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GROUND-WATER RESOURCES OF WEYBURN MAP-AREA SASKATCHEWAN

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UNCONSOLIDATED DEPOSITS

During Pleistocene time a mantle of glacial drift, in places more than 400 feet thick, was deposited over the Weyburn area. Moraine of low relief (Gm)[1] covers more than three quarters of the area. It is composed essentially of till and has a local relief that rarely exceeds 25 feet. Randomly scattered through the till are pockets of silt and sand that were deposited by meltwater from the glacier. These form the aquifers supplying water to most wells in the moraine of low relief. The pockets generally have an areal extent of only a few square feet, and especially when they are at a shallow depth, water levels in wells dug into them show a rapid response to changes in precipitation. There is no surface indication of these pockets of sand and silt, but with sufficient prospecting, one or more can usually be found within a depth of 25 feet that will supply sufficient hard water to serve the needs of a farmhouse and a few head of cattle. On the map are shown the approximate boundaries and depths of larger and deeper aquifers. In general, these will supply greater quantities of water and are less affected by drought conditions, though in many cases the water is too 'alkaline' for human consumption. Outside of these areas there are numerous individual wells supplying abundant water but because of insufficient information it is not possible to outline their aquifers.

Areas of hummocky moraine (Hm)[1] are confined to Moose Mountain and the Missouri Coteau, where the local relief commonly exceeds 100 feet. These areas are composed essentially of till but also contain small pockets of silt and sand, and minor amounts of sand and gravel in the form of kames. The hummocky moraine is dotted with depressions that have no surface drainage so that sloughs and small lakes are formed. Seepage from these bodies of water recharges the numerous springs on the

[1] Letter symbols in parentheses refer to map-legend

lower slopes of the hummocky moraine and also some of the aquifers underlying adjacent lowland areas. Most wells in the hummocky moraine obtain water from the small pockets of silt and sand buried in the till. These pockets can usually be found within 20 feet of the surface although it may be necessary to dig several dry holes before one is located. The deposits of sand and gravel that are, in places, found at the surface of the hummocky moraine are usually not productive aquifers due to the water draining out on adjacent slopes.

There are three major end moraines (Em) within the Weyburn map-area. The largest is the Stoughton moraine which is composed essentially of till. It has ground-water conditions within it that appear to be almost similar to those in the areas of moraine of low relief. The Kisbey moraine contains a high proportion of sand. Over most of its area it is easy to obtain sufficient medium-hard water from depths of less than 40 feet for the needs of 100 to 150 head of cattle. The Oxbow Moraine is composed largely of stratified silt and intercalated till lenses. These sediments are usually too fine grained to form an aquifer and this moraine is not favourable for obtaining ground water from shallow depths.

Eroded moraine (Er) is confined to the Souris River spillway. It is characterized by the numerous boulders visible at the surface and locally by alluvial deposits of sand and gravel. The sand and gravel deposits are rarely more than 15 feet thick but some can supply sufficient soft water for over 50 cattle even during dry years. Because of its low agricultural value, the eroded moraine is sparsely settled and few wells have been dug into it, consequently information is lacking concerning the location and areal extent of individual aquifers.

Areas mapped as kames (K) have a relatively small areal extent, and due to lack of exposures, little is known of their internal composition.

Shallow gravel pits show that at least the surface of some of them consists of sand and gravel. It is suggested that the lower slopes and the immediate vicinity of the base of those known to contain sand and gravel could provide favourable areas in which to attempt to locate ground water at relatively shallow depths.

Outwash (Op) is composed of stratified sand and gravel. Where it is more than a few feet thick it furnishes the most dependable and easily developed water supplies within the map-area. The water obtained is only moderately hard and the water levels are only slightly affected by drought conditions. The most productive outwash area knownis in the vicinity of Auburnton Creek where several wells less than 15 feet deep are each capable of supplying sufficient water for more than 100 head of cattle. There has been little development of ground water from the outwash plains near Lost Horse Hills but it is believed that they could be equally productive. The largest outwash plain in the Weyburn area is that south of Wordsworth. It contains many wells up to 20 feet deep that are capable of supplying water for more than 50 head of cattle but, in places, and especially along its western edge, the sand and gravel is only 1 foot or 2 feet thick and is unproductive. The outwash plain near Osage is the southern edge of an extensive deposit of sand and gravel. Only small amounts of ground water can be obtained from this source in the immediate vicinity of Osage, but near the northern edge of the map-area, where the sand and gravel is known to be at least 20 feet thick, adequate water for individual farm use is obtained by means of sand points.

Glacial-lake deposits (Glb) vary in composition and permeability in the different glacial-lake basins of the Weyburn area. The 160 square miles of the Lake Regina basin that lie along the western boundary of the map-area consist of lacustrine clay that is silty near the edge of the

basin. The relatively impervious clay is up to 20 feet thick over much of the basin and considerably restricts the seepage of precipitation to underlying aquifers, where present. Consequently over much of the Lake Regina basin only small supplies of hard 'alkaline' water may be expected. Within this area the greatest concentration of wells yielding relatively large amounts of water is in tp. 9, rge. 15. Here, a number of wells approximately 25 feet deep, each derive sufficient water for more than 50 head of cattle from glacial sand and gravel beneath the clay. Lake Arcola basin sediments range in composition from stratified sands in the northwest to stratified silts and clays in the eastern part. Except for an area between Arcola and Carlyle, where till is close to the surface, the lake-basin sediments form an excellent aquifer. In the eastern part of the basin the sand aquifer is overlain by 10 to 20 feet of black clay that gradually decreases in thickness toward the west. The sands are known to reach a thickness of 40 feet and wells dug at most places within the basin will yield an abundant supply of medium-hard, clear water. The smaller lake basins within the map-area are not known to contain any large aquifers. Generally, wells in these areas must be dug through the lake sediments and into pockets of silt and sand in the underlying till.

Alluvium (Afp) is present along the upper reaches of Moose Mountain Creek and along Souris River to the southeast of Weyburn. A number of wells on the flood plain of Moose Mountain Creek supply sufficient water for at least 50 cattle. The water is obtained at depths of about 12 feet from beds of sand and gravel. On Souris River the alluvial flood plain consists largely of silts with thin beds of fine-grained sand. Downstream from Roche Percée the alluvium is sandier than it is to the northwest. Wells dug into these deposits are commonly about 15 feet deep and depend on seepage from the river. Only moderate quantities of soft to medium-hard water are obtained. One well drilled into these

deposits near Oxbow, where the alluvium is about 30 feet thick only delivered 2 gallons per minute under test.

Meltwater flowing from the glaciers formed many broad, shallow depressions in the drift that are now commonly occupied by intermittent streams. These meltwater channels commonly contain deposits of sand and gravel, particularly in slip-off slopes on meander bends. The sand and gravel probably rarely exceeds 10 feet in depth but will supply sufficient water for a small farm. These channels also collect and store a certain amount of the precipitation so that recharge conditions to underlying aquifers in the till to depths of approximately 20 feet, are better than they are in adjoining areas. For this reason meltwater channels commonly form the most favourable place to locate water at shallow depths in till areas.

The preglacial channel of the Missouri River was cut to depths of 250 to 400 feet below the present surface of the Weyburn area. Little is known of the ground-water potential of this channel, but at one location in sec. 16, tp. 4, rge. 8, W. 2, at least 17 feet of glacial sand and gravel is present beneath 347 feet of till. A bailer test in this hole produced 12 gallons of water per minute with very little drawdown. The location of the channel as shown on the accompanying map is only approximate and any drilling operations to locate it should be preceded by a resistivity or seismic survey.

BEDROCK

Riding Mountain Formation

The Riding Mountain formation does not outcrop within the map-area but it is known to underlie the till in much of the northern part. It is more than 1,000 feet thick, consisting of grey to greenish grey shale, in part siliceous. Water is sometimes obtained from fractures in

the upper surface of the formation but only small quantities of highly saline water are likely to be found below the zone of fracturing. Many dry holes have been drilled into the formation and farmers are strongly advised to refrain from the expense of drilling to considerable depths within this material.

Eastend Formation

The Eastend formation lies between the Riding Mountain formation and the Ravenscrag formation, and immediately underlies the till in the 4-to-10-mile-wide belt shown on the map. Its only known outcrops are on Souris River 14 miles southeast of Weyburn and on Roughbark Creek near Halbrite. The formation rarely exceeds 40 feet in thickness and consists principally of fine-grained sands and silts with some shale and thin seams of lignite. Although the Eastend formation is water-bearing, the fineness of the sand makes it difficult to obtain large quantities of water and to maintain the well. No wells are known to be producing water from this source to the east of rge. 13.

Ravenscrag Formation

The Ravenscrag formation overlies the Eastend formation and is the youngest bedrock in the area. It consists of sand, silt, shale, clay, and lignite. The seams of sand and lignite that comprise the aquifers are not thought to be continuous horizons throughout the formation but rather a series of large lens-like deposits. Holes drilled almost anywhere in the Ravenscrag formation can encounter at least one of these aquifers. The water obtained is generally soft due to the presence of sodium carbonate and although usable by both livestock and humans it is unsuitable for irrigation. The water is under hydrostatic pressure and will rise up the hole to such an extent that in places flowing artesian wells are obtained. Water levels in wells in this formation are not affected by prolonged periods of drought. There is little quantitative information available but one well at Bienfait, 150 feet deep,

produces 20 gallons per minute from the Ravenscrag formation. In many places it is possible that production could be increased by deepening wells so that two or more aquifers could be used at the same time.