW.	21	"	"	"	Dug	14	2,562	- 13	2,549	13	2,549	Glacial sand	Soft, clear		D, S	Insufficient for local needs; also a 325-foo well, poor supply in Bearpaw.
8	NE.	23	"	"	"	Dug	20	2,431	- 9	2,422	9	2,422	Alluvial clay	Hard, clear, "alkaline"		S	Intermittent supply; other seepage wells 16 to 18 feet deep.
9		25	"	"	"		174	2,430					Bearpaw formation				Good supply.
10	SE.	28	"	"	"	Dug	14	2,450	- 13	2,437	13	2,437	Glacial gravel	Soft, clear		D, S	Sufficient for 6 head stock; also a 6-foot well, good supply.
11	NW.	33	"	"	"	Drilled	185	2,686	-140	2,546	185	2,501	Bearpaw formation	Hard, clear		D, S	Oversufficient for local needs; also a 110-foot drilled well aquifer black sand.
12	NE.	36	"	"	"	Dug	30	2,449	- 25	2,424	25	2,424	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
1	NE.	1	15	15	3	Bored	148	2,737	-140	2,597	140	2,597	Bearpaw clay	Soft, clear, sulphur		D	Insufficient for local needs; also a 600-foot well, small supply.
2	NE.	2	"	"	"	Bored	130	2,810	-100	2,710	130	2,680	Bearpaw formation	Hard, clear, iron		D, S, I	Oversufficient for local needs; also a 130-foot well; large supply.
3	SE.	2	"	"	"	Bored	135	2,790	-133	2,657	133	2,657	Bearpaw clay	Hard, clear		S	Sufficient for 25 head stock.
4	SE.	4	"	"	"	Bored	75	2,730	- 50	2,680	75	2,655	Bearpaw sand	Soft, clear		D, S	Oversufficient for local needs; also springs that flow continuously.
5	SE.	7	"	"	"	Dug	12	2,504	- 4	2,500	4	2,500	Glacial gravel	Hard, clear		D, S	Sufficient for 15 head stock; also a spring that flow continuously.
6	SE.	9	"	"	"	Dug	8	2,574					Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 6 head stock.
7	SE.	10	"	"	"	Spring	0	2,665	0	2,665	0	2,665	Bearpaw sand	Hard, clear, "alkaline"		D, S	
8	NE.	10	"	"	"	Dug	10	2,666	- 1	2,665	6	2,660	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 50 head stock.
9	SE.	12	"	"	"	Drilled	400	2,732	- 90	2,642	400	2,332	Bearpaw formation	Hard, clear		D, S	Sufficient for 50 head stock.
10	NE.	14	"	"	"	Dug	11	2,680	- 8	2,672	8	2,672	Glacial drift	Soft, clear		D	Oversufficient for local needs.
11	SE.	16	"	"	"	Dug	16	2,516	- 15	2,501	15	2,501	Glacial sand	Hard, cloudy, iron		S	Sufficient for 25 head stock; also a 14-foo well good quality water.
12	NE.	17	"	"	"	Dug	12	2,530	- 9	2,521	9	2,521	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for only 10 head stock; also a 12-foot well, small supply.
13	SE.	19	"	"	"	Dug	20	2,470	- 11	2,459	11	2,459	Glacial gravel	Hard, clear		D, S	Oversufficient for local needs.

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WELL RECORDS—Rural Municipality of SWIFT CURRENT NO. 137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
14	NW.	20	15	15	3	Drilled	180	2,492			180	2,312	Bearpaw formation	Hard, "alkaline"		S	Oversufficient for local needs; also two wells 10 and 12 feet deep; poor supply.
15	NW.	22	"	"	"	Dug	15	2,532	- 8	2,524	8	2,524	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 75 head stock; also a 31-foot well, large supply, poor water.
16	NW.	23	"	"	"	Dug	14	2,475	- 6	2,469	6	2,469	Glacial sand	Soft			
17	NW.	24	"	"	"	Dug	12	2,550	- 0	2,550	12	2,538	Glacial gravel	Soft, clear			Sufficient for 14 head stock; also a 350-foot well plugged with sand.
18	SW.	25	"	"	"	Dug	25	2,474	- 23	2,451	23	2,451	Glacial sand	Soft, clear		D, S	Intermittent supply.
19	NE.	28	"	"	"	Dug	22	2,470	- 10	2,460	10	2,460	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
20	NE.	33	"	"	"		80	2,450					Bearpaw formation	Hard, "alkaline"		S	
21	SW.	36	"	"	"	Dug	13	2,472	- 10	2,462	10	2,462	Glacial gravelly clay	Hard, iron, soda, clear		D, S	Sufficient for 14 head stock.
1	NE.	3	16	13	3	Dug	33	2,424	- 29	2,395	29	2,395	Glacial sand	Hard, clear		D, S	Sufficient for 10 head stock.
2	SE.	4	"	"	"	Drilled	302	2,416	-102	2,314	102	2,314	Glacial stones	Hard, clear, "alkaline" iron		D, S	Sufficient for local needs; also a second well 18 feet deep.
3	NW.	6	"	"	"	Drilled	100	2,560					Bearpaw sand	Hard, clear	42	D, S	Sufficient for local needs.
4	NE.	6	"	"	"	Dug	18	2,480	- 12	2,468	12	2,468	Glacial sand	Hard, clear, "alkaline"		S	Intermittent supply; also a 300-foot dry hole in shale.
5	NE.	11	"	"	"	Dug	50	2,416	- 45	2,371	45	2,371	Glacial sand	Hard, clear		S	Sufficient for only 6 head stock.
6	SW.	16	"	"	"	Dug	38	2,475	- 35	2,440	35	2,440	Glacial gravel	Hard, clear, iron		D, S	Oversufficient for 10 head stock.
7	SW.	17	"	"	"	Dug	32	2,555	- 25	2,530	25	2,530	Bearpaw sandy clay	Hard, clear, iron		D, S	Sufficient for 60 head stock.
8	SE.	18	"	"	"	Drilled	76	2,580			74	2,506	Bearpaw formation	Hard, iron, clear		D, S	Sufficient for local needs.
9	NE.	20	"	"	"	Drilled	140	2,580			138	2,442	Bearpaw formation	Hard, clear, "alkaline" iron		D, S	Sufficient for 100 head stock.
10	SE.	22	"	"	"	Drilled	52	2,450	- 47	2,403	52	2,398	Bearpaw sandstone	Soft, clear, "alkaline"		D, S	Oversufficient for local needs; dry holes 185, 235 and 400 feet deep.
11	NW.	28	"	"	"	Drilled	200	2,585					Bearpaw formation	Hard, clear, "alkaline" iron		D, S	Sufficient for 14 head stock; also a 60-foot well.
12	NE.	28	"	"	"	Drilled	110	2,575	- 72	2,503	72	2,503	Bearpaw formation	Hard, clear, "alkaline" iron		D, S	Sufficient for 100 head stock.
13	NW.	32	"	"	"	Drilled	114	2,645	- 86	2,559	86	2,559	Bearpaw sandy clay	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
14	NW.	32	"	"	"	Drilled	160	2,675	-148	2,527	148	2,527	Bearpaw formation	Hard, clear, "alkaline" iron		D, S	Sufficient for 20 head stock. #
15	SE.	32	"	"	"	Bored	126	2,615	-120	2,495	120	2,495	Bearpaw shale	Hard, clear, "alkaline" iron		D, S	Intermittent supply.
16	SE.	34	"	"	"	Drilled	120	2,615			100	2,515	Bearpaw shale	Soft			

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WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
17	SW.	35	16	13	3	Drilled	135	2,500	-100	2,400	132	2,368	Bearpaw shale	Hard, clear, "alkaline" iron		D, S	Oversufficient for 16 head stock.
18	SW.	36	"	"	"	Drilled	130	2,425	- 98	2,327	130	2,295	Bearpaw sand	Hard, clear, soda, iron		D, S	Sufficient for 20 head stock.
1	NW.	2	16	14	3	Drilled	66	2,522	- 20	2,502	66	2,456	Glacial sand	Hard, clear		D, S, I	Oversufficient for local needs.
2	NW.	4	"	"	"	Drilled	80	2,660					Bearpaw formation	Hard, iron, "alkaline" brown		S	Insufficient for local needs.
3	SE.	5	"	"	"	Drilled	195	2,714					Bearpaw formation	Soft, clear		D, S	Oversufficient for local needs; also a 165-foot well; poor supply.
4	SE.	6	"	"	"	Drilled	160	2,700	-152	2,548	160	2,540	Bearpaw sand	Hard, cloudy, "alkaline"		D, S	Sufficient for local needs.
5	NE.	7	"	"	"	Drilled	200	2,563	- 45	2,518	55	2,508	Glacial drift	Hard, cloudy, sulphur		S	Sufficient for 10 head stock; 20-foot well for domestic use. #
6	NE.	8	"	"	"	Dug	25	2,506	- 15	2,491	15	2,491	Glacial drift	Hard, clear		D, S	Insufficient for local needs.
7	SE.	11	"	"	"	Spring		2,514					Glacial drift	Hard, iron			
8	NW.	13	"	"	"	Bored	90	2,626	- 40	2,586	90	2,536	Bearpaw formation	Hard, clear, "alkaline" iron		S	Sufficient for 20 head stock.
9	NW.	14	"	"	"		36	2,626					Glacial drift	Soft		D	Probably only seepage.
10	NW.	14	"	"	"	Drilled	140	2,620			140	2,480	Bearpaw formation	Hard, clear, "alkaline" iron		S	Oversufficient for local needs.
11	SE.	15	"	"	"	Spring		2,482					Glacial drift				Large supply.
12	NW.	16	"	"	"	Dug	34	2,496	- 26	2,470	26	2,470	Bearpaw formation	Hard, clear, "alkaline"		S	Sufficient for 60 head stock.
13	SW.	16	"	"	"		11	2,468					Glacial sand	Hard			Good supply.
14	SE.	18	"	"	"	Bored	14	2,472	- 7	2,465	7	2,465	Alluvial sand	Hard, clear, "alkaline"		S	Insufficient for local needs.
15	SW.	18	"	"	"	Dug	7	2,400	- 4	2,396			Glacial drift				This was formerly a spring; also a 22-foot well, good supply.
16	NW.	20	"	"	"	Dug	20	2,413	- 12	2,401	12	2,401	Glacial sand	Hard, clear		S	Sufficient for only 20 head stock; also a well for domestic needs.
17	SW.	22	"	"	"	Drilled	110	2,590	-100	2,490	100	2,490	Bearpaw clay	Hard, clear, "alkaline" iron		S	Sufficient for 5 head stock.
18	SW.	23	"	"	"	Bored	116	2,620	- 99	2,521	116	2,504	Bearpaw formation	Soft, clear		D, S, I	Oversufficient for 25 head stock. #
19	NW.	25	"	"	"	Dug	28	2,538	- 12	2,526	12	2,526	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 40 head stock. #
20	NE.	26	"	"	"	Dug	30	2,498	- 14	2,484	14	2,484	Glacial sandy gravel	Hard, clear "alkaline"		D, S	Insufficient for 20 head stock.
21	SE.	27	"	"	"	Dug	28	2,566	- 25	2,541	25	2,541	Glacial gravel	Hard, clear		D, S	Sufficient for 80 head stock.
22	NE.	33	"	"	"	Dug	14	2,438	- 7	2,431	7	2,431	Glacial sandy clay	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.

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

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

WELL RECORDS—Rural Municipality of SWIFT CURRENT NO.137, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
23	SW.	36	16	14	3	Spring		2,534					Glacial drift				Continuous flow.
1	SE.	2	16	15	3	Drilled	375	2,473	-265	2,208	375	2,098	Bearpaw sand	Soft, clear		S	Sufficient for local needs; also a 12-foot well for domestic use. #
2	NE.	2	"	"	"	Drilled	380	2,500					Bearpaw formation	Soft, clear			Also a bored well on this quarter.
3	SW.	3	"	"	"	Dug	30	2,438	- 20	2,818	20	2,818	Glacial clay	Hard, clear, "alkaline"		S	Sufficient for only 10 head stock.
4	SW.	7	"	"	"	Drilled	50	2,440			50	2,390	Glacial sand	Hard, clear, "alkaline"		D	Sufficient only for domestic needs; also an 80-foot well plugged with sand and a 35-foot well.
5	NE.	9	"	"	"	Dug	12	2,400	- 8	2,392	8	2,392	Glacial gravel	Hard, clear "alkaline"		D, S	Sufficient for 10 head stock.
6	SE.	16	"	"	"	Dug	22	2,400	- 18	2,382	18	2,382	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
7	SW.	16	"	"	"		45	2,400					Glacial drift			D	Sufficient only for domestic needs.
8	SW.	20	"	"	"	Drilled	250	2,410	-225	2,185	250	2,160	Bearpaw sand	Hard, clear, salty, sediment		N	Large supply, but not usable.
9	SW.	20	"	"	"	Bored	55	2,410	- 25	2,385	55	2,355	Glacial drift	Hard, clear, iron, salty		D, S	Sufficient for 20 head stock. #
10	NW.	21	"	"	"	Dug	45	2,422	- 40	2,382	40	2,382	Glacial sand	Hard, clear		D, S	Sufficient for 40 head stock.
11	NW.	22	"	"	"	Dug	16	2,386	- 10	2,376	10	2,376	Glacial sand	Soft, clear	44	D, S	Sufficient for 45 head stock; also a 22-foot well with small supply. #
12	NE.	23	"	"	"	Dug	23	2,442	- 20	2,422	20	2,422	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 22 head stock. #
13	NW.	25	"	"	"	Sand-point	45	2,400					Glacial sand	Hard, "alkaline"		N	Good supply, but farm vacant.
14	SE.	26	"	"	"	Sand-point	45	2,400					Glacial sand	Hard, "alkaline"		N	Good supply, but farm vacant.
15	SE.	27	"	"	"	Dug	40	2,406					Glacial clay	Hard, clear		D, S	Insufficient for 30 head stock; also a 16-foot well not usable.
16	SW.	28	"	"	"		42	2,400					Glacial drift	Hard, clear			Sufficient for local needs.
17	NE.	28	"	"	"	Dug	28	2,400					Glacial sand				Small supply.
18	NE.	31	"	"	"	Dug	40	2,442	- 36	2,406	36	2,406	Glacial sand	Hard, clear		D, S	Sufficient for 10 head stock.
19	SE.	33	"	"	"	Dug	33	2,434	- 28	2,406	28	2,406	Glacial drift	Hard, clear		D, S	Sufficient for 30 head stock.
20	NE.	34	"	"	"	Dug	42	2,432	- 36	2,396	36	2,396	Glacial sand	Hard, clear		D, S	Sufficient for 12 head stock; also a 14-foot seepage well.
21	NE.	36	"	"	"	Dug	30	2,425	- 10	2,415	30	2,395	Glacial drift	Hard, clear		D, S	Sufficient for 28 head stock.

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

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(#) Sample taken for analysis.