CANADA
DEPARTMENT OF MINES

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BUREAU OF ECONOMIC GEOLOGY
GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF INDIAN HEAD No. 156 SASKATCHEWAN

BY

B. R. MacKay, H. N. Hainstock & G. L. Scott

Water Supply Paper No. 93

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INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Bearpaw Formation. The Bearpaw consists mostly of incoherent dark grey to dark brownish grey, partly bentonitic shales, weathering light grey, or, in places where much iron is present, buff. Beds of sand occur in places in the lower part of the formation. It forms the uppermost bedrock formation over much of western and southwestern Saskatchewan and has a maximum thickness of 700 feet or somewhat more.

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Indian Head is an area of approximately 295 square miles in southeastern Saskatchewan. It consists of six full townships described as townships 17 and 18, in ranges 11, 12, and 13; two fractional townships described as townships 19A, range 12, and township 19, range 13; and the parts of fractional township 19A, range 11, and township 19, ranges 11 and 12, that lie to the southwest of Qu'Appelle river. All of the townships are west of the Second meridian. The main line of the Canadian Pacific railway traverses the central part of the municipality and on it are located the towns of Indian Head and Sintaluta. The centre of the municipality is approximately 45 miles east of the city of Regina. The Assiniboine Indian reserve, No. 76, comprising an area of 63 square miles, is located directly south of townships 17, ranges 11 and 12. The municipality contains the Dominion Experimental Farm, located in sec. 19, tp. 18, range 12, and the Forest Nursery Station and Bird Sanctuary, located in sec. 11, tp. 18, range 13.

The municipality is drained by Qu'Appelle river, which forms the northeastern boundary of the municipality, and by Redfox and Indianhead creeks, which flow in a northerly direction through the central part of the area. The valley of Qu'Appelle river is from 1 to 2 miles wide and approximately 300 feet deep. For the greater part of their length the valleys of the two small creeks are fairly wide and shallow, but within 6 miles of the river they are quite wide and at least 175 feet deep. The flow of the streams through these gorge-like valleys becomes more continuous since they are fed by numerous springs. Many other shorter but equally deep ravines are tributary to Qu'Appelle river, and they all contain small rivulets of water. The slopes of these valleys are thickly wooded with scrub poplar. Two permanent bodies of water, Deep lake, located in township 17, range 13, and a small part of Katepwe lake, in township 19, range 12, occur within the municipality.

There is a wide, deep, pre-glacial river channel that roughly parallels Qu'Appelle river. It became filled with glacial debris during the glacial period and the present channel of Qu'Appelle river has been cut into this glacial debris. This pre-glacial valley is at least 360 feet in depth, as wells drilled to that depth are in glacial drift.

Recent deposits of sand and silt occur along the flood plains of Qu'Appelle river and its larger tributaries. The northern part of the municipality, in the vicinity of Qu'Appelle river, is a flat, treeless plain and marks the site of an old glacial lake basin. This area is covered by glacial lake clays and the topsoil is a heavy gumbo clay. The general elevation of this area is slightly under 1,900 feet above sea-level. The central and eastern parts of the area are mantled by boulder clay or glacial till. The area is undulating and its elevation increases towards the east and south. The southeastern corner, and the western portion of the municipality, and a small area in township 17, range 12, and practically all of the Assiniboine Indian Reserve, are mantled by part of a moraine. The maximum elevation of 2,260 feet is attained in the southeastern corner. The ground surface of these moraine covered areas is very undulating and undrained depressions are common. It is thickly bushed with poplar.

Water-bearing Horizons in the Unconsolidated Deposits

In general, a fairly abundant supply of water can be obtained in certain areas in this municipality, but the water often is so highly mineralized that it cannot be used for drinking. The fairly abundant supply of water is attributed to the fact that the drift is exceptionally thick and contains many deposits of sand and gravel that are water-bearing, as is shown by the presence of numerous springs in the ravines and coulées in the northern part of the municipality.

In the flat area that is mantled by glacial lake clays it is very difficult to obtain water on the plain, but farmers are able to secure an adequate supply from springs or shallow wells dug in the floors of the many ravines. Small dams are also used in this area. The wells and springs, however, are often located at an inconvenient distance from the farm buildings.

With the exception of this flat plain area the majority of the farmers residing in the remainder of the municipality derive a supply of water from dug or bored wells, 20 to 75 feet deep. An area has been outlined by the "A" boundary line on Figure 1 of the accompanying map, in which an abundant supply of mineralized water is being obtained at depths of less than 50 feet below the surface. Thick and extensive beds of sand and gravel occur at shallow depths in the glacial drift in this area and the slope of these aquifers corresponds roughly with the slope of the ground surface. The water is under fairly high hydrostatic pressure and, in general, is not so highly mineralized as it is in wells in the western and northern parts of the municipality. It is used for drinking as well as for stock.

In the areas, outside of the areas bounded by the "A" line, that are mantled by glacial till and glacial moraine, the sand and gravel deposits appear to occur as large pockets rather than in extensive layers, at depths ranging from 20 to 75 feet below the surface. This is particularly the case in township 17, range 13, and township 18, range 13, As a result of the pocket arrangement of the sand and gravel deposits, many dry holes are dug in certain localities before an adequate supply of water is obtained. The water when obtained is usually highly mineralized, the laxative effect of which renders it unfit for drinking and undesirable for stock. Many farmers in this area tank drinking water, the usual source being the spring water in Indian Head. Water from springs and shallow wells in the floors of coulées and ravines is generally not so highly mineralized as that from the wells on the uplands.

A large number of wells in the western and southern parts of the municipality obtain abundant supplies of hard, "alkaline" water that contains a considerable amount of iron at depths ranging from 100 to 300 feet below the surface. The elevations of the sand beds encountered indicates that there are possibly two aquifers at elevations of 1,715 to 1,790 feet, and from 1,823 to 1,890 feet. The water from these horizons is under hydrostatic pressure and rises a considerable distance above the top of the aquifer. In three wells located on the NE.¼, sec. 32, tp. 17, range 13, the SE.¼, sec. 12, tp. 18, range 12; and the NE.¼, sec. 5, tp. 18, range 13, the water flows over the top of the wells. The water is satisfactory for stock but may be too highly mineralized for drinking. These horizons do not occur in the area that is overlain by glacial lake clays, but it is believed that if wells were drilled to depths of 250 to 300 feet in this lake basin they would encounter water.

The drought of 1930 to 1934 caused a shortage of surface water in sloughs and creeks, but it did not deplete the well water supply to such an extent that farmers were forced to tank water extensively for stock. There are not many dugouts in the municipality, but the general character of the greater part of the area is very favourable for their excavation. Dugouts, if excavated collect and retain an abundant supply of slightly mineralized surface water for stock use during the summer and autumn months, and the water would be decidedly more beneficial for stock than the highly mineralized well water found in the western townships of the municipality. These dugouts should be made at least 12 feet deep. Many farmers, especially in the northern townships, have constructed small dams in the ravines and coulées and they have proved highly satisfactory as a means of storing water for stock use.

The towns of Indian Head and Sintaluta have sufficient supplies of water to meet the present requirements. Wells bored approximately 50 feet deep provide the town of Sintaluta with an abundance of hard, slightly "alkaline" water. Indian Head, the Forestry Station, Experimental Farm, and many farmers, obtain water from two springs located on the NW.$\frac{1}{4}$, sec. 20, tp. 17, range 13, and this slightly mineralized water is conveyed into the town by a gravity pipe line.

Water-bearing Horizons in the Bedrock

No well in the municipality has been drilled through the glacial drift to the underlying bedrock (Marine Shale). Consequently the exact elevation of the surface of the shale is unknown. There are no outcrops of shale on the slopes of Qu'Appelle valley, the floor of which is at an approximate elevation of 1,575 feet above sea-level. Wells drilled in areas to the west of the municipality and to the south of Regina, encounter the bedrock at an approximate elevation of 1,600 feet and probably the elevation of the bedrock is not greater than 1,600 feet above sea-level in this municipality. The Government well drilled in the village of Estlin, south of Regina, struck the shale at an elevation of 1,641 feet above sea-level. No water was obtained in the shale in this well, but very salty water was found in sandstone at a depth of 1,023 feet below the surface. If water is found in the shale it will probably be so highly mineralized that it cannot be used for any farm purpose. However, it is unlikely that a well in this municipality will need to be drilled into the bedrock before water is located. Should the shale be struck while searching for water for farm use, further drilling in that particular hole should be discontinued.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 17, Range 11

The greater part of the southern half of the township is mantled by part of a moraine, whereas the northern half is largely covered with glacial till. The elevation of the ground surface decreases gradually from approximately 2,260 feet at the southern border to an approximate elevation of 1,970 at the northern border. The surface of the moraine-covered area is quite rolling and rough and is broken by many long, shallow coulées and numerous, large, shallow, undrained depressions or sloughs. Northwards towards the town of Sintaluta the ground surface becomes less undulating and in places it is fairly flat. The moraine-covered area is thickly wooded with poplar.

The thickness of the glacial drift is not definitely known and since the deepest well in the township is only 80 feet deep, little information can be given as to the type of material that constitutes the glacial drift. It is believed that the maximum thickness of the drift mantle in this township is in excess of 400 feet. The greater part of the glacial drift is probably composed of blue clay.

A few shallow wells have been dug in the floors of coulées or in the vicinity of sloughs, but the supply of water obtained from them is dependant upon the amount of precipitation and is affected by drought. The majority of the wells in this township have been dug or bored to depths ranging from 15 to 60 feet below the surface. The upper 60 feet of the drift in this township is usually composed of 15 to 30 feet yellow clay, 5 to 30 feet blue clay, and a layer of gravel. In some areas a layer of sand occurs between the yellow and blue clays. This sand bed is the aquifer in a number of shallow wells 10 to 20 feet deep. Some of these wells, especially in the southern part of the township, yield water that is under hydrostatic pressure. In two wells located on the SW.$\frac{1}{4}$, section 1, and the

NE.$\frac{1}{4}$, section 6, the water overflows at the surface. In the former well the water barely overflows the casing, but in the latter well the water has been known to rise to a height of 16 feet above the surface. This well yields water at the rate of 260 barrels a day. The water from these wells, although fairly highly mineralized, is being used for both domestic and stock purposes.

The 25- to 60-foot wells that tap the gravel aquifer overlain by blue clay yield an abundant supply of hard, highly mineralized water. The hydrostatic pressure is sufficient to cause the water to rise 10 to 30 feet above the top of the aquifer. The drought of 1930-1934 had little effect on any of these wells. The water usually has a laxative effect upon humans, but it is being used for drinking when water of better quality cannot be obtained. A few farmers are forced to haul drinking water. No deep wells have been drilled in this township, but it is possible that abundant supplies of mineralized water could be obtained by drilling to depths exceeding 100 feet.

The town of Sintaluta obtains its water supply from several 50-foot wells. The water is abundant in quantity, and although the water is slightly "alkaline" it is usable for drinking.

With the exception of the NW.$\frac{1}{4}$, section 18, where sixteen holes were drilled to a maximum depth of 80 feet without encountering water, little trouble should be experienced in obtaining adequate supplies of water throughout this township within 60 feet of the surface. Springs are of frequent occurrence in the coulées and are being used extensively for drinking as well as for stock. The coulées and ravines provide suitable locations for the construction of small dams and supplies of water for stock can be retained by this method.

Township 17, Range 12

The elevation of the ground surface in this township decreases gradually in a northwesterly direction from 2,230 feet at the southeastern corner to an elevation of 1,990 at the northwestern corner. Redfox creek, an intermittent tributary of Qu'Appelle river, flows in a northeast to north direction through the township. In the southern part of the township the valley of Redfox creek is approximately $\frac{1}{2}$ mile wide and approximately 100 to 125 feet deep, but it gradually becomes shallower towards the northern part of the township. An area to the southeast of the valley is mantled by part of a moraine and the ground surface is rough and broken by small ravines. A moraine also occurs in the vicinity of sections 17 and 20. The remainder of the township is mantled by glacial till and the ground surface is less undulating than it is in the moraine-covered areas. The township is quite thickly wooded with small poplar, and sloughs are of common occurrence.

The glacial drift is very thick and although several wells have been drilled to approximately 200 feet below the surface no indication of the underlying bedrock was found. The surface of the bedrock is believed to lie at an approximate elevation of 1,600 feet or less above sea-level.

The ground water supply in this township is adequate for local needs, although water is not as readily obtained as it is in township 17, range 11. Yellow boulder clay 5 to 20 feet thick occurs beneath the top soil and is usually underlain by a bed of sand or gravel. Blue boulder clay underlies the yellow clay and the sand bed and may extend to the bedrock.

The wells that tap the sand layer that underlies the yellow clay at depths of 10 to 20 feet yield fairly abundant supplies of water which in a few places is under hydrostatic pressure. The water is hard and mineralized and shallow wells in the SE.$\frac{1}{4}$, section 1, NE.$\frac{1}{4}$, section 7, and the SE.$\frac{1}{4}$, section 18, yield water that is so highly mineralized that it cannot be used even for stock. Many shallow wells have also been dug in the floors of coulées, on Redfox creek, and obtain abundant supplies of water from gravel deposits. Springs are common along the ravines and the water from them is of better quality than that from the shallow dug wells.

Two general water-bearing horizons have been located in the blue clay. Bored wells usually tap an aquifer at depths ranging from 70 to 110 feet, or at an elevation of approximately 1,960 feet, depending upon the elevation of the ground surface. The water from this horizon rises to a point 20 to 40 feet below the surface. Drilled wells encounter the second aquifer at depths ranging from 180 to 200 feet, or at an approximate elevation of 1,850 feet. This sand aquifer is usually overlain by a 3-foot layer of hardpan, and when this layer is pierced the water rushes up, and rises to a point 20 to 40 feet below the surface. The water is abundant in quantity and the supply was not noticeably affected by the drought. It is hard and "alkaline" and is used for drinking only when water of better quality is not obtainable. No wells were drilled to greater depths than 200 feet, but it is quite possible that other water-bearing horizons exist in the drift below this level.

It appears to be more difficult to obtain a permanent supply of water in the western part of the township than in the remaining sections. It is believed, however, that drilling operations will meet with success anywhere in the township. The supply of water has not been unduly short during the past five years, although good drinking water is scarce.

Township 17, Range 13

Deep lake, a permanent body of surface water covering approximately 1,000 acres, is situated in the southeastern corner of the township. The depth of the lake varies from 8 feet to 14 feet and much of the water originates from springs. At the northern end of the lake a small intermittent stream, Indianhead creek, passes northwatd through sections 24, 25, and 36, and carries the overflow from Deep lake to Qu'Appelle river through a wide, gently sloping ravine.

The eastern part of the township is mantled with glacial till and is of lower elevation than the western part that is covered by a portion of a moraine. The ground surface of the moraine-covered district is more uneven and hilly than that of the glacial till-covered area, being particularly rough and hilly in sections 19, 20, 29, and 30. The moraine-covered area is thickly wooded with poplar, especially in the southwestern and northwestern corners of the township. Undrained depressions are of common occurrence. The glacial drift in this township is very thick, and several wells have been drilled to an approximate depth of 300 feet without encountering any material that resembles the Marine Shale bedrock that probably immediately underlies the drift. It is possible that the glacial drift is 500 feet thick.

There appears to be only two dependable water-bearing horizons in the upper 300 feet of the glacial drift in this township. The uppermost water-bearing horizon consists of sand and less often gravel that lies within 40 feet of the ground surface. Sandy yellow clay and in places a thin layer of blue clay overlies this sand bed. This sand does not extend in a continuous layer over the entire township, but it has been deposited in the form of large lenses. A few farmers are unable to strike it on their land. The supply of water from wells tapping these lenses depends to a large extent on the amount of rainfall and upon the thickness and extent of the sand lenses. In wells where the aquifer is overlain by the layer of impervious blue clay the supply of water is more abundant than it is in wells where only yellow clay overlies the aquifer. The water is generally hard and "alkaline", but farmers use it for drinking as well as for stock. The supply decreased during the prolonged drought of 1930 to 1934. The water in a 28-foot well in the NE.$\frac{1}{4}$, section 25, was condemned by the provincial analyst, but a 10-foot well in the NW.$\frac{1}{4}$, section 22, yields a good supply of very soft water. Before digging a well in this township farmers are advised to use testing augers in order to determine the quantity and quality of the water from the first water-bearing horizon before the well is dug. Tests need not exceed a depth of 40 feet below the surface. Fairly abundant quantities of water can usually be located in the sand lenses that constitute the first water-bearing horizon in this township.

The second water-bearing horizon is composed of a bed of fairly fine sand located approximately 300 feet below the surface. Three drilled wells in the NE.$\frac{1}{4}$, section 12, NW.$\frac{1}{4}$, section 13, and the NE.$\frac{1}{4}$, section 32, have tapped this aquifer. The water is under great pressure and rose to a point 90 feet below the surface in the first well, 10 feet below the surface in the second well, and 10 feet above the surface in the third well. The supply was little affected by drought conditons, but the quality of the water in the three wells is quite variable. The water from the flowing artesian well is hard, "alkaline", and contains a large amount of iron. It has a laxative effect upon humans, but is satisfactory for stock. The water from the well on the NW.$\frac{1}{4}$, section 13, is described as being soft and tastes of "soda". The water from the third well is hard, contains iron, but is not so highly mineralized as the water from the flowing artesian well. A farmer in the SE.$\frac{1}{4}$, section 4, has drilled four dry holes 175 feet, 220 feet, 275 feet, and 299 feet deep.

Small layers of sand exist between the first and second water-bearing horizons, but the supply of water from them is small and is very highly mineralized. Farmers are advised to either prospect the upper 40 feet of the glacial drift or drill to a depth of at least 300 feet to secure a permanent supply of water. The boring method of securing water is not advised in this township.

Springs are very numerous in the vicinity of Deep lake andlin the hilly country in the northwestern part of the township. The water in Deep lake is hard and slightly "alkaline", but it is suitable for stock use. Two springs located in the NW.$\frac{1}{4}$, section 20, yield an abundant supply of slightly mineralized water that is collected and delivered to the town of Indian Head by means of a gravity pipe line. This pipe line is $7\frac{1}{2}$ or 8 miles long and has a gradient of approximately 20 feet to the mile.

Water is more difficult to locate in this township than it is in township 17, ranges 11 and 12, since the sand and gravel deposits that form the uppermost water-bearing horizon are in the form of pockets. Nevertheless a fair supply of water can usually be located without much difficulty at shallow depths. The use of dugouts for the collecting and storing of water for stock use will greatly alleviate the water shortage on farms where the supply from wells is insufficient for local requirements. These dugouts are most convenient for watering stock, and the water from them is not as highly mineralized as that from the wells and is more beneficial for the stock. To be satisfactory the dugout should be made at least 12 feet deep and the location should be such that a maximum amount of run-off water will be collected in the spring. There are numerous good locations for dugouts in this township.

Township 18, Range 11

Qu'Appelle river flows through the northeastern corner of the township and the floor of its valley is at an approximate elevation of 1,560 feet or 325 feet below the plain level. The northeastern quarter of the township is dissected by short, wide, tributary ravines, 50 to 175 feet deep, that contain small rivulets of water. The flood-plain of Qu'Appelle river is covered by Recent deposits of sand and silt. The northwestern part of the township is a flat plain and is mantled by glacial lake clays, whereas the remainder of the township is slightly undulating and is covered by glacial till. Small, narrow gullies that lead into the deep ravines in the northeastern part of the township break the slightly undulating ground surface of the till-covered area. The slopes of the short, deep ravines are thickly wooded with poplar, and small, scattered clumps of poplar occur throughout the glacial lake clay-covered area.

The glacial deposit is very thick; a 360-foot drilled well in the NE.$\frac{1}{4}$, section 29, did not strike the bedrock. The elevation of the top of the bedrock in this locality, therefore, is less than 1,490 feet above sea-level.

All the producing wells in the township have been dug or bored to depths of less than 65 feet. Most of the wells in the till-covered area have been dug or bored to depths ranging from 25 to 50 feet below the surface and they all apparently strike the same water-bearing horizon that is composed of sand, or less often, gravel. In digging or boring a well in this area yellow clay is always struck beneath the top soil. In some places a small layer of sand underlies the yellow clay, but usually it is absent and blue clay follows the yellow clay until water is struck in the sand or gravel that lies between 25 feet and 65 feet below the surface. Shallow 10- to 15-foot wells that tap the sand beneath the yellow clay derive a poor supply of water that is easily affected by drought conditions. The deeper bored wells tapping the sand beneath the blue clay obtain a more abundant supply that is not so easily affected by drought periods and the water is generally under slight pressure. The supply of water in these deeper wells is not very abundant, but 50 head of stock can usually be watered at a single well. The water is hard and highly mineralized, and is unsuitable for drinking. In some wells the water is too "alkaline" for stock, and it is not used if surface water in sloughs and small creeks is available. Many farmers are forced to tank water for household purposes.

Farmers living in the vicinity of ravines experience no trouble in obtaining an abundant supply of usable water. Flowing springs are numerous in the ravines, and shallow wells 6 to 10 feet deep, dug at the base of the banks, yield an abundant quantity of water at all seasons of the year. Some farmers have constructed dams that retain large quantities of water for stock use.

In the lower lying lake clay-covered area in the northwestern corner of the township, small supplies of highly mineralized water are obtainable from sand and gravel beds that lie at approximately 20 to 35 feet beneath the surface. A 120-foot dry hole was bored in the SE.$\frac{1}{4}$, section 32. Water was obtained in a 360-foot well drilled in the NE.$\frac{1}{4}$, section 29, from a sand aquifer underlying blue clay, but the water was too highly mineralized to be used

Sufficient information is not available whereby the possibilities of obtaining water by deep drilling in this township can be estimated. The glacial drift is very thick and it is improbable that the blue clay extends to the bedrock without the occurrence of any water-bearing beds of sand or gravel. Deep drilled wells that strike water in the glacial drift almost always yield an abundant and permanent supply of highly mineralized water that is suitable for stock, and it can often be used for drinking.

There is no shortage of water for stock use in this township, since water can nearly always be located at depths ranging from 25 to 65 feet of the surface. The ravines offer numerous locations for the construction of small dams and some farmers have used this method of retaining a supply of slightly mineralized run-off water for stock use.

Township 18, Range 12

The elevation of the ground surface decreases gradually in a northerly direction, there being a difference of 125 feet in elevation between the southern and the northern boundaries of the township. The southern two-thirds of the township are covered with a deposit of glacial till, whereas the northern third is largely covered with glacial lake clays. The deep ravine in sections 27 and 34 has cut through the lake clays and has exposed along its banks the underlying boulder clay or glacial till. The ground surface of the glacial till-covered area in the south of the township is rolling and it gradually merges into the flat plain of the glacial lake clay-covered district. The township is drained by Redfox and Indianhead creeks.

The upper 165 feet of the glacial drift is composed largely of blue clay. The topsoil is underlain by approximately 15 to 20 feet of yellow clay which overlies a thin layer of sand. Blue clay is struck at a maximum depth of 25 feet below the surface and it may extend to bedrock. Beds of sand or gravel occur in the blue clay to a depth of 165 feet below the surface. Generally, however, there is a thick bed of water-bearing sand lying between depths of 40 and 75 feet below the surface. Many of the wells in the township have been dug or bored to this aquifer. The only localities in the township where a water-bearing aquifer is difficult to locate within 80 feet of the surface are the SW.$\frac{1}{4}$ and NE.$\frac{1}{4}$, section 6, SW.$\frac{1}{4}$, section 8, and the SW.$\frac{1}{4}$, section 31. Many dry holes have been dug and bored in these areas and the farmers have been forced to tank water to meet their stock and household requirements.

Shallow dug wells that tap the sand aquifer beneath the yellow clay do not, as a rule, yield an abundant supply of water. Most of them have been dug beside undrained depressions in order to obtain the maximum amount of seepage water. The supply of water depends entirely on the amount of rainfall. These wells have usually been dug to obtain drinking water, since the quality of the water from this horizon is better than that obtained from the deeper wells. It appears that water derived from an aquifer within the blue clay is more highly mineralized than that from an aquifer within the yellow clay. Bored wells, 45 to 75 feet deep, yield an abundant supply of highly mineralized water that is unsuitable for drinking. The water is under slight pressure and the supply was not greatly depleted by the drought of 1930 to 1934. The water from these wells can be used only for stock.

In the SE.$\frac{1}{4}$, section 12, there is a flowing artesian well that has been drilled to a sand aquifer at a depth of 113 feet below the surface. When the well was first drilled the water rose to a point 8 feet above the surface, but the pressure has gradually decreased and in 1935 the water rose to a point 1 foot above the surface. The water is hard and contains iron, which gives it a brown colour upon standing exposed to the air. It was not described as being "alkaline" and the farmer uses it for drinking as well as for stock.

A 165-foot well drilled in the SW.$\frac{1}{4}$, section 3, delivers water that contains iron and that cannot be used for drinking on account of its laxative qualities. The aquifer is a white sand, the water rises to a point 85 feet below the surface and continuous pumping does not lower this level.

Farmers who own land traversed by ravines do not experience any difficulty in obtaining an abundant supply of good water. Shallow wells dug to a depth of 15 feet in the bottom of these ravines, and springs, are generally used, since the water from them has a much lower mineral salt content than that from deeper bored or drilled wells. The ravines offer good locations for dam construction and the surface water that is retained in this manner is better for stock than the highly mineralized water from the wells.

Except in the localities mentioned, the supply of ground water in this township is good, and any water that is tanked is for household purposes and not for stock. Farmers in sections 6, 8, and 31, are advised to drill for a permanent supply of water. The glacial drift is very thick, probably in excess of 300 feet, and it is unlikely that the blue clay extends to the bedrock without the occurrence of any water-bearing bed of sand or gravel. The water obtained will probably be highly mineralized and suitable only for stock.

The Experimental Farm in section 19 derives its supply of water from the Indian Head pipe line.

Township 18, Range 13

An area comprising sections 35 and 36, and parts of sections 25, 26, 27, and 34, is mantled by a deposit of glacial lake clays. The greater part of the eastern 4 miles of the township is underlain by glacial till, and the western 2 miles is covered by part of a moraine. The ground surface of the till-covered area is slightly undulating, but that of the moraine-covered area is rough and hilly. Indianhead creek flows intermittently in a northerly direction through sections 1 and 2, and a small tributary traverses sections 4, 3, 10, 11, 14, 13, and 24. These creeks flow only for a few weeks in the spring of the year. A thick growth of poplar bush extends over the western half of the township.

Of the six southern townships of the municipality this township is the one in which it is most difficult to obtain a permanent supply of water at depths of less than 60 feet below the surface. The sand and gravel in the glacial drift has been deposited as small pockets rather than as fairly extensive layers. Many dry holes have been dug in attempts to locate these pockets and wells that have tapped them yield only small supplies of water. The extent and size of the pocket of sand or gravel have a decided bearing on the amount of water obtained in a well that has tapped it, and as a rule the wells under 50 feet deep in the township give an extremely variable supply of water. For example, two farmers in section 6, derive very small quantities of water from 30- and 32-foot wells and it is necessary for them to tank water for their stock, whereas in the NW.$\frac{1}{4}$, section 7, a 45-foot well yields an abundant permanent supply of water that is under pressure and rises to a point 15 feet below the surface. In section 3, a farmer dug a dry hole 60 feet deep and 25 feet away another well dug to a depth of 48 feet yielded an abundant supply of water under pressure. These instances are typical of the water conditions at depths of less than 50 feet in this township. Wells bored to depths ranging from 50 feet to 140 feet do not always meet with success. Wells 70 to 80 feet deep in sections 9, 17, 21, and 31, derive an abundant supply of water under pressure and their supply was not affected by the drought years, but many dry holes have been bored to depths of

90 to 125 feet below the surface in sections 13 and 15. The water, when obtained from wells less than 150 feet deep, is hard and very highly mineralized, and it is unfit for drinking and much of it unsuitable for stock. The use of the water from a 50-foot well in the SW.¼, section 17, had to be discontinued because the stock were failing badly. Horses especially do not thrive on the water from dug and bored wells in this township. Where possible, farmers have constructed dams or excavated small dugouts in order to conserve surface water for stock use. A few farmers living near the Indian Head pipe line tank water from stand pipes on the line. Springs are not numerous in the shallow ravines and good drinking water is very scarce. Many farmers tank their household water from Indian Head.

Deep drilled wells have met with success in this township. There is a general water-bearing horizon composed of sand and overlain by a layer of hardpan, at depths of 275 to 300 feet below the surface. Wells tapping this aquifer are located in the NE.¼, section 5, NE.¼, section 7, NE.¼, section 20, NE.¼, section 26, and the SE.¼, section 32. The water is under considerable pressure; the lowest pressure is in the 276-foot well in section 20, where the water rises to a point 140 feet below the surface, and the highest pressure is in the 300-foot well on section 5, where the water rises to a point 6 feet above the ground surface.

The water, although mineralized, is of better quality than that from the shallower bored wells. The water from all the wells, with the exception of that from the 290-foot well in section 26, is being used for drinking. The latter water is described as being hard, contains iron, and is slightly "alkaline". The location of these wells at widely separated points in the township and the fact that their depths and types of water are practically identical, leads to the belief that the water-bearing sand extends over the entire township, so that it is advisable, where finances permit, to drill to it. Boring operations are not advised and before a well is dug tests should be made with an auger to determine the quantity and quality of the water that will eventually be obtained after the well is made.

The Forestry Nursery Station, located in section 11, derives its water supply from the Indian Head pipe line.

Township 19A, Range 11

This fractional township consists of twelve sections, of which only sections 1 to 6 inclusive are each 640 acres in area. Qu'Appelle river runs through sections 9, 10, 3, 2, and 1 and forms the northeastern boundary of this municipality and, therefore, only sections 4, 5, 6, 7, and 8, and parts of sections 2, 3, 9, and 10 are discussed in this report.

The flat plain in the southern part of sections 4, 5, 6, and 7 is mantled by glacial lake clay. From this plain, at an elevation of approximately 1,800 feet, Qu'Appelle valley drops rapidly, its valley floor being at an elevation of 1,560 feet. Short, deep, tributary ravines break the flat plain topography at the northern part of the township. The slopes of Qu'Appelle valley and the ravines are covered by glacial till and the floors are mantled with a deposit of recent alluvium.

Only three wells were examined by the field party in this township. Two of these wells have been dug in coulées and both yield a good supply of hard water that is suitable for drinking. The well in the NW.$\frac{1}{4}$, section 5, has been dug to a fine sand aquifer and the farmer experiences difficulty with the sand washing in and shutting off the supply. This farmer also uses a dam built across a ravine as a source of water for stock.

The third well located on the SE.$\frac{1}{4}$, section 6, has been bored to a depth of 60 feet below the surface. A fairly abundant supply of water was obtained from a gravel aquifer, but the water has a purgative effect and cannot be used. This farmer tanks water for all purposes from a neighbour's well.

Township 19A, Range 12

This fractional township consists of about 9 square miles only. Two streams, Redfox and Indianhead creeks, flow northwards towards Qu'Appelle river. The valley containing Redfox creek is approximately 100 feet deep and it cuts through sections 2 and 11. The valley of Indianhead creek is approximately 60 feet dep and cuts across sections 4 and 9. Glacial till outcrops on the slopes of these two valleys, the floors of which are mantled with recent alluvium. The remainder of the township is a flat plain and is covered by glacial lake clay.

All the wells in the township have been dug or bored in the valleys of the two creeks or in smaller coulées tributary to these valleys. With the exception of a 10-foot well in the SW.$\frac{1}{4}$, section 1, all these shallow wells have struck a sand or gravel aquifer that yields a sufficient supply of water for local needs. The water in some of the wells is under a slight pressure and the quantity of water in any of these wells, except the well in section 1, was not noticeably affected by the drought of 1931 to 1934. The water is hard and is being used for drinking as well as for stock. Springs are numerous in the two valleys, especially in that of Redfox creek.

Township 19, Range 11

Since Qu'Appelle river forms the northeastern boundary of this municipality only section 6 and parts of sections 4, 5, 7, and 8 of this township are included in the municipality of Indian Head, and are discussed in this report. These sections are deeply dissected by Qu'Appelle river and its tributary ravines. The two wells examined are both located in the floor of Qu'Appelle valley. They have been dug 15 feet deep in the Recent deposits of sand and gravel. An abundant supply of hard, slightly mineralized water, which is suitable for drinking, is obtained from both wells. The river is also used by the farmers for watering stock.

Township 19, Range 12

The flat, plain topography of this township is broken by four, large, deep ravines, and their many smaller tributary coulées, which run into Qu'Appelle valley. The two largest ravines are located in the eastern and central parts of the township, and contain Redfox and Indianhead creeks. A small portion of Katepwe lake is located in parts of sections 28, 29, 32, and 33. This lake is a permanent body of water and is one of a chain of lakes in Qu'Appelle valley.

Recent deposits of sands and silts form the flood-plains of Qu'Appelle river and its larger tributary streams. The remainder of the area is mantled by glacial lake clays and where the streams have cut through this mantle, boulder clay or till is exposed. The slopes and floors of the ravines are thickly wooded with poplar, but the plain and the flood-plain of Qu'Appelle river are devoid of tree growth.

Almost all the producing wells in the township have been dug to depths of less than 40 feet, and the majority of them are located on the slopes or floors of the ravines and derive an abundant supply of drinkable water from water-bearing sands and gravels. The quantity of water from these wells was slightly depleted during the drought period. Five wells have been dug in the Recent alluvium that occurs in Qu'Appelle valley and they encounter a fairly abundant supply of hard, mineralized water in sand or gravel at depths of 15 feet or less. The alluvium is approximately 40 feet thick and overlies the blue boulder clay. Dams have been constructed in some of the ravines and supplies of water are thus stored for stock use.

It is very difficult to obtain a permanent supply of water in the flat area that is overlain by glacial lake clays. Dry holes have been bored and drilled to depths of 80, 100, 125, and 200 feet, in sections 32, 21, 7, and 2, respectively. The only sand beds encountered in these holes were within the upper 60 feet of the drift, but the supply of water from them was negligible and highly mineralized.

As the glacial drift is very thick in this area, it is possible that water may be obtained at depths in excess of 300 feet, but any that is obtained probably will be highly mineralized. Dugouts and dams can be used to advantage throughout this township.

Township 19, Range 13

The eastern half of the township is a very flat, treeless plain and is mantled by glacial lake clays. To the west of this flat plain an area approximately 2 miles in width is covered by glacial till. The ground surface of this area is slightly undulating. The southwestern portion of the township is mantled by part of a moraine, the ground surface is quite rough, and knolls and undrained depressions are common. A thick growth of poplar trees occurs throughout the till and moraine-covered areas.

A long, shallow ravine passes through sections 15, 22, 23, 24, and 25, becoming deeper towards the east. A shorter ravine occurs in sections 13 and 24, and these two ravines drain run-off water into Qu'Appelle river.

The glacial drift is very thick and probably exceeds 400 feet in thickness in the western part of the township. The deepest well in the township, located in the SW.$\frac{1}{4}$, section 2, encountered a bed of gravel of glacial origin at a depth of 204 feet. The upper 200 feet of glacial covering consists of 10 to 20 feet of yellow clay, an occasional small sand layer, and blue clay. Beds of sand or gravel may occur at any depth within the blue clay. Similar sand and gravel deposits will doubtless be found in the lower part of the drift. The small sand layer that in places separates the yellow and blue clays is very rarely found in the area that is mantled with glacial lake clays. Since the deposits of sand or gravel are of infrequent occurrence in the upper 40 feet of the glacial deposit, shallow dug wells do not produce a permanent supply of water. The only exception is in the floors of the two ravines in the eastern part of the township, where shallow dug wells tap sand or gravel that yields an abundant supply of very hard, mineralized water that is usable for drinking.

The majority of the wells on the plain have been bored or drilled to depths ranging from 60 to 204 feet below the surface. Abundant quantities of water are obtained from these wells and they are not readily affected by prolonged drought periods. The water is under hydrostatic pressure and usually rises to a point half way up the well. Many of these wells have never been pumped dry. The water from the 60- to 100-foot wells is hard and so highly mineralized that it cannot be used for drinking. It is not very suitable for stock, in many cases, but it is being used as water of better quality is not obtainable. The deeper 100- to 204-foot wells yield hard water that is usually not so highly mineralized as the water from the shallower bored wells. It is being used for drinking, although it has a slight laxative effect upon those not accustomed to its use. No deep, dry holes were recorded in this township, and the possibilities of striking a permanent supply of mineralized water by drilling methods are good, especially in the western half of the township.

A well in the NE.$\frac{1}{4}$, section 17, encountered a material, locally termed "sea-mud", at approximately 75 feet below the surface. The aquifer in this well is a 10-foot bed of gravel underlying the "sea-mud" and an abundant supply of hard water, containing iron, is derived from the gravel. An oily scum forms on the surface of the water and this scum probably comes from the "sea-mud" which is apparently an interglacial carbonaceous deposit that was laid down in a swamp during an interglacial period.

Suitable supplies of water for stock use can be obtained throughout the greater part of this township, but drinking water is scarce. Many farmers use shallow seepage wells, dug beside undrained depressions, for household requirements.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL
MUNICIPALITY OF INDIAN HEAD, NO. 156, SASKATCHEWAN

Township	17	17	17	18	18	18	19A	19A	19	19	19	Total No. in Municipality
West of 2nd meridian — Range	11	12	13	11	12	13	11	12	11	12	13	
Total No. of Wells in Township	111	68	102	57	67	50	3	12	2	27	54	553
No. of Wells in bedrock	0	0	0	0	0	0	0	0	0	0	0	0
No. of wells in glacial drift	111	68	102	54	66	50	3	10	0	19	54	537
No. of wells in alluvium	0	0	0	3	1	0	0	2	2	8	0	16
Permanency of Water Supply												
No. with permanent supply	67	51	69	56	53	45	3	10	2	19	42	417
No. with intermittent supply	4	4	11	0	0	0	0	1	0	3	4	27
No. dry holes	40	13	22	1	14	5	0	1	0	5	8	109
Types of Wells												
No. of flowing artesian wells	2	0	1	0	1	1	0	0	0	0	0	5
No. of non-flowing artesian wells	32	21	14	21	20	16	2	1	0	2	18	147
No. of Non-artesian wells	37	34	55	35	32	28	1	10	2	20	28	292
Quality of Water												
No. with hard water	69	53	76	55	53	45	3	11	2	22	45	434
No. with soft water	2	2	4	1	0	0	0	0	0	0	1	10
No. with salty water	0	1	0	0	0	0	0	0	0	0	0	1
No. with "alkaline" water	29	13	29	23	17	27	1	1	1	10	19	170
Depths of Wells												
No. from 0 to 50 feet deep	95	50	85	51	43	34	2	12	2	20	33	427
No. from 51 to 100 feet deep	16	11	8	4	22	8	1	0	0	3	13	86
No. from 101 to 150 feet deep	0	2	1	1	1	3	0	0	0	3	2	13
No. from 151 to 200 feet deep	0	5	2	0	1	0	0	0	0	1	5	14
No. from 201 to 500 feet deep	0	0	6	1	0	5	0	0	0	0	1	13
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0
How the Water is Used												
No. usable for domestic purposes	57	44	65	49	38	31	2	11	2	21	32	352
No. not usable for domestic purposes	14	11	15	7	15	14	1	0	0	1	14	92
No. usable for stock	70	50	72	54	53	42	2	11	2	22	45	423
No. not usable for stock	1	5	8	2	0	3	1	0	0	0	1	21
Sufficiency of Water Supply												
No. sufficient for domestic needs	67	50	69	56	52	45	3	10	2	19	42	415
No. insufficient for domestic needs	4	5	11	0	1	0	0	1	0	3	4	29
No. sufficient for stock needs	61	45	55	44	42	29	2	10	2	14	34	338
No. insufficient for stock needs	10	10	25	12	11	16	1	1	0	8	12	106

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

The term "total dissolved mineral solids" as here used refers to the residue remaining when a sample of water is evaporated to dryness. It is generally considered that waters that have less than 1,000 parts per million of dissolved solids are suitable for ordinary uses, but in the Prairie Provinces this figure is often exceeded. Nearly all waters that contain more than 1,000 parts per million of total solids have a taste due to the dissolved mineral matter. Residents accustomed to the waters may use those that have much more than 1,000 parts per million of dissolved solids without any marked inconvenience, although most persons not used to highly mineralized water would find such waters highly objectionable.

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

Calcium and magnesium salts impart hardness to water. Hardness of water is commonly recognized by its soap-destroying powers as shown by the difficulty of obtaining lather with soap. The total hardness of a water is the hardness of the water in its original state. Total hardness is divided into "permanent hardness" and "temporary hardness". Permanent hardness is the hardness of the water remaining after the sample has been boiled and it represents the amount of mineral salts that cannot be removed by boiling. Temporary hardness is the difference between the total hardness and the permanent hardness and represents the amount of mineral salts that can be removed by boiling. Temporary hardness is due mainly to the bicarbonates of calcium and magnesium and iron, and permanent harness to the sulphates and chlorides of calcium and magnesium. The permanent hardness can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. Water that has a total hardness of 300 parts per million or more is usually classed as excessively hard. Many of the Saskatchewan water samples have a total hardness greatly in excess of 300 parts per million; when the total hardness exceeded 3,000 parts per million no exact hardness determination was made. Also no determination for temporary hardness was made on waters having a total hardness less than 50 parts per million. As the determinations of the soap hardness in some cases were made after the samples had been stored for some time, the temporary hardness of some of the waters as they come from the wells probably is higher than that given in the table of analyses.

Analyses of Water Samples from the Municipality of Indian Head, No. 156, 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		
1	NW.	20	17	13	2	Spring	260	260	130	130	5	155	20	47	62	12	233	90		54	63		18	8		x 1
2	SE.	12	18	12	2	113	2,040	1,900	1800	100	18	90	250	263	1,300	227	1,875	90	486		784		485	30		x 1
3	NE.	7	18	13	2	274	2,160	1,300	1,100	200	38	415	340	169	1,169	407	2,102	415	262		504		858	63		x 1
4	NE.	17	19	13	2	95	1,620	1,050	1,050		21	550	390	148	705	156	1,540	550	199		441		315	35		x 1

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

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

Water from the Unconsolidated Deposits

Three samples of water from wells tapping aquifers in the glacial drift, and one sample from a spring in the drift, were analysed, and the results are listed in the accompanying table.

The spring is the source of water supply for the town of Indian Head. This water has a total dissolved solid content of 260 parts per million, which is extremely low for the drift waters in Saskatchewan. It is excellent for drinking and is being successfully used for irrigation on both the Forest Nursery Station and the Dominion Experimental Farm.

The other three samples of water were derived from depths of 95, 113, and 274 feet, and have a total dissolved solid content of 1,620, 2,040, and 2,160 parts per million. The sulphate salts are the chief constituents in these waters, approximately one-half the total dissolved solid content being composed of magnesium sulphate, and sodium sulphate. These salts have a laxative effect upon the human system. The waters are being used for drinking without any apparent ill effects, but they would have a laxative effect upon persons not accustomed to their use. The water from the well shown by sample No. 4 has an oily scum formed on its surface when it is allowed to stand. This scum is probably derived from a carbonaceous interglacial deposit, locally termed "sea-mud", through which the well was drilled.

No samples of the water that is derived from depths of 40 to 75 feet were taken for analyses. These waters are highly mineralized and probably contain a greater total dissolved solid content than those analysed. The laxative producing sulphate salts of magnesium and sodium are apparently abundant, and the water is generally unfit for drinking. It is, however, suitable for stock.

Water from the Bedrock

No well in the municipality is deriving water from an aquifer in the bedrock. In places in this general region where water has been located at depth in the Marine Shale bedrock, which probably underlies the glacial drift in the municipality, the water has been found to be too highly mineralized with magnesium sulphate, sodium sulphate, and sodium chloride, to be suitable for farm requirements.

WELL RECORDS—Rural Municipality of INDIAN HEAD, NO. 156, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
1	SE.	1	17	11	2	Spring		2,200	0				Glacial drift	Hard	45	D, S	Abundant supply.
2	SW.	1	"	"	"	Dug	12	2,200	+ 1	2,201	12	2,188	Glacial gravel	Hard, iron, "alkaline"		D, S	Abundant supply; water has a slight laxative effect.
3	SW.	2	"	"	"	Dug	5	2,250	− 3	2,247	3	2,247	Glacial sand	Hard, "alkaline"	45	D, S	Poor supply; water has a laxative effect. One other similar well.
4	SE.	2	"	"	"	Bored	30	2,225	− 15	2,210			Glacial drift	Hard	45	D, S	Intermittent supply; One 20-foot well. Abundant supply but highly mineralized.
5	NW.	2	"	"	"	Dug	5	2,200	− 1	2,199	5	2,195	Glacial gravel	Hard		D, S	Abundant supply.
6	NW.	3	"	"	"	Dug	15	2,225	− 5	2,220			Glacial gravel	Hard	45	D, S	Good supply.
7	NE.	3	"	"	"	Bored	40	2,250	− 20	2,230	40	2,210	Glacial sand, gravel	Hard, iron, "alkaline"		S	Abundant supply but water produces a laxative effect.
8	SW.	4	"	"	"	Dug	22	2,250	− 10	2,240	22	2,228	Glacial gravel	Hard, "alkaline"	45	D, S	Abundant supply; laxative producing water.
9	NE.	4	"	"	"	Bored	40	2,250	− 19	2,231			Glacial gravel	Hard		D, S	Plenty of water.
10	SE.	4	"	"	"	Bored	40	2,260	− 20	2,240			Glacial gravel	Hard		D, S	Abundant supply.
11	NE.	5	"	"	"	Bored	50	2,225	− 39	2,186	50	2,175	Glacial gravel	Hard, iron	45	D, S	Good supply; rather slow seepage. 2 shallow wells in a coulee seldom used.
12	NW.	5	"	"	"	Dug	60	2,225	− 35	2,190			Glacial gravel	Hard, iron		D, S	Abundant supply.
13	NE.	6	"	"	"	Bored	36	2,235	− 16	2,219			Glacial fine sand	Hard, slightly "alkaline"		D, S	Good supply.
14	NE.	6	"	"	"	Dug	12	2,235	+ 16	2,251			Glacial sand, gravel	Hard, slightly "alkaline"		D, S	Yields 260 barrels a day.
15	SW.	6	"	"	"	Dug	40	2,235	− 25	2,210			Glacial gravel	Hard, iron		D, S	Abundant supply.
16	SE.	8	"	"	"	Bored	60	2,200	− 40	2,160	40	2,160	Glacial sand	Hard, "alkaline"	45	D, S	Good supply; water produces a laxative effect.
17	NE.	8	"	"	"	Dug	24	2,130	− 20	2,110	20	2,110	Glacial gravel	Hard, iron	45	D, S	Good supply. Also owns a dam in a coulee.
18	NE.	9	"	"	"	Dug	10	2,150	− 1	2,149			Glacial gravel	Hard	45	D, S	Abundant supply.
19	NW.	9	"	"	"	Dug	9	2,110	− 4	2,106	4	2,106	Glacial sand, gravel	Hard, iron	45	D, S	Sufficient for 30 head stock.
20	NE.	10	"	"	"	Dug	12	2,125	− 4	2,121	12	2,113	Glacial gravel	Hard	45	D, S	Good supply.
21	SE.	10	"	"	"	Dug	5	2,175	− 1	2,174	1	2,174	Glacial gravel	Hard	45	D, S	Good supply.
22	SE.	11	"	"	"	Spring		2,150	0	2,150			Glacial gravel	Hard		D, S	Abundant supply.
23	NW.	12	"	"	"	Bored	80	2,060	− 50	2,010	78	1,982	Glacial sand	Hard, "alkaline"	42	D, S	Very good supply, but laxative producing water.
24	SE.	14	"	"	"	Dug	25	2,050	− 10	2,040	25	2,025	Glacial gravel	Soft	45	D, S	Good supply.
25	SE.	14	"	"	"	Dug	22	2,050	− 2	2,048	22	2,028	Glacial sand, gravel	Hard, "alkaline"		D, S	Abundant supply.

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 INDIAN HEAD, NO. 156, 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
26	NW.	14	17	11	2	Dug	5	2,050	0	2,050			Glacial gravel	Hard, "alkaline"		D, S	Flows continually; a spring.
27	NW.	16	"	"	"	Bored	60	2,075	- 14	2,061	60	2,015	Glacial sand, gravel	Hard	45	D, S	Plenty of water.
28	NW.	18	"	"	"	Dug	26	2,100	- 18	2,082			Glacial drift	Hard	42	D, S	Intermittent supply; 16 dry holes to a maximum depth of 80 feet.
29	NE.	18	"	"	"	Bored	30	2,080	- 26	2,054	26	2,054	Glacial sand	Hard		D, S	Sufficient for at least 20 head stock.
30	NE.	20	"	"	"	Bored	30	2,030	- 24	2,006	24	2,006	Glacial sandy clay	Hard, slightly "alkaline"	45	D, S	Sufficient supply. One other well that is seldom used.
31	SW.	24	"	"	"	Bored	33	2,000	- 25	1,975	30	1,970	Glacial gravel	Hard, "alkaline"		D, S	Abundant supply.
32	NE.	25	"	"	"	Bored	70	2,000	- 35	1,965			Glacial fine sand	Hard	45	D, S	Well has never been pumped dry. 15 dry holes 10 to 20 feet deep.
33	NW.	25	"	"	"	Dug	32	2,000	- 24	1,976			Glacial fine sand	Hard, "alkaline"	45	D, S	Good supply. Many dry holes.
34	SE.	25	"	"	"	Dug	20	2,010	- 17	1,993	17	1,993	Glacial sand	Hard	45	D, S	Good supply.
35	SE.	26	"	"	"	Dug	22	1,990	- 18	1,972	18	1,972	Glacial sand	Hard, "alkaline"	45	S	Fair supply. Tanks drinking water from Sintaluta.
36	NE.	26	"	"	"	Dug	10	1,985	- 7	1,978	7	1,978	Glacial gravel	Hard, "alkaline"		D, S	Constant supply.
37	SE.	27	"	"	"	Dug	30	2,000	- 2	1,998			Glacial clay	Hard, "alkaline		S	Slough seepage well.
38	SW.	29	"	"	"	Bored	39	2,010	- 27	1,983			Glacial sand, gravel	Soft	45	D, S	Abundant supply.
39	SE.	30	"	"	"	Dug	40	2,000	- 20	1,980			Glacial sand	Hard, "alkaline"	45	D, S	Good supply. 3 springs on NE¼, section 30.
40	SW.	30	"	"	"	Spring		2,000	- 1	1,999			Glacial fine sand	Hard		D, S	Supplies 6 pails an hour.
41	NE.	33	"	"	"	Bored	30	1,987	- 20	1,967	30	1,957	Glacial sand	Hard	45	D, S	Good supply.
42	NW.	34	"	"	"	Bored	50	1,987	- 30	1,957	50	1,937	Glacial sand	Hard, slightly "alkaline"		D, S	Good supply; several similar wells in town of Sintaluta.
43	SE.	34	"	"	"	Dug	40	1,987	- 25	1,962			Glacial fine sand	Hard, "alkaline"	45	D	Seepage from a slough.
44	SW.	35	"	"	"	Bored	75	1,975	- 25	1,950			Glacial sand	Hard, slightly "alkaline"	45	D, S	Abundant supply. One other 75 foot well.
45	NE.	36	"	"	"	Bored	60	1,950	- 20	1,930			Glacial fine sand	Hard, "alkaline"	43	D, S	Abundant supply. Several dry holes.
1	SE.	1	17	12	2	Dug	32	2,220	- 12	2,208	30	2,190	Glacial gravel	Hard	45	D, S	Good supply; water from a 20 foot well killed 5 horses.
2	NE.	1	"	"	"	Dug	37	2,210					Glacial drift				Dry hole.
3	NW.	2	"	"	"	Dug	75	2,200	- 35	2,165	70	2,130	Glacial sand, gravel	Hard		D, S	Sufficient for 120 head stock.
4	NE.	3	"	"	"	Dug	22	2,175	- 19	2,156	19	2,156	Glacial sand	Hard	42	D, S	Good supply.
5	NW.	4	"	"	"	Spring		2,130	0	2,130			Glacial sand	Hard		D, S	Abundant supply,

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 INDIAN HEAD, NO. 156, 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
6	NW.	5	17	12	2	Bored	60	2,155	- 57	2,098	57	2,098	Glacial fine sand	Hard, "alkaline"		S	Insufficient supply, slow seepage. 75-foot dry hole. 18-foot well used for domestic purposes.
7	NE.	5	"	"	"	Spring		2,100	0	2,100			Glacial sand	Hard	43	D, S	Abundant supply,
8	SW.	7	"	"	"	Dug	17	2,150	- 7	2,143			Glacial gravel	Hard, slightly "alkaline"	45	D, S	Good supply.
9	NE.	7	"	"	"	Dug	18	2,150	- 15	2,135	15	2,135	Glacial fine sand	Hard	45	D, S	Fair supply. A 60-foot well yields a highly mineralized water supply.
10	SW.	9	"	"	"	Dug	16	2,020	- 9	2,011			Glacial sand	Hard	44	D, S	Abundant supply.
11	SW.	10	"	"	"	Dug	22	2,040	- 19	2,021	19	2,021	Glacial fine sand	Hard	42	D, S	Barely sufficient in 1931 and 1932. Owns three other wells. Plenty of water on farm.
12	SE.	11	"	"	"	Dug	6	2,150	0	2,150			Glacial sand, gravel	Hard, iron	43	D, S	Abundant supply.
13	NW.	12	"	"	"	Dug	21	2,150	- 16	2,134	21	2,129	Glacial sand	Soft		D, S	Abundant supply.
14	SE.	13	"	"	"	Dug	18	2,130	- 14	2,116	14	2,116	Glacial sand	Hard		D, S	Abundant supply.
15	NE.	14	"	"	"	Dug	12	2,100	- 8	2,092			Glacial sand	Hard	45	D, S	Intermittent supply. Also owns a spring with abundant supply of water.
16	SE.	14	"	"	"	Bored	48	2,050	- 18	2,032			Glacial sand, gravel	Hard, iron, slightly "alkaline"	42	D, S	Abundant supply.
17	NW.	14	"	"	"	Dug	57	2,100	- 52	2,048	52	2,048	Glacial sand	Hard, iron	42	D, S	Very good supply.
18	SE.	16	"	"	"	Drilled	159	2,150	- 84	2,066	157	1,993	Glacial sand, gravel	Hard, iron, "alkaline"		D, S	Abundant supply of laxative producing water. 5 gallons per minute.
19	NW.	18	"	"	"	Bored	50	2,075	- 45	2,030	45	2,030	Glacial sand	Hard	45	D, S	Well partially caved in. Waters stock at a dam.
20	SE.	18	"	"	"	Dug	20	2,150	- 15	2,135			Glacial drift	Hard	45	D, S	Seepage water from a dam.
21	NW.	19	"	"	"	Dug	25	2,025	- 19	1,906			Glacial drift	Hard		D	Intermittent supply. Dry holes.
22	SW.	19	"	"	"	Drilled	200	2,075					Glacail drift	Hard			Farmer tanks water. Well has been abandoned. Poor supply.
23	NW.	20	"	"	"	Dug	35	2,100					Glacial drift				Dry hole.
24	NE.	21	"	"	"	Drilled	183	2,100	- 90	2,010			Glacial fine sand	Hard	42	S	Abundant supply.
25	SE.	22	"	"	"	Dug	12	2,050	0	2,050			Glacial sand	Hard	45	D, S, I	Abundant supply.
26	NW.	22	"	"	"	Bored	94	2,050	- 84	1,966	94	1,956	Glacial coarse gravel	Hard, "alkaline"		S	Abundant supply of highly mineralized water.
27	SE.	23	"	"	"	Spring.		2,000	0	2,000			Glacial gravel	Hard, iron		D, S	Abundant supply.
28	SE.	24	"	"	"	Spring		2,050	0	2,050			Glacial sand	Hard		D, S	Abundant supply.
29	NW.	24	"	"	"	Bored	48	2,000	- 20	1,980	48	1,952	Glacial sand	Hard, iron, "alkaline"		D, S	Abundant supply.
30	NE.	25	"	"	"	Dug	13	2,000	- 4	1,996	12	1,988	Glacial gravel	Hard, iron		D, S	Intermittent supply.
31	NE.	26	"	"	"	Bored	70	2,050	- 40	2,010			Glacial sand	Hard, iron	42	D, S	Very good supply.

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 INDIAN HEAD, NO. 156, 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
32	SW.	28	17	12	2	Drilled	105	2,060	- 32	2,028			Glacial gravel	Hard			
33	NW.	29	"	"	"	Dug	35	2,040	- 25	2,015			Glacial gravel	Hard, "alkaline"	42	D, S	Sufficient for 15 head stock.
34	NW.	30	"	"	"	Dug	28	2,025	- 21	2,004			Glacial fine sand	Hard, iron	45	D, S	Very good supply.
35	SW.	30	"	"	"	Drilled	198	2,050	- 20	2,030			Glacial sand	Hard, salty, "alkaline"		D, S	Abundant supply.
36	SE.	31	"	"	"	Dug	25	2,020	- 15	2,005			Glacial fine sand	Hard, black, "alkaline"		S	Abundant supply, but water is highly mineralized.
37	NE.	31	"	"	"	Dug	30	2,000	- 25	1,975	30	1,970	Glacial sand	Hard	45	D, S	Abundant supply.
38	NE.	32	"	"	"	Drilled	185	2,025	- 30	1,995	185	1,840	Glacial fine sand	Hard, very "alkaline"		D, S	Abundant supply, but water is highly mineralized.
39	NW.	34	"	"	"	Bored	102	2,025	- 82	1,943			Glacial drift	Hard, "alkaline"		S	Constant supply.
40	SE.	34	"	"	"	Bored	80	2,040	- 70	1,970	80	1,960	Glacial sand	Hard, iron, "alkaline"	43	S	Abundant supply. Stock are also watered at a dam.
41	NE.	35	"	"	"	Dug	22	2,000	- 16	1,984			Glacial fine sand	Hard		D, S	Sufficient for 25 head stock. Another 15-foot well with a good supply.
42	NW.	35	"	"	"	Bored	80	2,000	- 40	1,960	80	1,920	Glacial sand, gravel	Hard, "alkaline"		D, S	Abundant supply of highly mineralized water.
43	SE.	36	"	"	"	Dug	7	2,000	0	2,000	7	1,993	Glacial sand, gravel	Very hard, iron		D, S	Supplies 12 barrels a day.
44	NE.	36	"	"	"	Dug	20	1,980	- 12	1,968			Glacial drift	Hard	45	D, S	Intermittent supply. Has tested to 100 feet without success.
1	NE.	1	17	13	2	Spring		2,100	0	2,100			Glacial sand	Hard		D, S	Good supply.
2	SW.	1	"	"	"	Dug	8	2,065	- 4	2,061			Glacial gravel	Hard	45	D, S	Abundant supply.
3	NE.	2	"	"	"	Dug	16	2,030	- 13	2,017			Glacial gravel	Soft		D, S	There are numerous springs in the vicinity of Deep lake.
4	SW.	2	"	"	"	Dug	10	2,125	- 8	2,117	2	2,123	Glacial gravel	Hard	45	D, S	Abundant supply.
5	SE.	4	"	"	"	Drilled	299	2,160					Glacial drift				Dry hole. 3 other dry holes 175, 220 and 275 feet deep.
6	SE.	4	"	"	"	Bored	42	2,160	- 28	2,132	40	2,120	Glacial sand	Hard, "alkaline"		D, S	Good supply.
7	NW.	5	"	"	"	Bored	57	2,170	- 47	2,123			Glacial sand	Hard, "alkaline"	45	D	Poor supply. One other 16-foot well also used. 4 intermittent wells 16-20 feet deep.
8	NE.	6	"	"	"	Dug	20	2,170	- 13	2,157	20	2,150	Glacial sand	Hard		D, S	Abundant supply; fast seepage.
9	NE.	7	"	"	"	Dug	4	2,160					Glacial sand	Hard	45	D, S	Abundant supply.
10	SE.	7	"	"	"	Dug	30	2,190	- 22	2,168			Glacial sand	Hard		D	Fair supply. Uses a dugout and a spring for stock use.
11	NW.	10	"	"	"	Dug	32	2,150	- 28	2,122	25	2,125	Glacial sand	Hard, "alkaline"	43	D, S	Poor supply. A 30-foot well with a poor supply is also used for stock.
12	SE.	10	"	"	"	Dug	35	2,150	- 30	2,120			Glacial sand	Hard		D, S	Rather poor supply.
13	SE.	12	"	"	"	Spring		2,075	0	2,075			Glacial sand, gravel	Hard	45	D, S	Plenty of water.
14	NE.	12	"	"	"	Drilled	275	2,100	- 90	2,010	275	1,825	Glacial sand	Hard, iron	42	D, S	Very good supply.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of INDIAN HEAD, NO. 156, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
15	SW.	13	17	13	2	Dug	30	2,010	- 27	1,983			Glacial fine sand	Hard, "alkaline"		N	Probably seepage from deep lake.
16	NW.	13	"	"	"	Drilled	297	2,020	- 10	2,010	295	1,725	Glacial fine sand	Soft, soda	42	D, S	Abundant supply.
17	SW.	14	"	"	"	Bored	110	2,060	- 70	1,990	110	1,950	Glacial sand	Hard, iron, "alkaline"		D, S	Slow seepage and insufficient supply.
18	NE.	15	"	"	"	Dug	30	2,110	- 20	2,090			Glacial black sand	Hard	45	D, S	Fair supply. 2 other wells 14 and 48 feet deep
19	SW.	16	"	"	"	Bored	50	2,150	- 42	2,108			Glacial sand	Hard, "alkaline"	45	S	Poor supply. One other 20-foot well.
20	NW.	16	"	"	"	Dug	28	2,130	- 17	2,113			Glacial sand, gravel	Hard, "alkaline"	43	D	Intermittent supply. Uses a dam for watering stock.
21	NW.	17	"	"	"	Dug	8	2,150	- 6	2,144			Glacial sand	Hard, "alkaline"		D	Intermittent supply. 6 dry holes. Tanks water for stock in winter.
22	SW.	18	"	"	"	Dug	14	2,150	- 10	2,140	10	2,140	Glacial sand	Hard	45	D, S	Good supply.
23	NE.	19	"	"	"	Spring		2,130					Glacial sand, gravel	Hard	42	D, S	Abundant supply.
24	NW.	20	"	"	"	Spring		2,130					Glacial drift	Hard	42	D, S	One other spring. Water is collected and piped into the town of Indian Head. #.
25	SE.	20	"	"	"	Dug	35	2,120	- 33	2,087	33	2,087	Glacial gravel	Hard, "alkaline"		S	Poor supply. Also use a spring.
26	NW.	21	"	"	"	Bored	34	2,100	- 15	2,085	30	2,070	Glacial sand	Hard	42	D, S	Sufficient for 60 head stock.
27	NE.	21	"	"	"	Dug	32	2,100	- 30	2,070			Glacial gravel	Hard, "alkaline"		N	Intermittent supply.
28	NW.	22	"	"	"	Dug	10	2,075	- 6	2,069	6	2,069	Glacial sand	Soft		D, S	Good supply.
29	NW.	22	"	"	"	Dug	30	2,100	- 25	2,075	30	2,070	Glacial sand, gravel	Hard, "alkaline"	42	D, S	Good supply.
30	NE.	22	"	"	"	Bored	30	2,075	- 22	2,053			Glacial sand	Hard, "alkaline"		D, S	Good supply. Dry hole 90 feet deep.
31	SE.	23	"	"	"	Drilled	190	2,050	-170	1,880	190	1,860	Glacial fine sand	Very hard, "alkaline"		S	Well pumps dry. Tanks water for domestic use.
32	NE.	24	"	"	"	Dug	25	2,025	- 18	2,007			Glacial drift	Hard		S	Intermittent well.
33	NE.	25	"	"	"	Bored	28	2,000	- 16	1,984	28	1,972	Glacial sand	Hard, "alkaline"	45	N	Abundant supply but water was condemned by analyst.
34	NE.	26	"	"	"	Dug	35	2,075	- 30	2,045			Glacial sand	Hard, iron	45	D, S	Very good supply.
35	SW.	26	"	"	"	Bored	32	2,075	- 22	2,053			Glacial sand, gravel	Hard, iron, "alkaline"	45	D, S	Fair supply; slow seepage.
36	SE.	27	"	"	"	Bored	40	2,070	- 24	2,046			Glacial sand, gravel	Hard, iron, "alkaline"	45	D, S	Good supply.
37	SE.	28	"	"	"5	Bored	30	2,100	- 22	2,078			Glacial sand	Hard, "alkaline"		D, S	Sufficient for 50 head stock.
38	NW.	28	"	"	"	Dug	15	2,100	- 11	2,089			Glacial fine sand	Hard	45	D, S	Good supply.
39	SE.	29	"	"	"	Spring		2,100	0	2,100			Glacial fine sand	Hard		D, S	Several similar springs in an area of one-half an acre.
40	SW.	29	"	"	"	Spring		2,125	0	2,125			Glacial fine sand	Hard	45	D, S	Good supply.
41	NE.	30	"	"	"	Dug	36	2,160	- 20	2,140			Glacial sand	Hard	45	D, S	Insufficient and poor supply. 10 dry holes to a depth of 160 feet.

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 INDIAN HEAD, NO. 156, 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
42	NW.	31	17	13	2	Bored	75	2,160	-45	2,115	70	2,090	Glacial sand	Hard, "alkaline"	45	D, S	Sufficient supply.
43	NE.	32	"	"	"	Drilled	307	2,100	+ 10	2,110	307	1,793	Glacial sand	Hard, iron, "alkaline"	42	D, S	Abundant supply.
44	NW.	34	"	"	"	Bored	40	2,050	- 33	2,017			Glacial sand	Hard, iron	45	D, S	Good supply. 2 other wells yield very "alkaline" water.
45	NE.	34	"	"	"	Bored	15	2,030	- 9	2,021			Glacial sand	Hard		S	Plenty of water. 23-foot well used for domestic use.
46	SE.	35	"	"	"	Dug	36	2,010	- 30	1,980			Glacial fine sand	Hard, "alkaline"	42	D, S	Yields 5 barrels a day.
47	NW.	35	"	"	"	Bored	32	2,025	- 17	2,008			Glacial sand	Hard, "alkaline"	45	D, S	Good supply.
48	NW.	36	"	"	"	Dug	36	1,960	- 32	1,928	32	1,928	Glacial sand	Hard, "alkaline"	45	D, S	Good supply. 2 other 16 - foot wells also used.
1	NW.	1	18	11	2	Bored	62	1,950	- 12	1,938	62	1,888	Glacial gravel	Hard, "alkaline"	45	S	Very good supply. 22-foot well used for domestic purposes.
2	SE.	2	"	"	"	Bored	50	1,960	- 46	1,914	46	1,914	Glacial sand	Hard	45	D	Poor supply.
3	SE.	2	"	"	"		30	1,960	- 5	1,955	30	1,930	Glacial sand				Abundant supply.
4	SW.	2	"	"	"	Bored	40	1,960	- 20	1,940	40	1,920	Glacial sand	Hard, "alkaline"	45	D, S	Fair supply but sufficient.
5	NW.	2	"	"	"	Bored	50	1,950	- 25	1,925	50	1,900	Glacial gravel	Hard, "alkaline"	45	S	Abundant supply. Tanks drinking water from Sintaluta.
6	NE.	4	"	"	"	Dug	65	1,970	- 25	1,945	65	1,905	Glacial sand, gravel	Hard		D, S	Sufficient supply.
7	SE.	5	"	"	"	Bored	40	1,975	- 32	1,943			Glacial sandy clay	Soft	45	S	Supply varies with rainfall.
8	NE.	5	"	"	"	Bored	65	1,980	- 40	1,940	65	1,915	Glacial sand, gravel.	Hard, "alkaline"	42	D, S	Abundant supply for 35 head stock.
9	SW.	6	"	"	"	Bored	48	1,950	- 30	1,920	48	1,902	Glacial coarse gravel	Hard, iron, sulphur		D, S	Sufficient supply.
10	SW.	6	"	"	"	Bored	40	1,950	- 30	1,920			Glacial sand, gravel	Hard, "alkaline"	44	D, S	Abundant supply.
11	NE.	6	"	"	"	Bored	42	1,950	- 30	1,920	42	1,908	Glacial sand	Hard, "alkaline"		D, S	Abundant supply; laxative producing water.
12	NE.	7	"	"	"	Bored	55	1,950	- 40	1,910			Glacial sand	Hard, iron, "alkaline"	43	D, S	Sufficient for at least 20 head stock.
13	SW.	8	"	"	"	Bored	37	1,930	- 29	1,901	35	1,895	Glacial sand	Hard, "alkaline"		D, S	Very poor supply. Owns a 12-foot well in coulée.
14	NE.	8	"	"	"	Dug	12	1,910	- 4	1,906	12	1,898	Glacial gravel	Hard	45	D, S	Abundant supply.
15	SE.	9	"	"	"	Bored	26	1,950	- 10	1,940			Glacial sand, gravel	Hard, "alkaline"		D, S	Delivers 3 barrels a day.
16	SE.	10	"	"	"	Dug	42	1,940	- 22	1,918			Glacial sand	Hard, "alkaline"	45	S	Slow seepage. Also uses 31-foot well.
17	NW.	10	"	"	"	Dug	12	1,940	- 7	1,933			Glacial sand	Hard, "alkaline"		D, S	Fair supply but sufficient.
18	SW.	10	"	"	"	Dug	33	1,950	- 23	1,927			Glacial sand	Hard	45	D, S	Fair supply.
19	NW.	12	"	"	"	Dug	7	1,900	0	1,900			Glacial drift	Hard, "alkaline"	45	D, S	Very good supply. Well situated beside a large dam.
20	SE.	13	"	"	"	Dug	12	1,900	0	1,900			Glacial sand	Hard	45	D, S	Well situated by a dam in coulée.

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 INDIAN HEAD, NO. 156, 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
21	NW.	14	18	11	2	Dug	35	1,900	- 25	1,875	35	1,865	Glacial gravel	Hard, "alkaline"	45	D, S	Fair supply but sufficient.
22	NW.	15	"	"	"	Dug	42	1,920	- 33	1,887	42	1,878	Glacial sand	Hard	45	D, S,	Good supply.
23	SE.	16	"	"	"	Bored	42	1,925	- 30	1,895			Glacial sand	Hard, "alkaline"		D, S	Sufficient for at least 15 head stock.
24	NE.	16	"	"	"	Dug	12	1,900	- 9	1,891			Glacial sand	Hard		D, S	Has watered 60 head stock. Also use a dam for stock.
25	SW.	16	"	"	"	Dug	40	1,960	- 25	1,935	40	1,920	Glacial gravel	Hard, iron		D, S	Abundant supply.
26	SW.	17	"	"	"	Dug	45	1,925	- 12	1,913	45	1,880	Glacial gravel	Hard, "alkaline"	45	D, S	Fair supply of mineralized water.
27	NW.	19	"	"	"	Bored	24	1,890	- 16	1,874			Glacial sand, gravel	Very hard, "alkaline"		D, S	Sufficient water. Owns two other wells.
28	SE.	20	"	"	"	Dug	29	1,900	- 25	1,875	25	1,875	Glacial sand, gravel	Hard		D, S	Sufficient for at least 40 head stock.
29	SE.	21	"	"	"	Dug	6	1,875	- 3	1,872			Glacial sand	Hard	42	D, S	Abundant supply.
30	NW.	22	"	"	"	Dug	24	1,850	- 8	1,842	24	1,826	Glacial sand, gravel	Hard	42	D, S	Abundant supply.
31	NE.	22	"	"	"	Dug	8	1,850	- 1	1,849			Glacial gravel	Hard	45	D, S	Abundant supply.
32	SW.	22	"	"	"	Bored	28	1,900	- 17	1,883			Glacial sand	Hard, "alkaline"	42	D, S	Good supply of highly mineralized water.
33	NW.	23	"	"	"	Bored	32	1,875	- 18	1,857			Glacial sand	Hard, "alkaline"		D, S	Fair supply but sufficient.
34	NW.	24	"	"	"	Spring		1,800	0	1,800			Glacial gravel	Hard	45	D, S	Abundant supply.
35	NE.	26	"	"	"	Dug	12	1,850	- 10	1,840	10	1,840	Glacial sand	Hard	45	D, S	Slow seepage and insufficient.
36	NE.	27	"	"	"	Dug	16	1,860	- 1	1,859			Glacial sandy clay	Hard	45	D, S	Fair supply. Depends largely on rainfall seepage.
37	SE.	28	"	"	"	Dug	12	1,800	- 3	1,797			Recent stream sand	Hard, "alkaline"		D, S	Varies with water level in the coulée. Also used a dugout for stock.
38	NE.	29	"	"	"	Drilled	360	1,850			360	1,490	Glacial sand	Hard		N	Well is not used. Very little information.
39	SW.	30	"	"	"	Bored	22	1,880	- 7	1,873	22	1,858	Glacial sand	Hard, "alkaline"	45	N	Highly mineralized water. Tanks drinking water. Uses a dam for stock.
40	NW.	31	"	"	"	Dug	10	1,850	- 5	1,845			Glacial drift	Hard		D	Uses a dam for stock purposes.
41	SE.	32	"	"	"	Bored	120	1,860					Glacial drift				Dry hole. Tanks drinking water and uses a dam for stock.
42	NW.	34	"	"	"	Dug	6	1,750	- 2	1,748			Recent stream sand	Hard	45	D, S	Abundant supply.
1	SE.	1	18	12	2	Spring		1,930	0	1,930			Glacial drift	Hard		D, S	Good supply. Sufficient for 35 head stock.
2	SW.	1	"	"	"	Bored	29	1,950	- 17	1,933	29	1,921	Glacial fine sand	Hard	43	D, S	Abundant supply.
3	SW.	3	"	"	"	Drilled	165	2,020	- 85	1,935	165	1,855	Glacial white gravel	Hard, iron	42	S	Abundant supply of highly mineralized water.
4	NW.	4	"	"	"	Dug	18	2,000	- 14	1,986			Glacial drift	Hard, iron	44	D, S	Poor supply; slough seepage.
5	SE.	4	"	"	"	Bored	60	2,025	- 38	1,987	60	1,965	Glacial sand, gravel	Hard		D, S	Plenty of water.

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 INDIAN HEAD, NO. 156, 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
6	SW.	5	18	12	2	Bored	55	2,000	− 40	1,960	55	1,945	Glacial sand	Hard, "alkaline"	45	S	Poor supply of highly mineralized water.
7	NW.	5	"	"	"	Dug	32	1,990	− 26	1,964			Glacial sand, gravel	Hard, very "alkaline"		S	Sufficient but highly mineralized. Tanks water from Indian Head.
8	SE.	6	"	"	"	Bored	80	2,000					Glacial drift				Dry hole.
9	SW.	6	"	"	"			1,975					Glacial drift				Dry holes. Two dams supply stock. Tanks water from Indian Head.
10	NE.	6	"	"	"	Bored	85	1,980					Glacial drift				Dry hole. Tanks water from Indian Head.
11	SW.	8	"	"	"			1,980					Glacial drift				Dry holes. Tanks water from Indian Head.
12	NW.	8	"	"	"	Dug	12	1,960	− 10	1,950			Glacial gravel	Hard		D, S	Insufficient for stock purposes.
13	NE.	8	"	"	"	Dug	56	1,960	− 24	1,936			Glacial sandy clay	Hard		D, S	Sufficient supply.
14	NW.	9	"	"	"	Bored	22	1,970	− 14	1,956			Glacial sand	Hard	42	D, S	Supply varies with rainfall.
15	SW.	10	"	"	"	Bored	18	1,980	− 3	1,977			Glacial gravel	Hard		D	A dam is used for stock purposes.
16	NW.	10	"	"	"	Bored	26	1,960	− 20	1,940	20	1,940	Glacial sand	Hard, iron, "alkaline"	45	S	Good supply of highly mineralized water.
17	SW.	11	"	"	"	Bored	45	1,960	− 15	1,945	45	1,915	Glacial sand	Hard, iron, "alkaline"	45	S	Good supply of highly mineralized water.
18	SE.	12	"	"	"	Drilled	113	1,910	+ 1	1,911	110	1,800	Glacial sand	Hard, iron		D, S	When first drilled water rose 8 feet above the surface. Abundant supply. #.
19	NW.	12	"	"	"	Bored	38	1,920	− 26	1,894	38	1,882	Glacial sand	Hard, iron, "alkaline"	45	D, S	Good supply of laxative producing water.
20	NE.	13	"	"	"	Dug	21	1,920	− 15	1,905			Glacial gravel	Hard, "alkaline"	45	D, S	Good and constant supply.
21	SE.	14	"	"	"	Dug	45	1,925	− 25	1,900	45	1,880	Glacial sand	Hard, "alkaline"	45	D, S	Abundant supply.
22	SE.	15	"	"	"	Dug	16	1,960	− 11	1,949	11	1,949	Glacial sand	Hard	45	D, S	Good supply.
23	NW.	15	"	"	"	Dug	25	1,950	− 14	1,936	25	1,925	Glacial sand	Hard, "alkaline"	45	S	Good supply. Tanks drinking water.
24	NW.	16	"	"	"	Dug	60	1,940	− 40	1,900			Glacial sand	Hard, "alkaline"		S	Fair supply of laxative producing water.
25	SW.	16	"	"	"	Bored	75	1,940	− 55	1,885	75	1,865	Glacial sand	Hard, "alkaline"	45	S	Good supply but highly mineralized. Tanks drinking water.
26	SW.	18	"	"	"	Bored	65	1,940	− 45	1,895	65	1,875	Glacial sand	Hard, iron		D, S	Plenty of water.
27	NE.	20	"	"	"	Bored	80	1,920	− 35	1,885	80	1,840	Glacial sand	Hard, iron		D, S	Abundant supply. 9 bored holes.
28	NW.	20	"	"	"	Bored	75	1,920	− 45	1,875	75	1,845	Glacial sand	Hard, "alkaline"	45	S	Good supply.
29	NE.	22	"	"	"	Bored	40	1,900	− 36	1,864			Glacial fine sand	Hard, "alkaline"	43	S	Fair supply. Water condemned by the analyst. Hauls drinking water.
30	NW.	23	"	"	"	Bored	26	1,900	− 10	1,890			Glacial gravel	Hard, "alkaline"	45	S	Water unfit for human use; good supply.
31	SW.	23	"	"	"	Bored	80	1,900	− 50	1,850	80	1,820	Glacial sand	Hard, iron	42	S	Abundant supply but highly mineralized. Tanks drinking water.
32	NE.	24	"	"	"	Dug	24	1,900	− 19	1,881			Glacial sand	Hard		D, S	4 farmers tank from this well for drinking water. Dam used for 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 INDIAN HEAD, NO. 156, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
33	SE.	25	18	12	2	Bored	62	1,900	- 12	1,888	62	1,838	Glacial sand	Hard, soda		S	Good supply. Tanks drinking water.
34	NE.	27	"	"	"	Dug	6	1,820	- 4	1,816			Recent stream sand	Hard		D, S	Good supply. Dam is also used for stock.
35	SE.	28	"	"	"	Dug	56	1,900	- 36	1,864	55	1,845	Glacial sand, gravel	Hard, "alkaline"		S	Constant supply.
36	SW.	28	"	"	"	Bored	90	1,900	- 20	1,880	90	1,810	Glacial sand	Hard, "alkaline"	45	S	Abundant supply. Tanks drinking water from Indian Head.
37	SE.	29	"	"	"	Bored	60	1,910	- 35	1,875	60	1,850	Glacial sand	Hard, iron, "alkaline"		D, S	Constant, sufficient supply.
38	SE.	30	"	"	"	Dug	27	1,900	- 22	1,878			Glacial drift	Hard	45	D, S	Abundant supply.
39	SW.	31	"	"	"	Bored	60	1,900					Glacial drift				Dry hole. Water is tanked from Indian Head.
40	SW.	32	"	"	"	Bored	60	1,860	- 50	1,810	50	1,810	Glacial sand, gravel	Hard, "alkaline"		D, S	Poor supply of highly mineralized water.
41	NW.	32	"	"	"	Dug	12	1,820	- 4	1,816	4	1,816	Glacial gravel	Hard		D, S	Good supply. Two other similar wells.
42	NE.	33	"	"	"	Dug	15	1,860	- 2	1,858	11	1,849	Glacial gravel	Hard		D, S	Poor supply in coulée. Several springs accur.
1	SE.	1	18	13	2	Dug	30	1,950	- 12	1,938	30	1,920	Glacial sand	Hard, "alkaline"	43	S	Abundant supply but water produces a laxative effect. 64-foot well with small supply.
2	NW.	2	"	"	"	Dug	30	2,010	- 24	1,986	24	1,986	Glacial sand, gravel	Hard, "alkaline"	45	S	Fair supply of highly mineralized water.
3	SW.	2	"	"	"	Bored	45	2,020					Glacial drift	Hard, iron	45	D, S	Sufficient for 10 head stock.
4	NE.	3	"	"	"	Bored	48	2,015	- 18	1,997	45	1,970	Glacial sand	Hard, "alkaline"		S	Abundant supply. A 60-foot dry hole, 25 feet away from this well.
5	NE.	5	"	"	"	Drilled	300	2,060	+ 6	2,066	300	1,760	Glacial sand	Hard, iron, "alkaline"	43	D, S	Abundant supply.
6	NE.	6	"	"	"	Bored	30	2,125	- 26	2,099			Glacial sand	Hard, iron, "alkaline"	45	S	Fair supply; rather slow seepage.
7	SW.	6	"	"	"	Bored	32	2,170	- 28	2,142			Glacial sand	Hard, "alkaline"		D, S	Very poor supply. Forced to tank water.
8	NE.	7	"	"	"	Drilled	274	2,100	-100	2,000	270	1,830	Glacial sand	Hard, iron, "alkaline"	42	D, S	Abundant supply. #.
9	NW.	7	"	"	"	Bored	45	2,120	- 15	2,105	45	2,075	Glacial sand	Hard, iron, "alkaline"	45	D, S	Good supply. Water has laxative effect.
10	NE.	8	"	"	"	Bored	20	2,025	- 16	2,009			Glacial fine sand	Hard	45	D	Dam used for stock purposes.
11	SE.	9	"	"	"	Bored	70	2,020	- 20	2,000	70	1,950	Glacial gravel	Hard	45	D, S	Abundant supply.
12	NE.	9	"	"	"	Dug	36	2,000	- 24	1,976			Glacial drift	Hard, "alkaline"		D, S	Good supply but poor quality.
13	NW.	10	"	"	"	Bored	40	1,980	- 35	1,945			Glacial sand	Hard, "alkaline"		S	Poor supply. Uses standpipe on pipe line to Indian Head.
14	NW.	12	"	"	"	Bored	44	1,950	- 24	1,926	12	1,938	Glacial sand	Hard, "alkaline"	45	N	Poor supply of highly mineralized water.
15	SW.	12	"	"	"	Drilled	45	1,940	- 25	1,915			Glacial sand	Hard		D, S	Abundant supply.
16	SW.	13	"	"	"	Bored	30	1,940	- 29	1,911	29	1,911	Glacial sand	Hard	43	D	Tanks water for stock purposes. One dry drilled well 125 feet deep.

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 INDIAN HEAD, NO. 156, 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
17	SE.	15	18	13	2	Dug	46	1,970	- 6	1,964			Glacial drift	Hard, "alkaline"	45	N	Tanks all water from Indian Head. 6 dry holes bored to 92 feet.
18	SE.	16	"	"	"	Dug	14	1,990	- 10	1,980			Glacial sand	Hard	45	D, S	Very good supply. 3 other wells, 14, 45, and 60 feet deep.
19	SW.	17	"	"	"	Bored	50	2,060	- 30	2,030			Glacial sand	Hard, iron, "alkaline"	45	S	Fair supply but water is injurious to stock. Uses a dugout at present.
20	NE.	17	"	"	"	Bored	70	2,010	- 40	1,970	70	1,940	Glacial sand	Hard, iron, "alkaline"	45	S	Good supply but water is highly mineralized.
21	NE.	20	"	"	"	Drilled	276	2,000	-146	1,854	276	1,724	Glacial sand	Hard, iron		D, S	Abundant supply.
22	NE.	21	"	"	"	Bored	70	1,975	-20	1,955	70	1,905	Glacial sand	Hard, "alkaline"		D, S	Bitter water. Has a 24-foot well with small supply.
23	SE.	22	"	"	"	Dug	10	1,950	- 6	1,944			Glacial sand, gravel	Hard		D, S	A dam is also used for stock purposes.
24		23	"	"	"	Bored	55	1,940	- 33	1,907	55	1,885	Glacial sand	Hard, "alkaline"	43	D, S	Sufficient supply.
25	NE.	26	"	"	"	Drilled	290	1,925	- 90	1,835	290	1,635	Glacial sand	Hard, "alkaline"	42	S	Abundant supply.
26	SE.	26	"	"	"	Bored	30	1,940	- 15	1,925			Glacial sand	Hard, "alkaline"	45	D, S	Good supply of highly mineralized water. Tanks drinking water from Indian Head.
27	SE.	30	"	"	"	Dug	12	2,040	- 11	2,029			Glacial drift	Hard		D, S	Poor supply. Tanks water from Indian Head.
28	NW.	31	"	"	"	Dug	16	2,025	0	2,025			Glacial sandy clay	Hard	45	D, S	Poor supply and insufficient.
29	SE.	31	"	"	"	Drilled	80	2,020	- 30	1,990	80	1,940	Glacial sand	Hard, iron, "alkaline"	45	N	Well has been abandoned; good supply.
30	SE.	32	"	"	"	Drilled	276	1,990	- 40	1,950	275	1,715	Glacial sand	Hard, "alkaline"	44	D, S	Abundant supply. One 10-foot well yields a highly mineralized water.
31	NE.	33	"	"	"	Bored	40	1,950	- 32	1,918			Glacial fine sand	Hard, iron, "alkaline"	44	S	Dugout is used for stock and a shallow seepage well used for house purposes.
32	NW.	33	"	"	"	Bored	20	1,950	- 8	1,942			Glacial sand	Hard	43	D	Sufficient for house use only.
33	SW.	34	"	"	"	Bored	140	1,960	-100	1,860	137	1,823	Glacial gravel	Hard, "alkaline"	42	S	Fair supply; tanks drinking water.
34	NW.	35	"	"	"	Dug	15	1,900	- 8	1,892			Glacial sand	Hard		D, S	Fair supply.
35	NW.	36	"	"	"	Dug	25	1,900	- 10	1,890			Glacial sand	Hard		D, S	Sufficient supply. Waters stock in the coulée also.
1	SW.	4	19a	11	2	Dug	20	1,780	- 8	1,772	20	1,760	Glacial sand	Hard	45	D, S	Good supply.
2	NW.	5	19a	"	"	Dug	12	1,800	- 6	1,794			Glacial fine sand	Hard	45	D, S	Has trouble with quicksand washing in. Waters stock at dam.
3	SE.	6	"	"	"	Bored	60	1,850	- 30	1,820			Glacial gravel	Hard, "alkaline"		N	Water is too highly mineralized for use. Took water from a neighbour.
1	SW.	1	19a	12	2	Dug	10	1,830	- 4	1,826			Glacial drift	Hard		D, S	Intermittent well.
2	NE.	2	"	"	"	Dug	12	1,780	- 8	1,772	12	1,768	Recent stream sand	Hard	45	D, S	Good and constant supply.
3	NW.	2	"	"	"	Dug	12	1,740	- 7	1,733			Recent stream sand			D, S	Plenty of water.
4	NE.	3	"	"	"	Dug	10	1,840	- 3	1,837			Glacial sand	Hard	43	D, S	Abundant supply. Several springs along the coulée.
5	SW.	4	"	"	"	Bored	30	1,850	- 6	1,844	6	1,844	Glacial sand	Hard, "alkaline"		D, S	Sufficient supply. Dry hole 50 feet deep.

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 INDIAN HEAD, NO. 156, 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
6	SE.	9	19a	12	2	Dug	6	1,800	- 2	1,798			Glacial gravel	Hard	45	D, S	Abundant supply.
1	NW.	5	19	11	2	Dug	15	1,600	- 5	1,595	15	1,585	Recent river sand	Hard, iron, "alkaline"	44	D, S	Abundant supply.
2	SW.	8	"	"	"	Dug	14	1,600	- 8	1,592			Recent river gravel	Hard	43	D, S	Sufficient supply. Use creek for stock purposes.
1	SW.	2	19	12	2	Drilled	200	1,850					Glacial drift				Dry hole.
2	SW.	3	"	"	"	Drilled		1,860					Glacial drift	Hard, "alkaline"		S	Intermittent well.
3	SW.	5	"	"	"	Dug	7	1,800	0	1,800			Recent stream gravel	Hard		D, S	Well is seldom used. Good supply.
4	SE.	5	"	"	"	Bored	40	1,850	- 37	1,813	25	1,825	Glacial gravel	Hard, iron	43	D	Intermittent supply. Uses on other well.
5	SE.	6	"	"	"	Dug	9	1,850	- 5	1,845			Glacial	Hard	43	D, S	Seepage water from a dam.
6	SW.	7	"	"	"	Drilled	125	1,865					Glacial				Dry hole.
7	NW.	7	"	"	"	Dug	40	1,780	- 20	1,760	40	1,740	Glacial gravel	Hard, "alkaline"	42	D, S	Abundant supply.
8	NW.	7	"	"	"	Dug	38	1,780	- 15	1,765			Glacial gravel	Hard	43	D, S	Abundant supply.
9	SE.	9	"	"	"	Dug	30	1,740	- 27	1,713			Glacial sand, gravel	Hard, "alkaline"	43	D	Use a dam for stock in summer and a 15-foot well in winter.
10	NE.	12	"	"	"	Dug	14	1,590	-11	1,579			Recent river sand	Hard	43	D, S	Sufficient supply.
11	SW.	12	"	"	"	Dug	8	1,650	0	1,650			Recent stream sand	Hard	43	D, S	Abundant supply.
12	SE.	15	"	"	"	Dug	7	1,750	- 4	1,746			Glacial gravel	Hard, iron	43	D	Intermittent flow in winter.
13	NW.	18	"	"	"	Dug	25	1,750	- 19	1,731			Glacial gravel	Hard, "alkaline"	42	D, S	Abundant supply.
14	SW.	19	"	"	"	Dug	14	1,730	- 12	1,718	12	1,718	Recent stream gravel	Hard	41	D, S	Abundant supply.
15	SE.	21	"	"	"	Bored	60	1,650	- 45	1,605			Glacial gravel	Hard, "alkaline"	43	D, S	Constant and sufficient supply.
16	NW.	21	"	"	"	Drilled	100	1,810					Glacial drift				Dry hole. Another dry hole drilled a little deeper.
17	NW.	22	"	"	"	Dug	12	1,620	- 6	1,614	10	1,610	Recent river sand	Hard, "alkaline"	44	D, S	Sufficient supply.
18	NE.	22	"	"	"	Dug	15	1,600	- 11	1,589	11	1,589	Recent river gravel	Hard, "alkaline"	43	D, S	Good supply and sufficient.
19	SW.	27	"	"	"	Dug	18	1,590	- 15	1,575	15	1,575	Recent river gravel	Hard, "alkaline"	42	D, S	Abundant supply.
20	NE.	31	"	"	"	Dug	14	1,750	- 9	1,741			Glacial sand, gravel	Hard, "alkaline"	43	D	A dam is used for stock.
21	SW.	32	"	"	"	Bored	80	1,800					Glacial drift				Dry hole. Use a dam for stock.
22	SW.	33	"	"	"	Dug	3	1,580	- 2	1,578			Recent river sand	Hard, "alkaline"		D	Lake seepage; used by campers.
1	SE.	1	19	13	2	Dug	46	1,900	- 40	1,860			Glacial gravel	Hard, "alkaline"		S	Insufficient in drought periods.
2	SW.	2	"	"	"	Drilled	204	1,940	- 94	1,846	154	1,786	Glacial sand, gravel	Hard, iron		D, S#	Yields 3 gallons a minute.

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 INDIAN HEAD, NO. 156, 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.	3	19	13	2	Bored	30	1,940	- 10	1,930	30	1,910	Glacial gravel	Hard, "alkaline"	43	D, S	Abundant supply.
4	SE.	4	"	"	"	Drilled	158	1,955	-108	1,847	158	1,797	Glacial gravel	Hard, iron	42	D, S	Abundant supply.
5	SW.	5	"	"	"	Bored	60	2,020	- 40	1,980			Glacial sand, gravel	Hard, "alkaline"	42	D, S	Sufficient supply but slow seepage.
6	SE.	6	"	"	"	Bored	80	2,025	- 10	2,015			Glacial gravel	Hard, sulphur, "alkaline"	42	D, S	Good supply. 6 dry holes in blue clay.
7	NE.	7	"	"	"	Drilled	93	2,020	- 47	1,973	91	1,929	Glacial sand	Hard, "alkaline"		D, S	Delivers 3 gallons a minute.
8	NE.	8	"	"	"	Dug	13	2,000	- 5	1,995			Glacial gravel	Soft	42	D	Slough seepage well.
9	SE.	9	"	"	"	Drilled	175	1,940	- 50	1,890	175	1,765	Glacial sand	Hard, "alkaline"	42	D, S	Abundant supply. Small supply from a 40-foot well.
10	NE.	9	"	"	"	Bored	40	1,955	- 20	1,935			Glacial drift	Hard, iron, "alkaline"		S	Poor supply. Uses a dam part of the year for stock.
11	SE.	10	"	"	"	Drilled	160	1,925	-100	1,825	160	1,765	Glacial gravel	Hard, "alkaline"	43	S	Sufficient but water is highly mineralized.
12	NW.	13	"	"	"	Dug	25	1,840	- 5	1,835			Glacial drift	Hard, "alkaline"		S	Varies greatly with rainfall conditions. 15-foot well used for the house.
13	SE.	15	"	"	"	Drilled	200	1,900	-100	1,800	200	1,700	Glacial gravel	Hard, "alkaline"		S	Yields 2 gallons a minute.
14	NE.	15	"	"	"	Dug	14	1,880	- 8	1,872			Glacial gravel	Hard		D, S	Sufficient supply with a dam and one 15-foot well.
15	NE.	16	"	"	"	Bored	60	1,955	- 40	1,915			Glacial gravel	Hard, "alkaline"	42	D, S	Good supply. Water acts as a laxative.
16	NE.	17	"	"	"	Bored	95	2,010	- 45	1,965			Glacial gravel	Hard, iron, oily		D, S	Abundant supply. #.
17	SE.	18	"	"	"	Bored	85	2,020	- 65	1,955			Glacial gravel	Hard, sulphur	42	D, S	Good supply of laxative producing water.
18	NE.	18	"	"	"	Bored	80	2,020	- 40	1,980	80	1,940	Glacial gravel	Hard, iron, "alkaline"	38	D, S	Abundant supply.
19	SW.	20	"	"	"	Drilled	112	2,000	- 22	1,978	110	1,890	Glacial gravel	Hard, iron	41	D, S	Abundant supply.
20	NE.	21	"	"	"	Drilled	100	1,940	- 50	1,890	100	1,840	Glacial gravel	Hard, iron	43	D, S	Abundant supply.
21	SE.	22	"	"	"	Bored	20	1,890	- 2	1,888			Glacial drift	Hard, "alkaline"	43	S	Seepage from a dam. 8-foot well used for drinking water.
22	NE.	23	"	"	"	Dug	14	1,810	- 7	1,803			Glacial fine sand	Hard	42	D, S	Abundant supply.
23	SW.	23	"	"	"	Dug	12	1,890	- 6	1,884			Glacial gravel	Hard, "alkaline"	42	S	Sufficient for 15 head stock. Unfit for human use.
24	NW.	24	"	"	"	Dug	10	1,800	- 5	1,795			Glacial gravel	Hard	42	D	Sufficient for house use.
25	SE.	27	"	"	"	Drilled	160	1,890	-100	1,790	160	1,730	Glacial sand, gravel	Hard	43	D, S	Abundant supply.
26	SE.	28	"	"	"	Bored	100	1,930	- 50	1,880	100	1,830	Glacial gravel	Hard, "alkaline"	42	S	Supply decreased in past years. Cribbing in bad shape.

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 INDIAN HEAD, NO. 156, 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.	29	19	13	2	Dug	20	1,965	- 17	1,948	17	1,948	Glacial gravel	Hard	43	D, S	Fair supply; slow seepage.
28	SW.	29	"	"	"	Dug	10	1,970	- 5	1,965			Glacial gravel	Hard	43	D, S	Sufficient for 25 head stock.
29	SE.	30	"	"	"	Bored	106	2,000	- 25	1,975			Glacial sand, gravel	Hard, iron		D, S	Good supply.
30	SE.	31	"	"	"	Dug	16	1,980	- 12	1,968			Glacial fine sand	Hard	43	D, S	Sufficient supply. Several shallow seepage wells.
31	NE.	33	"	"	"	Bored	18	1,900	- 10	1,890			Glacial gravel	Hard, "alkaline"	42	S	Abundant supply.
32	SE.	34	"	"	"	Bored	33	1,875	- 10	1,865			Glacial gravel	Hard, "alkaline"		S	Abundant supply. A dam also used for stock.
33	SE.	35	"	"	"	Dug		1,850					Glacial drift				Dry holes. No water on the property.
34	SE.	36	"	"	"	Dug	14	1,825	- 7	1,818			Glacial gravel	Hard	41	D, S	Abundant supply.

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.